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Health Tourism Institute

The 1st International Conference on Integrative Medicine for Wellness (ICIM 2019)

June 6-7, 2019

5-2 Room, 5 th Floor, President' s office Building
Dhurakij Pundit University

About the Conference

The international conference on integrative medicine for wellness 2019 (ICIM 2019) is an international platform for scholars, researchers, students and practitioners. The conference takes place from 6th – 7th June 2019 at Dhurakij Pundit University (DPU), Bangkok, Thailand. The conference aims to: 1) exchange and share their experiences and research results about all aspects of integrative medicine, wellness, business, education, tourism and related areas, and 2) discuss on the practical challenges encountered and the solutions adopted.

The scope of the 1st conference is as follows:

• To provide scientific information on nutrition, herb and supplement, spa services, body & mind health, aging society, environment, education, tourism, artificial intelligent related from global scale to personal health of wellness.

• To promote the understanding the knowledge of wellness. The meaning of wellness, which is important for every party doing this industry. Knowing the background, the present situation in the world and the position of Thailand at the present time, the trend to be in the near future. Also formulate the idea of how these industries should adapt themselves for the benefit of every party.

• To create an international network for researchers, scientists, and scholar students and working people on integrative medicine and wellness, so that there should be further co-operation and collaboration in between institute to institute and/or people to people in this territory.

The ICIM2019 is organized by the College of Integrative Medicine (CIM) and the Research Service Center (RSC), Dhurakij Pundit University, Thailand, as well as our academic network as follows:

1) Pharma Nord, Denmark
2) Burton and South Derbyshire College (BSDC), UK
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Conference Agenda Thursday, June 6th,2019

Date	Time	Activity		Venue
6th June 2019 (Thursday)	08.30-08.45	Registration		**Sanom Sudhipitak, Building 4**
	08.45-09.00	Opening Ceremony **by Professor Emeritus Dr.Yongyut Watcharadul** Chair of the Interdisciplinary Network of the Royal Institute of Thailand under the Royal Patronage of HRH Princess Maha Chakri Sirindhorn		
	09.00-10.30	"The role of Integrative Medicine for People's Health in Thailand" **by Tewan Thaneerat, M.D. Wanviput Sanphansitvong, M.D. .Monthaka Teerachaisakul, Ph.D.**		
	10.30-10.45	**Tea Break**		
	10.45-12.00	"Wellness-the Unlimited Health Care, from Heart Disease, Blood Fat to Youngness " **by Banchob Junhasavasdikul, M.D.**		
	13.00-13.15	CIM Wellness Network Activity		
	13.15-14.45	"Thai Wellness-the Signature of Thai Health" **by Komsan Dinakara Na Ayudhaya, (Traditional Thai Medicine Doctor) & Tipatat Junhasavasdikul, M.D.**	"Anthroposophic Music Therapy" **By Mr. Stephan Kühne (Germany Music Therapist) Room 1022**	
	14.45-15.00	**Tea Break**		
	15.00-15.45	"Chronic Fatigue Lacking Vital Energy, the Over looked Hormonal Depletion" **by Asst. Prof. Pansak Sugkraroek, M.D.**		
	15.45-16.30	"The Role of Chelation and Integrative Medicine on Environmental Pollution" **by Bancha Daengneam, M.D.**		

Conference Agenda Friday, June 7th, 2019

Date	Time	Activity	Venue
7th June 2019 (Friday)	08.00-09.00	Registration	**5-2 Room, 5th Floor President's office Building**
	09.00-09.25	Opening Ceremony by **Mr. Chote Trachu** Permanent Secretary of Minister of Tourism and Sports **Marut Jirasttasiri, M.D.** Director of Department of Thai Traditional and Alternative Medicine	
	09.25-09.30	**Mr.Jorgen Dam** Director of **Pharma Nord ApS Co.,Ltd.**	
	09.30-10.15	Holistic View of Wellness in Thailand **by Banchob Junhasavasdikul, M.D.** Dean of College of Integrative Medicine	
	10.15-10.30	**Tea Break**	
	10.30-11.30	Keynote Speaker#1 : "Remarkable Benefits by Prevention of Oxidation and Inflammation-Supplements of First Choice" by **Claus Hancke, M.D.** FACAM Specialist in General Medicine	
	11.30-12.00	Keynote Speaker #2 "Influencing Metabolic Pain Pathways Through Botanical Therapeutics" by **Patrick Garrett , M.D**. American Board of Functional Medicine/ Nutrition	
	12:00-13:30	**Lunch**	President's office Building1, 5th floor
	13:30-15.00	Parallel Session 1	Classrooms
	15.00-16.30	Parallel Session 2	Classrooms
End of Conference			

REMARKS: All presenters should be ready in the meeting room at least 10 minutes prior to the start of the session. Presenters should introduce themselves to the session chair and upload their papers to the computer.

Schedule of Paper Presentation

Friday, June 7th, 2019 from 13.30 to 16.30 p.m.

President's office Building 2, 3rd Floor, Room 3-1

Sequence	Time	Name - Last name	Paper Title	Paper No.
1	13.00 – 13.20	Suchitra Rimdusit and Varaphorn Duangsaeng	Behaviors and Expectations, Satisfactions of Foreign Tourists towards Thai Culinary School	1006
2	13.20 – 13.40	Rattana Srinuan	Marketing relations, Integrated Marketing, internal marketing overview that affects the achievement of business operations Accounting Business in Thailand	1012
3	13.40 – 14.00	Monruadee Keeratipranon	Influence of Marketing Factors to the Behavior of Spa-Hot Spring Users in Ranong	1017
4	14.00 – 14.20	Puri Chunkajorn	Value-added Development: A model for Creating Joint Activities between Local Food Tourism and Health Tourism	1021
5	14.20 – 14.40	Piyavit Thipbharos	Functional Banana Flower Ingredients: Opportunities and Challenges for Innovative Food Entrepreneurs in the Thailand 4.0 Era	1022
6	14.40 – 15.00	Thitirat Wangratanaparkdee	Dietary Exposure to Benzoic Acid and Sorbic Acid from Frozen Food in Convenience store	1025
7	15.00 – 15.20	Nachattamar Rungratmaneemas	Study of pH values in Bottled Drinking Water Sold at Convenience Stores	1030

President's office Building 2, 3rd Floor, Room 3-3

Sequence	Time	Name - Last name	Paper Title	Paper No.
1	13.00 – 13.20	Piyaporn Detudom and Amarin Ratanavis	Graffiti Removal using CO2 laser	1010
2	13.20 – 13.40	Jumpon Yangomoot and Amarin Ratanavis	Laser based fabrication of Microfluidics devices	1011
3	13.40 – 14.00	Picha Suwannahitaorn, and Jarasphol Rintha	Comparison of Second Derivative of Photoplethysmography Indices and 10-Year Cardiovascular Risk Predictor Tool	1016
4	14.00 – 14.20	Pawadee Laonopkhun, and Punyaphat Sirithanabadeekul	Efficacy and Safety of a single treatment using 1064-nm Picosecond Laser for Treatment of Keratosis Pilaris	1034
5	14.20 – 14.40	Tarin Charoensetthasilp	A Pilot Study of Body Composition, Blood Sugar and Lipid Profile Effect of Nutrilite® Plant-Based Protein Supplement in Overweight Subjects	1015
6	14.40 – 15.00	Kittikun Ngamudomkiat, Punyaphat Sirithanabadeekul, and Voraphol Vejjabhinanta	The observation of Koebner phenomenon with topical 0.1% Triamcinolone acetonide in combination with a fractional Erbium YAG laser for the treatment of psoriasis	1028
7	15.00 – 15.20	Paporn Thepparak and Pongsiri Khunngam,	Graffiti Removal using CO2 laser	1039

President's office Building 2, 3rd Floor, Room 3-4

Sequence	Time	Name - Last name	Paper Title	Paper No.
1	13.00 – 13.20	Panitee Suwanamornlert and Mary Joy P. Paico	Enrichment of Eggs with Functional Ingredients and Strategies for Enhancing Safety	1037
2	13.20 – 13.40	Nuengwong Tuaycharoen, Yanisa Kwandee, and Naparat Srilapan	Do Thai People Know Their Own Thai Birth Elements?	1014
3	13.40 – 14.00	Sudkanung Naruponjirakul	Exploring the English Self-Efficacy of L2 Graduate Students	1009
4	14.00 – 14.20	Janpha Thadphoothon	Brain Research and Its implications for English Language Teaching (ELT)	1003
5	14.20 – 14.40	Likhasit Suwannatrai and Narathip Thumawongsa	The Effect of Integrating Web-Assisted Language Learning (WALL) on Vocabulary Enhancement of the Elementary English Students	1007
6	14.40 – 15.00	Naparat Srilapan, Banchob Junhasawasdikul, John Beaty, Ramaimas Chankao and Sohnatda Panchee	MedWellNet 1.2.2 Concept and Dimension of Wellness: A systematic scoping review	1024

President's office Building 2, 3rd Floor, Room 3-6

Sequence	Time	Name - Last name	Paper Title	Paper No.
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2	13.20 – 13.40	Banchob Junhasavasdikul, Sumio Goto, Amporn Krobthong, Payong Wanikiat, Kamon Chaiyasit and Rangsit Sarachitti	Prevalence and Comparison of High Homocysteine and Dyslipidemia in Office Personals of a Rice Exporting Company	1032
3	13.40 – 14.00	Sarinya Wongsanit, Thunyatorn Yimsoo, Werayut Yingmema and Pattra Lertsarawut	Biodistribution Study of 68Ga-DOTAVAP-P1 in BALB/cMlac-nu Models	1027
4	14.00 – 14.20	Venkatesan Puthur Thirusailam	Homeopathic approach to cancer treating and palliating the cancer cases homeopathic way	1018
5	14.20 – 14.40	Banchob Junhasavasdikul and Venkatesan Puthur Thirusailam	Homeopathic Approach for the Treatment of Ailments from PM2.5	1038
6	14.40 – 15.00	Gary Weaver	The paradigm of using a repertory in Homoeopathy	1040

President's office Building 2, 3rd Floor, Room 3-6 (Continue)

Sequence	Time	Name - Last name	Paper Title	Paper No.
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8	15.20 – 15.40	Banchob Junhasavasdikul, Yasuaki Goto, Sasithorn Anantasopon, Kamon Chaiyasit, Kullaya Pisitsungkagarn, Payong Wanikiat, and Amporn Krobthong	Effect of online Dynamic Mindfulness Practicing in the Lineage of Luanpor Teean's Teaching: On the Status of MindFluness, Depression, Anxiety and Stress in Working People	1033

Contents

Brain Research and Its implications for English Language Teaching (ELT)

Janpha Thadphoothon

Faculty of Arts, Dhurakij Pundit University, Thailand

janphadpu@gmail.com

Abstract

In this paper, the author discusses some major findings of research on human brain or brain research related to learning in general and language learning in particular. The author, then highlights its implications for the teaching and learning of language, especially the learning and teaching of English as a second/foreign language. The aim of the paper is to summarize and discuss the brain research findings and discuss their implications for English language instruction. The author reviewed the literature on/related to brain research and language instruction. Based on the findings gleaned from research into the human brain, the author argues that neuroscience has confirmed many of the good ideas that English as a Foreign Language (EFL) teachers have been implementing, such as Communicative Language Teaching (CLT) and Cooperative Language (CL). It is, hence, logical that, by implementing cooperative learning principles, for example, EFL teachers are actually helping their learners to learn the language more effectively, as how they learn reflects how their brains work.

Keywords: Brain research, Neuroscience, ELT, Language acquisition, Cooperative learning

1. Introduction

Recently, major findings of research on how human brain works have been investigated and many findings have been applied to help language educators and teachers do their job more effectively. In this paper, I, first of all, argue that EFL/ESL teachers and program providers take the findings of brain research and its related disciplines into consideration when they teach or plan their learning activities and curriculum. Next, I present some findings of brain research that are relevant to the EFL/ESL classroom. Lastly, this paper concludes by suggesting that by implementing CL & activities and the communicative approach to the teaching of English, we EFL/ESL teachers create conditions for learners to learn the language more effectively, as how they learn reflects how their brains work. Next section, I define what EFL/ESL and brain research are; then I discuss why EFL/ESL teachers should apply the findings of by brain research.

2. EFL/ESL and Brain Research

EFL stands for *English as a foreign language*; ESL is *English as a second language*. In Thailand, for example, English has been perceived by the majority as the most important foreign language or EFL. EFL/ESL is a discipline under the umbrella of ELT or *English Language Teaching.* ELT is a discipline drawn from some of the principles of other fields, including, education, linguistics and applied linguistics, among others. EFL/ESL as a discipline emerged after World War II (Smith, 2012).

In the past, EFL/ESL relied on research findings of behaviorists such as John B. Watson and B. F. Skinner. The behaviorists emphasize habit forming and modeling. Watson excluded 'the brain' or rather what goes on inside the brain; he focused solely on the behavior. Language teachers in the 1950s and 1960s emphasized habit formation and repetition. This teaching method is called the audio-lingual method of teaching. Audio-lingual teaching has been criticized by many language teachers and researchers since 1970s, as it emphasizes memorization and repetition of grammatical structures in isolation from contexts of meaningful use. In the late 1970s, the communicative approach to language teaching was introduced, emphasizing real-life situations that necessitate communication. This approach hypothesizes that successful language learning involves not only a knowledge of the structures and grammar, but also the functions and purposes that a language serves in different communicative settings. This approach emphasizes the communications of meaning over rote learning and the manipulation of grammatical forms.

Cooperative learning activities are compatible with the communicative approach to language teaching; in particular, they promote authentic use of the language and promote student-student interaction. Unlike the teacher-fronted approach to language teaching, CL activities provide learners more opportunities to practice using L2.

Long (1997) has discussed one of the weaknesses of teacher-fronted, lock-step instruction, "whereby the teacher presents and practices the same material in the same way to and with all the learners simultaneously". He suggests the use of group work as an alternative. Learning together with peers and other allows learners to have access to more sense data or stimuli --- anything that is able to cause response in us as human beings. Rather than the sole input from the teacher, learners can interact with each other; more input. More meaningful interaction is a crucial factor in language learning. Kagan (2004) has argued that, to a remarkable degree, proper application of cooperative learning principles promote effective learning, such as learning is actually brain-friendly learning.

Brain Research

Putting ELT aside, let's look at brain research, which is simply research on the human brain --- how it develops and operates; it is often conducted with several brain imaging techniques such as Positron Emission Tomography (PET), Magnetic Resonance Imaging (MRI), and Functional Magnetic Resonance Imaging (fMRI). The advent of imaging technology has made it possible for us to observe neural activities in the brain. This is because humans are determined to know what is inside the 'black box'. In this paper, the term 'brain research' is conceptualized in a broader sense, encompassing other brain-based disciplines such as neuroscience, which is a study of the nervous system, biopsychology, psychobiology, cognitive neuroscience, and behavioral neuroscience, to name just a few. They all study human brain; how it relates to overt behavior and interacts with nature.

Why do EFL/ESL teachers need to know about brain research? Why not just simply teach the student grammar and vocabulary, and so forth? Intuition tells us that it is because language learning, like any other human activities (e.g. Learning to drive, play guitar, etc.), is integrated with the activities in our brains. Indeed, speech and language are unique to man as Noam Chomsky (1968) has put it:

> "When we study human language, we are approaching what some might call the 'human essence' the distinctive quality of mind that are, so far as we know, unique to man."

Furthermore, Noam Chomsky and many psycholinguists such as Steven Pinker have postulated that "the human brain is genetically structured to generate language --- that children are biologically "pre-wired" with neuronal circuits that predispose them to language usage"(Vander Zanden, 1980, p.210).

Whether or not the brain has been pre-wired to generate language is a controversial subject. The fact is that there are people who are good at English and people who are not. Research has been done to find out why it is so. For instance, there are some people who think that one reason why they are not good at learning another language is because of their poor memory. Others reason they are too old to learn another language. Now, let's pause and reflect. Memory, short-term or long-term, is essentially about the brain. As teachers, we have observed that younger children excel when it comes to L2 acquisition. Our biological age is related to our brain cells. Another reason would be the fact that EFL/ESL is a field that is interdisciplinary by nature. Since its inception, it has drawn principles and findings from theories and practices of other field such as linguistics, psychology, behavioral science, and anthropology. Recently, we have tried to include theories and findings from basic science such as brain research to explain our practices. Brain research, in my opinion, is not just another fad in education; it is a new paradigm in the 21st century.

The brain, admittedly, is not something new among linguists. It is recognized that the first person who catalyzed the study on the relationship between the brain and speech was a French man called Paul Broca (1824-1880). He is credited for his discovery of the speech production center of the brain located in the frontal lobes. Now, the area in that part of the brain is known as the Broca's area.

Not long after that Karl Wernicke, a German scientist discovered another significant area in the brain. The area is known as the Wernicke area, named after him. Damaged to this part of the brain may result in language impairments. His findings demonstrated that our ability to learn languages resides in specific areas of the brain. It is believed among language specialists and medical practitioners that the Broca's area of the brain helps us produce coherent speech; whereas, the Wernicke area helps us process language stimuli and understanding the language.

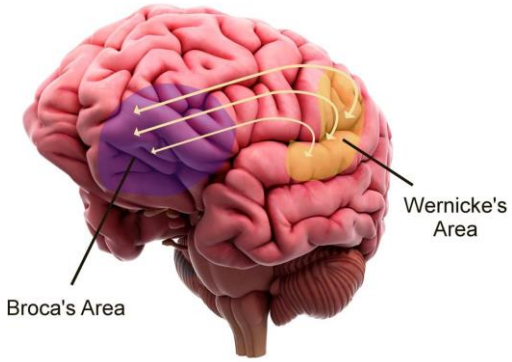


Figure 1: Broca's Area Vs. Wernicke's Area
Source: https://bodytomy.com/difference-between-brocas-area-wernickes-area-in-brain
Bain has its age and it ages. Based on evidence from brain damage studies, Lenneburge (1967) has asserted that the plasticity of the brain is determined by our biological age. He proposed the Critical Age Hypothesis, asserting that our ability to attain native-line accent decreases with our age. The brain is believed to be hard-wired, but plastic and malleable. There are connections made by billions of neurons that send electrical signals to the brain when they are stimulated. How the brain recognizes words and gives us our consciousness is still unclear.

Concerns about the link between language ability and the brain have led many linguists to turn to evidence from basic scientific studies. There emerged a discipline called neurolinguistics, defined as a science concerned with the human brain mechanisms underlying the comprehension, production and abstract knowledge of language, be it spoken, signed or written. As an interdisciplinary endeavor, this field deals with findings from linguistics, cognitive science, neurobiology and computer science, among others. Neurolinguitics emerged, partly, as the result of the discovery of the brain language areas.

3. Key Findings of Brain Research

In this section, I present the key finding of brain research that I think are relevant to the EFL/ESL classroom.

3.1) Brain Plasticity

Findings from brain research seem to suggest that the brain is plastic and malleable. The brain's plasticity means that new learning and relearning can take place at any age. However, young children tend to find it easier to learn and relearn new things, compared with adults.
In linguistics, brain plasticity has its discourse in the critical period hypothesis, stating that "the period of child development lasting up to puberty is the optimum period for language acquisition; after that the capacity to learn language with ease wanes (O'Grady, Dobrovolsky, and Katamba, 1997, p. 710.)" This hypothesis is supported by brain research demonstrating that if a child learns a second language early in life, both the native and second language are represented in the same cortical region. In contrast, when a second language is acquired in adulthood, a new language center that is clearly separated from the native language center is established in the cortex.

Ventureyra, Pallier, and Yoo, (2004) have attempted to explain the critical age hypothesis, arguing that the reason older learners of L2 often have difficulties in their learning could be because of their low levels of engagement. They explain that the brain is plastic, and the reason why that is so is not due to an irreversible decrease of neural plasticity with age, but is rather due to an increased stabilization of the neural network by the learning of L1. They seem to tell us that: old habits die hard.

Next, we turn to the question: "Can brains generate new cells?" research has shown that the brain has the capacity to generate new nerve cells in some areas. In 1998, Peter Eriksson and colleagues discovered that the brain also produces new nerve cells in adulthood. This may invalidate the long-held assumption that humans are born with all the brain cells they will ever have. They indicate that the human hippocampus (the structure deep in the brain that takes thoughts and perceptions and turns them into durable memories) retains its ability to generate neurons throughout life. However, this does not mean that all parts of the brain can generate new cells. It is true that the neurons in the hippocampus can be generated; it is also true that nobody really knows their functions.

However, the plasticity of the brain has its limitation, and age plays a key role in its capacity to regenerate new cells (Lenneburg, 1967). A team of researchers at Howard Hughes Medical Institute used fMRI to investigate cortical activity of adult monkeys with injuries to their retinas. They discovered that the reorganization in the primary visual cortex was very limited. This finding seems to suggest that the brain may be less plastic than we had hoped.

Age at the onset is an important factor, but, surely, not the only factor. One study on the possible remnants of L1 phonology found that the sample of Korean adoptees in France did not perceive the differences between Korean phonemes (Korean glottalized consonants and aspirated consonants are alien to French) better than the sample of native French speakers previously unexposed to Korean. The Korean adoptees did not have easy access to the phonetic categories of the Korean language (Ventureyra. Et al., 2004). This seems to suggest that language attrition is the result of the formation of new habits: old habits have been replaced by the new ones.

Kim, Relkin, Lee, and Hirsc (1997) investigated the fundamental question of how multiple languages are represented in the brain. They applied fMRI to determine the spatial relationship between native and second languages in the human cortex. They found that within the frontal-lobe language-sensitive regions of Broca's area, second languages acquired in adulthood ('late' bilingual subjects) are spatially separated from native languages. However, when acquired during the early language acquisition stage of development ('early' bilingual subjects), native and second languages tend to be represented in common frontal cortical areas. In both late and early bilingual subjects, the temporal-lobe language-sensitive regions or Wernicke's area also show effectively little or no separation of activity based on the age of language acquisition.

In sum, brain research has suggested that the brain is plastic and malleable; age of onset is one factor determining its plasticity. If a child learns a second language early in life, both the native and second language would be represented in the same cortical region. In contrast, when a second language (say, English) is acquired in adulthood, a new language center that is clearly separated from the native language center is established in the cortex. These findings, however, do not yet explain why young children are able to learn a new language more easily than older people, they confirm the findings that early experiences affect the way the brain develops.

3.2) Brain Lateralization

Both sides of the brain are required for language comprehension and use. Language is both logical and creative, which means that we need to utilize the ability and capacity of the brain from the whole brain. Even though the lateralization of the brain is another finding related to language learning (Broca's area and Wernicke's are located in the left hemisphere of the brain), research, however, shows that both hemispheres of the brain are needed to enable us to use language effectively.

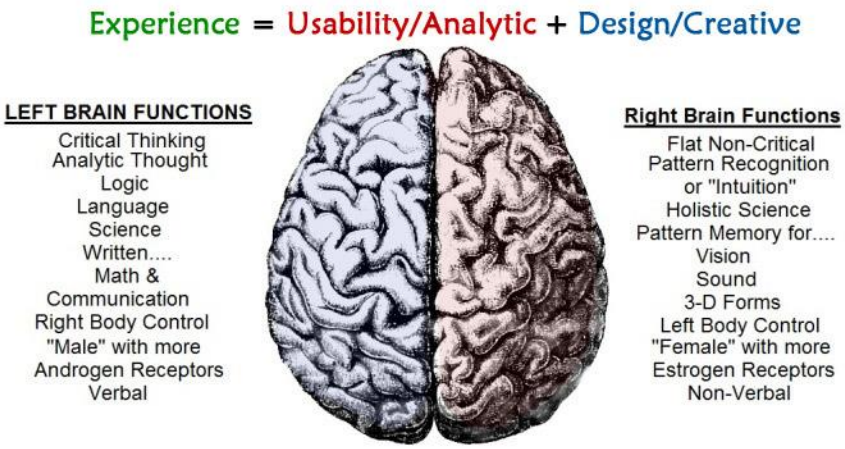


Figure 2: The Left and Right Cerebral Hemispheres
Source: https://evolveconsciousness.org/consciousness-and-the-cerebral-hemispheres/

Brain lateralization does have the implications for second language acquisition. In terms of genders, males and females have different brain sizes. In general, it is believed that females have bigger left brain than males do, so they tend to perform language functions better than males.

A recent study reported by Wong et al. (2007) claimed to have found the area in the brain that seems to partially responsible for the success of L2 learning. They investigated the relationship between the anatomy of Heschl's Gyrus with L2 learning and found that the size if the left HG mage the difference when it comes to speech learning and word recognition. However this research has excluded other things that matter in L2 acquisition: age at onset, motivation, teaching quality, etc. their claim needs to be challenged by other disciplines.

3.3) Health

Brains need nutrients and exercise. When Milton Chen (2007) asked Stanford University professor Carol Dweck about the implications of her research on human intelligence, she recommended many strategies, such as nutrition.

> "Teach students to think of their brain as a muscle that strengthens with use, and have them visualize the brain forming new connections every time they learn".

Before the brain operates, it needs nourishment. The brain needs to be nourished with necessary nutrients such as water, many kinds of minerals, oxygen, glucose, and amino acids.

Research has found that several benefits: "…exercise is strongly correlated with increased brain mass, better cognition, mood regulation, and new cells production: (Jensen, 2008)".

3.4) Social Stimuli

Brains need social stimuli. Brains are social organisms. Early behavioral studies have showed that as young children gradually engage in cooperative and associative activities; while, solitary activities begin to wane (Paten, 1932; Maudry & Nekula, 1939).

Bronislaw Malinowski, among others, has recognized the role of culture in forming individual's worldview. Likewise, Vygotsky (1978) asserted that a child forms his knowledge and self by interacting with a society in which he or he lives. Social conditions influence our brains. Similarly, Brothers (1997), our brains have evolved to selectively attend to social stimuli. Recent research has demonstrated that social stimuli influence brains, for example, Carter (1999) has shown that brains are more active learning in interaction with others than when alone, reading or listening to a lecture. This supports group work or CL activities.

An experiment was designed to see if thought is also an action. It was reported by Humphrey (1948) that when we are merely thinking of something, we are actually doing something or acting on something, though on a small scale. Thought never wholly free itself from action. Humans not only learn by doing something meaningful or from first-hand experience, but also from indirect experience i.e. by observing the natural and social phenomena. Learners as observers can acquire new cognitive skills and patterns of behavior by "observing the performance of other" (Bandura, 1986, p. 49). According to Bandura (1986), when learners pay attention to the modeled activities or events [most of them are abstractly represented as conceptions, rules, rules of action which specify what to do], they remember them. They then transform what they observe into their cognitive representational systems.

3.5) Brain Complexity

The brain is complex; it processes parts and wholes simultaneously; it can also do many things at one time. Even though there is evidence of brain laterality, for a healthy person, the two hemispheres are inextricably interactive, irrespective of whether a person is dealing with words, mathematics, chemistry, crossword puzzles, music, or art (Hand 1984; Levy 1972, cited in Caine and Caine, 1990).

The brain perceives the world using several parallel pathways. One aspect of the brain architecture is that it can process information in parallel. Quoting Spolsky (1989), Brown (1994) contrasts it with the early connectionist view:

> "A more messier but more fruitful picture is provided by what has come to be known as the *Parallel Distributed Processing* (PDP) model (also called connectionism) in which neurons in the

> brain are said to from multiple connections: each of the 100 billion nerve cells in the brain maybe lined to as many as 10,000 of its counterparts."

Moreover,

> "… a child's(or adult's) linguistic performance maybe the consequence of many levels of simultaneous neural interconnections and not a serial process of one rule being applied, then another, and so forth."

Brown (Ibid) invites the reader to imagine [of course, in a logically possibly manner] an orchestra playing a symphony e.g. London Symphony Orchestra performing Mozart's *A Little Night Music* (Eine Kleine Nachtmusik). He put it like this:

> "The score for the symphony may have, let's say, twelve separate parts that are performed simultaneously. The symphony of the human brain enables us to process many segments and levels of language , cognition , affect , and perception all at once --- in parallel configuration."

Quoting Sokolik (1990) as well as Ney and Pearson (1990), Brown (ibid) writes:

> "According to PDP model, a sentence --- which has phonological, morphological, morphological, syntactic, lexical, semantic, discourse, sociolinguistic, and strategic properties --- is not generated by a series of the simultaneous interconnection of a multitude of brain cells."

How we have become a conscious being is still a mystery. Language acquisition (and language learning) is a complex biological and social process.

3.6. Brain Scans Show How Language Is Processed

Changeux (1998), as a scientist, engaged in a conversation on how humans think with a French philosopher by the name of Paul Ricoeur. One of their conversations was on brain images. Under this topic, Changeux explains how scientists have tried to study the human brain. "Brain imaging…in the course of recent decades, new observational instruments … include positron emission tomography (PET) and functional resonance imaging (fMRI), as well as new developments in electroencephalography" (p. 52). He suggests that now it is possible to "interpret images of the mental states of another person" (p. 53). Of course, their conversations aim to help us understand more about how we think and the relationship between our brain activities and self-awareness.

Scientist have been using scanners to take pictures and videos of human brains. First, it was done for medical purposes; later, however, it is also done to probe into how we think, feel, and acquire languages. The Applied Learning Processes Center, for example, has been looking for methods, research-based ones, to better diagnose and treat people with learning difficulties. They also review the possible use of brain imaging and findings from brain research. In the article "Brain Scans Show How Language Is Processed" (2019, January 5), the center notes the contribution of brain research and their research-based practices:

> This finding supports the work we've been doing in the clinic for years. If you link words to action and real-life scenarios, your brain is able to process the words efficiently. It's wonderful to have this added validation for our treatment approach. We look forward to seeing how this new type of brain scan will be used in research about dyslexia and other learning disabilities, as well.

As noted, we can learn words/phrases better if we are augmented by real-life stimuli.

3.7 Relationship between Performance and Psychological Safety

Republished by the Online World Economic Forum (2017, May 17th), we have learned that top performers (in business) are often those who can manage their emotions. According to two neuroscientists, Friederike Fabritius and Hans Hagemann, "psychological safety" plays an important role in work performance. In language acquisition, under the Filter Hypothesis proposed by Krashen (32012), L2 learners perform better under the non-threatening learning environment.

4. Implications for EFL/ESL Learning and Teaching Activities

In this section, I argue that research on the brain has confirmed many of the good ideas that EFL teachers were already implementing, such as CLT and CL. Below are the implications.

4.1) Critical Period for Language Acquisition?

In second language acquisition, the strongest evidence for the critical period hypothesis is in the study of accent, where most older leaners do not reach a native-like level. However, under certain conditions, native – like accent has been observed, suggesting that accent is affected by multiple factors, such as identity and motivation, rather than a critical period biological constraint (Bongaerts et al., 1995; Moyer, 1999). Results from behavioral research on language attrition and acquisition (e.g. Ventureyra, Pallier, and Yoo, 2004) show that practices make new habits; new habits can replace old ones. The fact that the brain is plastic implies the possibility of forming new habits. The social environment has a significant role people's language learning. Cooperative learning activities allow learners to practice using the language. This adage shows us that we need to use our brains; otherwise, they will not function well.

4.2) Brain Lateralization

The brain relies on both sides to function well. CL activities allow students to use both sides of their brains. Cooperative learning activity is a whole-brain approach to learning; students develop their language skills as well as social skills. CL requires that teachers apply a wide range of activities used in the class room. Tasks and cooperative structures should be designed to tap on the ability & potential from both hemispheres of the brain. For example, cooperative mind mapping allows learners to exhibit their creativity as well as their critical thinking skills. Cooperative learning covers a wide range of group activities and structures.

4.3) Brain Plasticity

The fact that brains are plastic and malleable may suggest that there are links between perceptive and productive skills. There may be a close link between pronunciation and grammar as implied by Lian, Hoven, and Hudson (1993). When the learner pays attention his own pronunciation of words or sentences, he actually attempts to raise his own awareness. For example, when the learner pays special attention to his or her pronunciation of the final sound of the word "floated" in the sentence "The krathong was floated on the water.", he or she is likely to pronounce the final /-ed/. Thai phonology restricts final sounds, such as no consonant clusters. Thai speakers of English have not been taught to articulate final clusters, therefore, they neither perceive them nor pronounce them as in present simple third person singular /-s/ or past simple /-ed/. If the link between pronunciation and grammar is strong, it may imply that grammar and pronunciation are linked and are equally important. Often we as EFL/ESL teachers are told by some students that they prefer learning to speak English than learning grammatical rules. We teachers can teach them that having a good accent is important; if your pronunciation is good, your grammar will be improved. Correcting your pronunciation is also correcting your grammar. In a classroom where communicative language teaching is emphasized, the students are giving ample of opportunities to practice using English. The teacher provides feedback, so as other groupmates. Finally, let's turn to the significance of brain research to computer-assisted language learning or CALL. For CALL, A software or program that allows learners to monitor and practice pronouncing words, phrases, or sentences is brain friendly. The feedback from the system that has the potential to raise the learner's awareness of his or her shortcomings is deemed valuable foe L2 acquisition. An example of such a system is MMBrowse, a piece of software designed to develop listening comprehension skills through a self-study approach based on the exploration of authentic audio and/or video text (Lian, 2000).

4.4) Brain Health

The fact that our brains need adequate nutrients to function well implies that active learning inherent in cooperative learning activities is a brain-compatible learning. Indeed, water, glucose, minerals and oxygen are important. The brain needs an adequate supply of blood. When the students interact with each other --- walking around the room and doing the activities, they have the opportunity to intake oxygen. Group activities demand active learning, and this requires oxygen and water. Therefore, teachers as well as groupmates should encourage each other to drink water. Fresh and clean water (water without ions, germs, or any other foreign minerals) should be available for pupils and teachers alike. When the level of oxygen (O_2) and glucose ($C_6H_{12}O_6$) is low, the students' ability to concentrate and learn will be significantly affected. Increasing the supply of oxygen and blood to the brains of the students will increase their alertness and learning. Cooperative learning activities require that the students be active --- getting out of their seats and moving in and around the classroom (Kagan, Robertson, & Kagan, 1995). Cooperative learning activities actually nourish the brain. With adequate nourishments, the students are ready for learning that requires cognitive skills. Policy makers, school administrators and executives must bear in mind that it is a must to provide adequate clean water, at all time, to everybody. Water (H_2O) can fuel better education; it is, in fact, an essential element for better quality of life.

4.5) Brain Needs Social Stimuli

Research has reported that the brain needs social stimuli, as discussed by The Applied Learning Processes Center (2019, January 5th). Social stimuli are abundant in group activities. Cooperative learning activities reduce teacher talk and increase student-student interaction. The fact that there exist mirror neurons implies that group support and positive interdependence among group members help create a sense of togetherness, which is helpful foe L2 leaning. If we naturally attend for more to social stimuli as research has revealed, it does make sense to have learners interact, discuss, debate, and work together. As far as online learning is concerned, it makes sense to create/design a learning program/environment that values the significance of the emotions such as sense of being in a community and togetherness. Avatars and real people can help create a sense of being in a community. The online environments need to establish conventions and social rules such as politeness. Whether in a virtual world or in a real world, cooperative skills such as asking for help, thanking, asking for explanations, offering help, and so forth, are indispensable. In L2 learning context, learners learn better when they have opportunities to practice using the language. CLT emphasizes the use of English for communicative purpose; structured CL allows equal participation, increasing the amount of time the learners can practice the language.

5. Conclusion

Man has the power of speech and language given by nature. The brain is responsible for language, and we now know that it is plastic and malleable. The plasticity of the brain is affected by the environment, age, and genetic endowment. The brain's plasticity means that new learning and relearning can take place at any age, albeit research has suggested that young children tend to find it easier to learn and relearn new things, compared with older people. Why it is so is a subject debatable.

In this paper, I have discussed why cooperative learning activities are brain compatible. I have also suggested that the *Lianian* approach to computer-assisted language learning, to a large extend, is brain compatible. As brains are biological, they need nutrients to function; as brains are social organisms, they need social stimuli. CLT and CL, thus, are good ideas for L2 learning and teaching. However important, evidence based on neuroscience research is not the only answer to education. Many decades ago, two psychologists, Krech and Crutchfield (1958), pointed out the limitation of the brain study. They have written that:

> "Modern experimental methods have made possible the study of the effects of brain destruction on the adaptive behavior of animals, the direct observation of the brains of human surgical patients, the recording of "brain waves" from intact men and animals, etc. But we find that the brain by itself, apart from the rest of the nervous system, is not enough to account for adaptive behavior. The nervous system, by itself, apart from the musculature, is not enough either --- for it appears that we "think" with our muscles as well as with our brain."
>
> (p. 10)

Similarly, one may sum up the universe of brain research with regards to education as follows:

> "Our understanding of the brain is continually evolving, … Brian research cannot prescribe what we should teach, how we should organize complex sequences of teaching, nor how we should work with students with special needs. Educators should not abandon their traditional sources of insight and guidance to draw on and develop their own insights about learning based on their classroom experiences and classroom-based research to complement the insights that are emerging from advances in brain research". Genesee (2000)

Similarly, one of the leaders in the brain-based movement in education Eric Jensen (2008) has reminded us of the status of brain-based education: "Brain-based education is not a panacea or magic bullet to solve all education's problems". Research on the brain is still in its infancy. I have argued that many of our existing teaching principles and methods such as CL and CLT, in many aspects, are brain compatible. Brain research has gained its currency in the EFL/ESL discourse, and it will continue to do so. In the 21st century, scientific evidence from brain/neuroscience research is going to affect how educators work. Jensen (2008), in particular, has pointed out that it is important for educators to be able to "support the use of a particular classroom strategy with scientific reasoning or studies."

I would like to end my paper with a word of wisdom from Carl R. Rogers, a humanistic psychologist, who stated: “Why bother?” in other words, as far as learning is concerned, the actual cognitive process of learning should not be our major concern. What we need to consider is the context of learning: “If the context for learning is properly created, then human beings will, in fact, learn everything they need to” (Roger, 1983, quoted in Brown, 1994).

References

Applied Learning Processes. (2019, January 5) "Brain Scans Show How Language Is Processed" Retrieved from https://appliedlearningprocesses.com/reading/brain-scans-show-how-language-is-processed/

Bandura, A. (1986). *Social Foundation of Thought and Action.* New Jersey: Prentice-Hall.

Bongaerts, T., Planken, B., & Schils, E. (1995). Can late learners attain a native accent in a foreign language? A test of the critical period hypothesis. In D. Singleton & Z. Lengyel (Eds.), *The age factor in second language acquisition* (pp. 30-50). Clevedon, England: Multilingual Matters.

Brothers, L. (1997). *Friday’s Footprint: How Society Shapes the Human Mind.* New York: Oxford University Press, 1997.

Brown, H. D. (1994) *Principles and language learning and teaching* (3rded) Prentice Hall.

Caine, R., Caine, G. (October 1990). Understanding a Brain-Based Approach to Learning and Teaching. *Educational Leadership.* 48 (2), pp. 66-70.

Caplan, M (1987) *Exploring the concept of mind.* Iowa City: University of Iowa Press.

Carter, R. (1999). *Mapping the mind.* Berkeley, CA: University of California Press.

Chen, M. (2007). Smart Talking: Tell Students to Feed Their Brains. *Edutopia.* Available online at: http://www.edutopia.org/tell-students-feed-their-brains [18 November 2008]

Changeux, J-P. and Ricoeur, P. (1998). *What Makes Us Think* (translated by M.B. DeBevoise). Princeton: Princeton University Press.

Chomsky, N. (1968). *Language and mind.* Boston: MIT Press.

Genesee, F. (2000). Brain Research: Implications for second language learning. McGill University. U.S. Dept. of Education, Office of Educational Research and Improvement, National Library of Education.

Howard Hughes Medical Institute (2005, May 19). Brain May Be Less Plastic Than Hoped. *ScienceDaily.* Available Online at http://www.sciencedaily.com/reasrchs/2005/05/050519142707.htm [18 November 2008]

Jensen E.P. (2008) Fresh Look at Brain-Based Education. *Phi Delta Kappan*, 89 (6). Available online at http://www.pdkintl.org/kappan/k_v89/k0802jen.htm [18 November 2008]

Jensen, E. (1998). *Teaching with the brain in mind.* Alexandria, VA: Association for Supervision and Curriculum Development.

Kagan, s (2004). Cooperative Learning and Brain-Friendly Teaching in *IASCE Newsletter* Summer 2004. Available Online at: http://www.iasce.net/Newsletters/2004_Summer/2004_summer_1.shtml [19 November 2008]

Kaggan, M., Robertson, L., & Kagan, s. (1995). *Cooperative Learning structures for class building.* San Clemente, CA: Kagan Publishing.

Kim K, Relkin H, Lee K, Hirsch J (1997), Distinct cortical areas associated with native and second languages. *Nature.* 388:171-174.

Krech, D. and Crutchfield, R. S. (1958). *Elements of Psychology.* New York: Knopf. *The Cognitive Neuroscience of Second Language Acquisition*. Marianna Gullberg and Peter Indefrey (Eds.) Oxford: Blackwell, 2006.

Lenneberg, E. H. (1967). *Biological Foundations of Language*. New York: Wiley.

Lian, A-P., Hoven, D. L. and Hudson, T. J.: *Audio-Video Computer Enhanced Language Learning and the Development of Listening Comprehension Skills,* Australian Second Language Learning Project, 1993, pp. 25-41

Lian, A-P., 2000, 'From First Principles: Constructing Language-Learning and Teaching Environments' in *Selected Papers from the Ninth International Symposium on English Teaching*, Taipei, Crane Publishing Co., Ltd., November 2000, pp. 49-62, available in a slightly modified version at: http://www.comedu.canberra.edu.au/~andrewl/mlapl/first_principles/index.html

Long, M. (1997). Group work in the teaching and learning of English as a foreign language. *English Language Teaching Journal*, 31(4), 285-295.

Maudry, M. and Nekula M. (1939). Social Relations Between Children of the Same Age During the First Two Years of Life. In *Journal of Genetic Psychology.* 54: 193-215.

McCarthy, M. (2001). *Issue in Applied Linguistics*. Cambridge: Cambridge University Press.

Moyer, A. (1999). Ultimate attainment in L2 phonology: The critical factors of age, motivation, and instruction. *Studies in second language acquisition*, 21, 81-108.

O'Grady, W., Dobrovolsky, M., and Katamba, F. (1997). *Contemporary Linguistics: An introduction.* Longman.

Paten, M. B. (1932). Social participation among pre-school children. In *Journal of abnormal social psychology*. 27: 243-269.

Pallier, C., Dehaene, S., Poline, J-B., Le bihan, D., Argenti, A-M., Dupoux, E.et al (2003), "Brain imaging of language plasticity in adopted adults: can a second language replace the first?" *Cerebral Cortex*, 13, 155-161.

Smith, R. (2012). *A Short History of ELT* (Video Presentation). Retrieved from https://www.teachingenglish.org.uk/article/a-short-history-elt

Vander Zanden, J W (1980) *Educational Psychology in Theory and Practice* New York: Random House

Venturyra, V., Pallier, C. & Yoo, H. Y. 2004. The loss of first language phonetic perception in adopted Koreans. *Journal of neurolinguistics*, 17, 7991.

Online World Economic Forum (2017, May 17th). How you can achieve peak brain performance, according to science. Retrieved from https://www.weforum.org/agenda/2017/05/how-you-can-achieve-peak-brain-performance-according-to-science?fbclid=IwAR0PzgclPH3CbD7K91THd4GpEkXwnP6IbZ7cO7tGR9c6ArH5LHfg-qL-RqM

Vygotsky, L. S. (1978). *Mind in Society*. Cambridge, MA: Harvard University press.

Wong, P.C.M, et al (2007). Volume of Left Heschl's Gyrus and Linguistic Oitch Learning. *Cerebral Cortex*. Available online at: http://cercor.oxfordjournals.org/cgi/reprint/bhm115v1 [18 November 2008]

Behaviors and Expectations, Satisfactions of Foreign Tourists towards Thai Culinary School

Suchitra Rimdusit[a] and Varaphorn Duangsaeng[b]

[a]Ph.D., Tourism Development, Maejo University, Thailand, yingwin@hotmail.com

[b]Dr., Professsor, Tourism Development, Maejo University, Thailand, varaphorn@gmail.com

Abstract

The purpose of this study is to study tourism behaviors and expectations, satisfactions of foreign tourists towards Thai culinary school. Quantitative method gathered the data from 400 foreign tourists by using questionnaires. Percentage, mean, standard deviation, and Pearson's correlation were used to analyze the data. The study shows that most respondents are female, aged between 21-30 years. They were single and have been traveling from the United States of America. They educated in bachelor's degree. They are as business owner with income lower than 2,000 USD.

The result of this study the researcher found that most foreign tourists made decision to choose Thai culinary school from friends or acquaintances. Mostly know Thai food before. They know Pad Thai. The first thing that they think taste of Thai food. Most selected a half day course and want to cook Thai food when go back home. Most had expectations of using Thai culinary school in term of Personnel at the highest level, in term of place, course, fee distribution channel and promotion at the high level. The foreign tourists satisfactions in term of place, course, personnel, fee and distribution channel at the highest level, in term of promotion at the high level. The result of the relationship between expectation and satisfaction of foreign tourists using the Thai culinary school found that expectations were related to the satisfaction of foreign tourists using Thai culinary school.

Keywords: tourists behavior, food tourism, Thai culinary school, tourist satisfactions

1. Background

Food tourism is interesting in the dimension of being used as a tourist makes Thailand as a quality tourist destination which the food tourism trend for learning and cooking has spread in various tourist destinations because tourists are interested in how to cook the local food on destination. However, Thai food that displays Thai culture, the unique Thai food makes it a popular choice for foreign tourists to come and try. Thus creating a Thai culinary school for foreign tourists in large cities or major tourist cities of the country, including Chiang Mai is a city where foreign tourists travel to Chiangmai. Reflects that Chiang Mai has the availability of elements for tourism industry (5As) In according to the research of Anat Phattharathammaporn (2008) which studied the factors affecting the decision to visit Chiang Mai by foreign tourists Found that the activities that foreign tourists want to do the most Is to watch the scenery and followed by the taste of Thai food.

Thai culinary school for foreign tourists in Chiangmai being popular with the trend of tourists who like Thai food. They want to have cooking experience to cook it themselves when returning to his country. Have known Thai food before but have not received knowledge about Thai food (Samran Phochad, 2003: 59). In addition, the research results of Supalak Na apai (2012: 71-72) found that foreign tourists who come to learn to cooking Thai food in Chiang Mai have the expectations of participation in activities. Learning Thai food flavors learn Thai culture Thai cooking skills Thai cooking process and fun in learning by the service process of the culinary school for foreign tourists to create experiences from beginning to the end, start from booking, pick up the foreign tourists from the accommodation, Greetings and welcome, theoretical study, visit and select raw materials at the fresh market, preparation of ingredients and cooking Thai food after

finished have eating their food. And the last step is to send foreign tourists back to the accommodation (Supaluck Na apai, 2013: 75)

However, Narisa Khamkaen. (2014). discussed the weaknesses of Thai food in Thailand. Such as the tourism policies of each province still lack coordination in both government sectors. Private sectors in organizing tourism activities for learning about food still lack the clarity and continuity of tourism policies of each province and lack of the management budget to support tourism from the government. In addition, it was found that personnel still lack knowledge of food tourism, and lack of cultural dimention links to create additional value. Therefore the question of whether food tourism or culinary tourism is aimed at cooking, but lacking in Thai culture that will cause foreign tourists to not understand the authentic Thai food.

Therefore the researcher is interested in studying "Behaviors and Expectations, Satisfactions of Foreign tourists towards Thai Culinary School" The objective of this study is to study tourism behavior and expectations, satisfactions of foreign tourists towards Thai culinary school. Expecting the results of the study will make food tourism in the form of culinary tourism of Thailand stronger. Able to create value for tourism Expand the food-oriented tourist market to the high-quality tourist market. Including making Thailand as a food tourism destination at the beginning of the ASEAN countries and able to create the image of Thailand by learning and finding experience through the Thai culinary culture which will make the food tourism of Thailand with sustainability

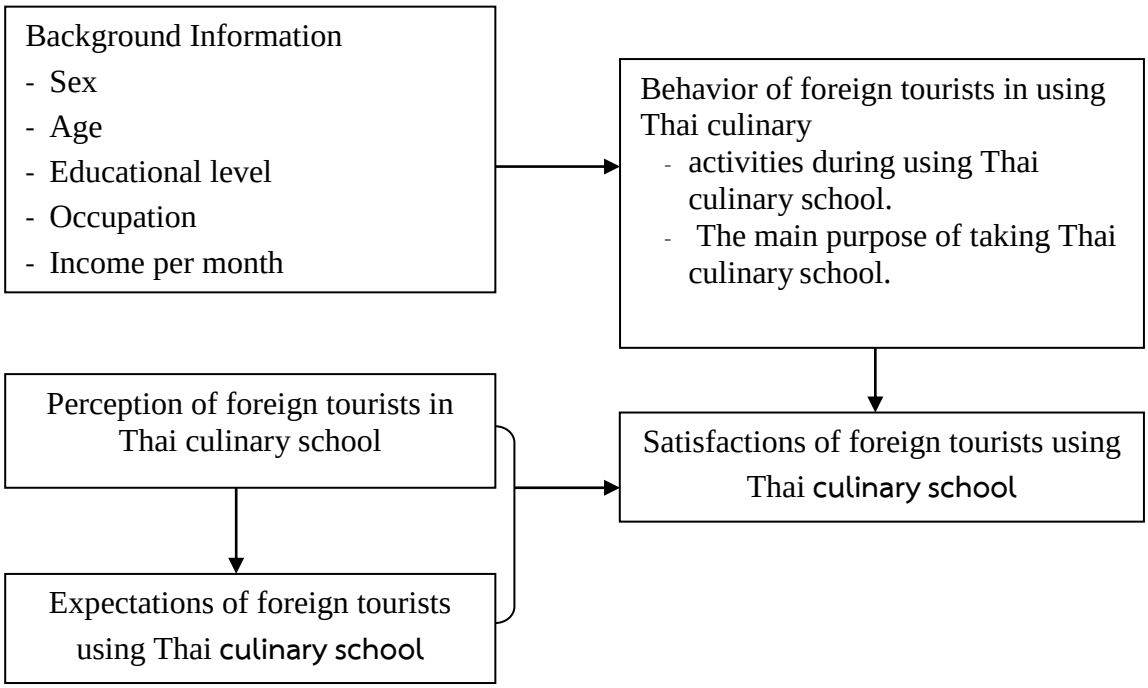
2. Literature

Boonlert Jittangwatana (2014: 239-247) said that the tourism industry have marketing tool, 4P's and 8P's later, to be suitable for tourism products and services. 8P's marketing mix of the tourism industry. There are product in tourism, price in tourism, place in tourism, promotion in tourism, people in tourism, packaging in tourism, programming in tourism and partnership in tourism.

Supaluck Na apai (2012) has studied research on management of foreign tourists experience in Thai cooking schools The study found that the expectations of foreign tourists who come to learn to cook Thai food in Chiang Mai Can identify expectations as follows: participation in activities Learning the true taste of Thai food Learn culture cooking skills Cooking process And fun For important factors for foreign tourists visiting Chiangmai in order to receive real Thai cooking skills. Is the quality of service provided by the cooking school

Samran Phochad (2002) studied the subject teaching Thai cooking methods for foreign tourists The study found that tourists want to learn to cook Thai food for cooking themselves. Receiving news about Thai cooking from travel guide books. The foreign tourists choosing a famous cooking school near the accommodation, clean, enough equipment for the number of learners in the course The foreign tourists need a one-day course. They want take a course that has been approved by government agencies. Thai culinary school are teaching methods, lectures, market tour, demonstrations, and the qualifications of personnel during teach cooking that tourists want, with knowledge and expertise. The teacher should be cheerful, friendly with learners and have a good ability to speak a foreign language, good personality. About study fees the foreign tourists want value for money, knowledge and services that are received and want to have the most promotion such as aprons, cookbooks or books. For the problems that foreign tourists encounter after cooking, the number of learners is too high. There are too many food items to study. Finding raw materials for making Thai food difficult in foreign countries and do not understand to use other materials to replace each other.

Conceptual Framework



3. Methods

The study on tourism behavior and expectation, satisfaction of foreign tourists towards Thai culinary school in Chiangmai was a quantitative research by studying and collecting data from document research and survey research. This research mainly aimed to find the model to develop the culinary tourism in Thailand.

In collecting data, the researcher divided the study into 2 parts:

Part 1 was document research or the secondary research concerning tourists behavior and expectation, satisfaction concept and theories, research related with this study.

Part 2 was survey research in collecting data on tourism behavior and expectation, satisfaction of foreign tourists towards Thai culinary school in Chiangmai by distributing questionnaires to foreign tourists.

Accidental sampling is selected according to specific events during data collection. Due to not knowing the size of the population of foreign tourists who use the services of the Thai culinary school in Chiang Mai. The calculation method is used to determine the sample size. In case of not knowing the population of W.G. Cochran at 95% reliability level and the significant level of 0.05, therefore the sample size is 400.

After verifying the data collected from the questionnaires and completion, the researcher analyzed the data by computerized data processing. The statistical package was used in calculating the statistical values and testing the established hypotheses with the reliability of 95% and at the statistical significance level of 0.05. The statistics used in analyzing the data were as follow:

I. Descriptive Statistics Analysis was used in describing the data by frequency, showing data in the form of table by percentage to explain personal including gender, age, education level, occupation, monthly income, the first thing that foreign tourists think about when talking about Thai food and main purpose of taking Thai culinary course. Standard deviation and means were used to described interval scale data.

II. Inferential Statistics Analysis was used in the relationship between expectations and satisfaction of foreign tourists in using Thai culinary schools by using Pearson’s Product Moment Correlation Coefficient at the statistical significance level of 0.01.

4. Finding

In presenting results of data analysis and interpretation, the researcher analyzed and presented data in descriptive tables:

Table 1: Number and percentage of respondents classified by gender, age, education level, occupation and income per month.

		Number	Percentage
Gender	Male	169	42.25
	Female	231	57.75
Age (years old)	lower 20	48	12.00
	21 - 30	159	39.00
	31 - 40	109	27.25
	41 - 50	57	14.25
	51 - 60	28	7.00
	61 up	2	0.50
Education	Lower than Bachelor Degree	92	23.00
	Bachelor Degree	270	67.50
	Higher than Bachelor Degree	38	9.50
Occupation	Agriculturist	71	17.75
	Government employee	130	32.50
	Private company employee	61	15.25
	Business owner	132	33.00
	Student	6	1.50
Income per month	lower 2,000	141	35.25
	2,001 - 3,000	100	25.00
	3,001 - 4,000	59	14.75
	4,001 - 5,000	68	17.00
	5,001 - 6,000	27	6.75
	6,001 up	5	1.25

From Table 1 The analysis on background information of the respondents show that that most respondents are female 57.75%, aged between 21-30 years 39%. They educated in bachelor's degree 67.50%. They are as business owner 33% with income lower than 2,000 USD 35.25%.

Table 2: Number and percentage the first thing foreign tourists think about when talking about Thai food.

The first thing foreign tourists think about when talking about Thai food	Number	Percentage
Taste of Thai food	341	85.25
Value	26	6.50
Friend or acquaintance loves eating Thai food	5	1.25
Thai traditional style	18	4.50
Characteristic	3	0.75
Thai culinary procedures	3	0.75
Variety of Thai food	4	1.00

From Table 2 Result of the first thing that foreign tourists think about when talking about Thai food show that most of them think about taste of Thai food 85.25%.

Table 3: The number and percentage of foreign tourists Classified by the behavior of using the Thai culinary school.

The main purpose of taking Thai culinary course	Number	Percentage
For cooking by themselves	200	50.00
For fun	111	27.75
For a career	1	0.25
For New experience	50	12.50
For learning Thai culture	30	7.50
Part of school's activity	8	2.00

From Table 3 Result of the behaviors of using the Thai culinary school. The main purpose of taking Thai culinary found that most of them had main purpose for cooking by themselves 50%.

Table 4: The number and percentage of activities during using Thai culinary school.

Activities during using Thai culinary school	Yes		No	
	Number	Percentage	Number	Percentage
Buying raw materials at the market	223	55.75	17	44.25
Theories and Workshops	400	100.00	0	0
Carving fruits and vegetables	37	9.25	362	90.50
Eating Thai food after cooking	310	77.50	90	22.50
Taking a look at homegrown vegetables and storage for cooking	125	31.25	275	68.75
Participating cultural activities of the community near the school	8	2.00	392	98.00

From Table 4 Result of the activities during using Thai culinary school. It was found that most of them learned theories and workshops 100%, eating Thai food after cooking 77.50%, buying raw materials at the market 55.75%, taking a look at homegrown vegetables and storage for cooking 31.25%, Carving fruits and vegetables 9.25% and participating cultural activities of the community near the school 2%.

Table 5: Mean and standard deviations of the expectations and satisfactions of using Thai culinary school.

Item	Expectations			Satisfactions		
	$\bar{x}$	S.D.	Interpretation	$\bar{x}$	S.D.	Interpretation
Place	4.17	0.74	High	4.57	0.53	Highest
Course	4.14	0.77	High	4.53	0.52	Highest
Personnel	4.23	0.74	Highest	4.62	0.73	Highest
Fee	4.16	0.82	High	4.38	0.68	Highest
Distribution channel	4.03	0.08	High	4.23	0.73	Highest
Promotion	3.89	0.85	High	3.91	1.01	High

From Table 5 Result of the expectations and satisfactions of using Thai culinary school showed that most of them had expectations of using Thai culinary school in term of Personnel (4.23) at the highest level, in term of place (4.17), fee (4.16), course (4.14), distribution channel (4.03) and promotion (3.89) at the high level. The foreign tourists satisfactions in term of personnel (4.62), place (4.57), course (4.53), fee (4.38) and distribution channel (4.23) at the highest level, but in term of promotion (3.91) at the high level.

Table 6: The relationship between expectations and satisfactions in using Thai culinary school.

Expectations		Satisfactions					
		Place	Course	Personnel	Fee	Distribution channel	Promotion
Place	Pearson Correlation	.542**	.492**	.450**	.584**	.531**	.199**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000
	N	400	400	400	400	400	400
Course	Pearson Correlation	.428**	.536**	.428**	.574**	.535**	.192**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000
	N	400	400	400	400	400	400
Personnel	Pearson Correlation	.438**	.433**	.494**	.596**	.493**	.152**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.002
	N	400	400	400	400	400	400
Fee	Pearson Correlation	.383**	.439**	.455**	.701**	.556**	.274**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000
	N	400	400	400	400	400	400
Distribution channel	Pearson Correlation	.376**	.398**	.392*	.640**	.651**	.295**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000
	N	400	400	400	400	400	400
Promotion	Pearson Correlation	.222**	.263**	.209**	.413**	.504**	.468**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000
	N	400	400	400	400	400	400

**. With statistical significance at 0.01 level

From Table 6 The result of the relationship between expectations and satisfactions of foreign tourists using the Thai culinary school found that expectations were related to the satisfactions of foreign tourists using Thai culinary school.

5. Discussions

The study on “Behaviors and Expectations, Satisfactions of Foreign tourists towards Thai Culinary School” could be discussed as follows:

The samples were 400 foreign tourists. The data collected by questionnaire. It was found that the majority of foreign tourists who answered the questionnaire were e female, aged between 21-30 years. They are single and have been traveling from the United States of America. They educated in bachelor's degree. They are as business owner with income lower than 2,000 USD. Most foreign tourists made decision to choose Thai culinary school from friends or acquaintances. Mostly know Thai food before come to Thailand. They know Pad Thai. The first thing that they think taste of Thai food. Most selected a half day course and want to cook Thai food when go back home. As Wuttichai Kritsanaprakornkit (2013), who talks about people who like and care about food more than usual. Serious about eating, cooking, choosing raw materials Create a restaurant atmosphere Dish decoration Search for knowledge about food, efforts to pass on experiences, stories, tastes and identity to others through new media, call this group that the Foodie group, which is a new generation of young people. Most had expectation of using Thai culinary school in term of Personnel at the highest level, in term of place, course, fee distribution channel and promotion at the

high level. The foreign tourists satisfactions in term of place, course, personnel, fee and distribution channel at the highest level, in term of promotion at the high level. According to the research is based on the research of Benyapha Yoophothong and Sombat Kanchanakij (2015). Behavior and Satisfactions of International Travelers with Thai Food along the Thai way in Bangkok. The study found that most international tourists came to Bangkok for 2-3 times, less than 5 days to Bangkok. The purpose is to travel to Bangkok for tourism. As the motivation of the tourist revolves around food, experiencing new tastes, and exploring the history or culture becomes gastronomic tourism (Hall and Sharples, 2003).

6. Recommendations

The study on Behaviors and Expectation, Satisfaction of Foreign tourists towards Thai Culinary School to know that the main reason to learn Thai cooking because taste of Thai food, know Pad Thai and they want to cook by themselves when go back to country. Therefore, the management of food tourism on culinary school should make of quality raw materials while cooking, should focus on expectations and satisfactions of tourists. In addition, future research should study about how to promote other type of Thai food.

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8. References

Anat Phattharathamaporn. (2008). Factors affecting the decision to travel to Chiang Mai of Foreign tourists. Independent research, the Faculty of Economics, Chiang Mai University.

Benyapha Yoophothong & Sombat Kanchanakit (2015) “A Behavior and Satisfaction of International Tourists toward Thai Street Food in Bangkok Metropolis”, Chulalongkorn University, http://cuir.car.chula.ac.th/handle/123456789/45780

Boonlert Jittangwattana. (2014). “Tourist Behavior”, 2nd edition, Nonthaburi: Fern Kha Luang Printing and Publinging.

Chiung-Tzu Lucetta Tsai (2013), “Culinary Tourism and Night Markets in Taiwan”, Volume 8, Number 2, December 2013, National Taipei University, Taiwan.

Hall, C.M. & Sharples, L (2003), “The consumption of experiences or the experiences of consumption, An introduction to the tourism of taste. C. Michael Hall, Liz Sharples, Richard Mitchell, Niki Macionis and Brock Cambourne (Ed.) Food Tourism: Around the World: Development, Management and Markets. Chapter 1, p.1-24, Butterworth-Heinemann, Oxford.

Karim, A.S.; Chi, C. G. Q. (2010). Culinary Tourism as a Destination Attraction: An Empirical Examination of Destinations' Food Image. Journal of Hospitality Marketing & Management, 19: (6), Pp.531-555.

Narisa Khamkaen. (2014). Tourism strategy for learning about food.Bangkok: Thailand Research Fund.

Samran Phochad. (2002). Teaching Thai cooking methods for foreign tourists. Independent research, Master's degree. Chiang Mai University.

Supaluck Na apai. (2013). Experience management of foreign tourists in Thai cooking schools, Chiang Mai Province. Master's thesis. Naresuan University.

Termsak Singsomboon (2014), “Marketing Strategies for Thai Gastronomic Tourism Promotion”, Graduate School of Tourism Management, National Institute of Development Administration.

Walaiporn Reutragulpaiboon (2010), “Tourist Behavior”, 4th edition. Bangkok: Bangkok

University Press.
Wikipedia (2016), “https://th.wikipedia.org”, URL:https://th.wikipedia.org/wiki/อาหารไทย.
Wuttichai Kritsanaprakornkit (2017), “Foodie Food Tourism Trend 2017”, TAT Review Magazine, Vol. 3 No 1, Bangkok, Thailand.

The Effect of Integrating Web-Assisted Language Learning (WALL) on Vocabulary Enhancement of the Elementary English Students

Likhasit Suwannatrai[1], **Narathip Thumawongsa (Ph.D.)** [2]

[1, 2] Faculty of Humanities, Srinakharinwirot University, Bangkok, 10110, Thailand

Abstract

Having rich vocabulary can provide opportunities to convey the intended meaning of word appropriately. However, the second language learners (L2) have encountered difficulties in vocabulary learning under limitations of the learning environments since they have less opportunity to use language in the real contexts (Nation, 2001; Ado, 2017; Schmitt, 2010). This study aimed to 1) investigate the vocabulary enhancement by integrating Web-Assisted Language Learning (WALL), 2) examine whether the application of WALL allows and facilitate the L2 learners in promoting the positive attitudes towards learning English in Thai EFL context and enhancing the learner autonomy in language learning through WALL. The participants were 24 students who were beginners studying English as a foreign language, validated by giving the placement test, and the pre-test score indicating the participants were at the elementary level. 12 students in the experimental group learned vocabulary by using the traditional teaching style and integration of WALL; whereas, 12 students in the control group learned vocabulary by using the traditional teaching style. The data were analyzed by applying an independent sample t-test in analyzing the significant differences in vocabulary enhancement, and pair sample t-test in finding the significant differences in the students' attitudes towards WALL and learner autonomy capacity. In addition, the content analysis was employed to analyze the data of the semi-structured interview. The results revealed that at the end of the experimental period the post-test score of the experimental group was higher than the control group. The students in the experimental group expressed positive attitudes towards WALL after integrating WALL in class. Finally, autonomous learning capacity of the students in the experimental group has changed from uncertain level to favorable level after integrating WALL.

Keywords: Web-assisted language learning, Vocabulary knowledge, attitudes, learner autonomy

1. Introduction

Vocabulary, a basic foundation for a language learner, is considered an essential element for second language learners (L2 Learners) (Nation, 1997, 2001; Schmitt, 2010). Vocabulary is generally defined as all the words known and used by a particular person to communicate in a given field of knowledge (Cambridge Dictionary, 2010; Merriam Webster, 2015). L2 Learners begin to learn a language by memorizing a word first, and form words into phrase and sentence to build a meaningful communication; therefore, sufficient sources of vocabulary knowledge helps L2 learners establish an effective communication in a given context. Wilkins (1972) significantly notes that learners cannot achieve effective communication if they lack sufficient knowledge of vocabulary. In addition, the vocabulary is regarded as the important element of language, when the learners begin to learn a second language; they usually put an effort to learn words from dictionaries, not a grammar book (Schmitt, 2010). It is true that when the vocabulary knowledge of the learners is insufficient, they cannot effectively master the communication and express the exact meanings of ideas or opinions. For this reason, there has been an increasing effort to study how to learn and teach vocabulary in the contexts that learn English in addition to mother tongues. L2 learners who have problems in vocabulary seem to find it difficult to develop their L2 learning processes. Having rich vocabulary which is a key element can provide opportunities to convey the intended meaning of word appropriately. However, L2 learners have encountered difficulties in vocabulary learning. This is because, under the EFL contexts, development of the vocabulary is limited since the L2 learners have less opportunity to use language in the real contexts regularly, which a major influential factor of vocabulary learning (Nation, 1997, 2001; Ado, 2017; Schmitt, 2010). One of the most important

factors being an obstacle to vocabulary learning is the complexity of the word knowledge. The lack of understanding of how to use word leads to a lack of confidence. This difficulty may be caused by many factors such as the English subject curriculum, insufficiency of teacher's training, discouraging behavior of the teachers, and unqualified teacher. These factors can affect the learners' attitude in second language learning. To overcome those difficulties and obstacles in acquiring the vocabulary, the scholars and researchers are interested in vocabulary development in EFL contexts. It is a challenge that they attempt to promote positive attitudes facilitating vocabulary acquisition. Attitude towards language learning is one of the factors that play a very dominant role in a process of learning a foreign language (Gardner, 1982, 1985; Ellis, 2008), including unqualified teachers, who do not understand the relationship between attitudes and its effects on the L2 learning process, are unable to teach a language effectively (Hurwitz, et al. 1986; Oroujlou &Vahedi, 2011).

At present, language teaching has changed. To promote positive attitudes towards the L2 learning process, new technologies have been applied in EFL classes. Primarily, computer-assisted language learning (CALL) has been effectively used to second language learning and foreign language. This provides opportunities for L2 learners to study on-screen activities. A number of studies show that CALL has been useful for L2 learning activities including vocabulary learning (Conrad, 1996; Ellis, 2008; Goodfellow, 1995). In addition, many papers have been published on the use of CALL support that the software can enhance L2 learning and also support vocabulary learning. The application of CALL in EFL contexts not only promotes L2 attitudes but also learners' autonomy (Holec, 1980; Dickinson, 1995; Benson, 2008, 2011). In this global world, a web-assisted language learning (WALL) becomes a new trend in teaching a foreign language. The WALL including the utilization of modern technologies is an alternative tool for teaching a foreign language. Son (2011) explains that WALL consists of many features including texts, graphics, audio, and video in a range of combinations facilitating the vocabulary learning process. In addition, Roman (2002) remarks that the integration of web-based language course in instruction environment is an effective tool for second language acquisition because it allows the L2 learners expose to the authentic materials and language – learning related activities which enable learners to receive a meaningful communication process.

The previous studies show that multimedia technology can be useful tools for improving vocabulary knowledge (e.g. Killickaya & Krajka, 2010; Son, 2011). However, the vocabulary acquisition of L2 learners cannot be achieved in a short period, the teachers should play a role as the language learning facilitator for L2 learners by providing a suitable technology as well as encouraging them to learn outside the classroom in order that L2 learners retain the vocabulary for a long term. To shed light on the advantages of the modern technologies, the application of WALL is expected to allow and facilitate the L2 learners in improving their vocabulary knowledge as well as promoting the positive attitudes towards learning English in Thai EFL context and enhancing the learners' autonomy in language learning through WALL. This study examines the vocabulary enhancement via WALL in the Thai EFL context in order to overcome the limitation of the language learning environment. Furthermore, the integration of the WALL in the Thai EFL classroom is expected that it could promote positive attitudes towards English language learning and enhance the learners' autonomy.

2. Purposes of the Study

1. To study the effect of web-assisted language learning (WALL) on vocabulary enhancement of Thai students in the elementary level of English learning.

2. To examine whether the integration of web-assisted language learning (WALL) can enhance positive attitudes towards second language learning in Thai EFL context.

3. To examine whether the integration of web-assisted language learning (WALL) can enhance learners' autonomy in second language learning in Thai EFL context.

3. Research Questions

1. Are there significant differences in vocabulary enhancement between the experimental group who learns vocabulary via the integration of web-assisted language learning (WALL) and the control group who learns vocabulary by utilizing the traditional teaching style?

2. Are there significant differences in attitude of the students in the experimental group who learn vocabulary via the integration of web-assisted language learning (WALL) in class before and after using WALL?

3. Are there significant differences in learners' autonomy in second language learning of the students in the experimental group who learn vocabulary via the integration of web-assisted language learning (WALL) in class before and after using WALL?

4. Research Methodology

Research design: This quasi-research on vocabulary enhancement via the web-assisted language learning (WALL) consisted of the two groups of participants. The experimental group learned vocabulary via the integration of WALL with the traditional teaching style; whereas the control group learned vocabulary by following the traditional style in the textbook.

Participants: The participants who selected by convenient sampling in this study consisted of 24 mixed gender students, 12 students in the experimental group and 12 students in control group, enrolling in an elementary English course in the first semester, the academic year 2017 at Rajapark Institute, validated by giving the placement test provided in the *LearnEnglish* website by the British Council, reporting that the students had the same level ($p>0.05$). In order to ensure students' language level, the pre-test (IOC > .50) was used to measure language proficiency. The results showed in the independence sample t-test in that there was no significant difference in language proficiency between the experimental group and the control group ($p>0.05$).

Instrumentation

Web-Assisted Language Learning (WALL): The WALL utilized in this study was based on *LearnEnlgish* web provided by British Council, specializing in high-quality language materials and the International English Language Testing System (IELTS) which is one of the world's most popular tests for higher education and global migration. Based on availability that students can access online via computer and mobile application, WALL was reviewed by the dean of the faculty of Liberal Arts, according to *Language Learning Website Review Form* developed by Son (2003, 2005). It was suitable for integrating into EFL classroom that the students are beginners. Additionally, the web meets the evaluation criteria for WALL developed by Son (2005) including; 1) purpose, 2) accuracy, 3) currency, 4) authority, 5) loading speed, 6) usefulness (convenient information and language activities), 7) organization, 8) navigation, 9) reliability 10) authenticity (language learning authentic materials), 11) interactivity, 12) feedback, 13) multimedia, 14) communication (bidirectional communication among learners), and 15) integration of the online materials into the curriculum.

Questionnaire: In this present study, the questionnaire which was employed to elicit information involving students' attitudes towards WALL and learning autonomy was divided into three sections. Sections one contains the background information of the participants. Section two adopted from the general attitude towards computer-assisted language learning (CALL) containing 10 items developed by Onsoy (2004) and Tuncok (2010). Section three was adopted from the learners' autonomy views containing 20 items, the first 10 items were developed by Zhang & Li, (2004) and Yiamkhamnuan (2016) The section two and section three were designed in five-point Likert-type scales ranging from; "5 = Strongly agree", "4= Agree", "3= Uncertain", " 2 = Disagree", " 1= Strongly disagree. The interpretation of means that was used to summarize the results in section two and three were: 4.51–5.00 = Strongly agree, 3.51–4.50 = Agree, 2.51–3.50 = Uncertain, 1.51–2.50 = Disagree, 1.00–1.50 = Strongly disagree (Yiamkhamnuan, 2016).In term of validity, the questionnaires were reviewed and revised by three experts in order to investigate the Index of Item Objective Congruence (IOC). The three experts confirmed that all questions in the questionnaires were relevant to the purposes of the study. Each item received the IOC value more than .50.

Furthermore, the pilot of the questionnaire was conducted in October 2017 with 30 students (Cronbach's Alpha = .803).

Semi-Structured Interview Questions: The questions (IOC value over. 50) for the interview consisted of four questions that were adapted from Yiamkhamnuan, 2016 in order to investigate the qualitative data related to the students' attitude and the learner autonomy.

Data analysis

The program of Statistical Package for the Social Science (SPSS) was applied, an independent sample t-test, to compare the participants' performance in the post-test scores between the experimental group and control group. In addition, a paired sample t-test was employed to investigate the differences in students' attitude and autonomy after the utilization of WALL in the experimental group. Furthermore, a content analysis was applied to analyze the students' responses from the semi-structured interviews.

5. Findings

RQ 1: The independent sample t-test was used to examine differences in vocabulary enhancement between the experimental group the control group. The results were shown in the following tables.

Table 1: The Independent Sample t-test of the Post-Test Score of the Experimental Group and the Control Group

		M	*SD*	*SE*	*f*	*t*	*df*	*p*
Post-Test Score	Experimental group	15.75	2.301	.664	.129	2.392	22	.026
	Control group	12.92	3.397	.981				

P < .05

RQ 2: Paired - sample t-test was utilized to find the differences in students' attitudes towards WALL in the experimental group before and after using WALL. The results were presented in table 2 and 3

Table 2: Students' attitudes of the experimental group before learning vocabulary via WALL

	Statements	Mean	SD	
1	I generally have positive attitudes towards using WALL in language instruction.	3.00	.000	Uncertain
2	I can study English vocabulary well with WALL.	3.17	.389	Uncertain
3	I like using WALL for teaching and learning English vocabulary.	2.92	.289	Uncertain
4	Using WALL makes me more efficient in vocabulary learning.	3.17	.718	Uncertain
5	I like searching internet for general interest	3.50	.798	Uncertain
6	WALL can be a good supplement to support English vocabulary learning.	3.25	.452	Uncertain
7	I perceive computers as pedagogical tools	3.25	.452	Uncertain
8	I can learn some vocabularies faster when learning via WALL.	3.17	.389	Uncertain
9	Using WALL generally makes completing class tasks easier.	2.92	.515	Uncertain
10	In general, I like using WALL in teaching English in class.	3.42	.515	Uncertain

Table 3: Paired - sample t-test of students' attitudes of the experimental group towards WALL.

		Paired Differences					t	df	Sig. (2-tailed)
					95% Confidence Interval of the Difference				
		Mean	SD	SE	Lower	Upper			
Pair 1	Statement 1	-1.917	.289	.083	-2.100	-1.733	-23.000	11	.000
Pair 2	Statement 2	-1.750	.622	.179	-2.145	-1.355	-9.753	11	.000
Pair 3	Statement 3	-1.917	.515	.149	-2.244	-1.589	-12.894	11	.000
Pair 4	Statement 4	-1.583	.793	.229	-2.087	-1.080	-6.917	11	.000
Pair 5	Statement 5	-1.417	.996	.288	-2.050	-.784	-4.926	11	.000
Pair 6	Statement 6	-1.583	.669	.193	-2.008	-1.159	-8.204	11	.000
Pair 7	Statement 7	-1.333	.651	.188	-1.747	-.919	-7.091	11	.000
Pair 8	Statement 8	-1.833	.389	.112	-2.081	-1.586	-16.316	11	.000
Pair 9	Statement 9	-1.917	.515	.149	-2.244	-1.589	-12.894	11	.000
Pair 10	Statement 10	-1.167	.577	.167	-1.533	-.800	-7.000	11	.000

P < .001

RQ 3: The differences in students' attitudes towards WALL in the experimental group before and after using WALL were analyzed. The results were presents in table 4 and 5.

Table 4: Students' autonomous leaning capacity of the experimental group before learning vocabulary via WALL

	Statement	Mean	SD	
1	I think I have the ability to learn English well.	3.00	.000	Uncertain
2	I make good use of my free time in English study.	3.25	.754	Uncertain
3	I preview the lesson before the English class.	3.17	.577	Uncertain
4	I find I can finish my tasks on time.	2.75	.452	Uncertain
5	I keep a record of my English study, such as keeping in a diary, a smartphone etc.	2.92	.669	Uncertain
6	I practice self-exam with the exam WALL chosen by myself.	3.25	.622	Uncertain
7	I reward myself such as going shopping, playing etc. when I found that I make progress in English.	3.08	.289	Uncertain
8	I attend out-class activities to practice and learn the English language.	2.92	.515	Uncertain
9	During the class, I try to catch chances to take part in activities such as answering the teacher's questions, asking friends, etc.	3.25	.622	Uncertain
10	I know my strengths and weaknesses in my English study.	3.25	.452	Uncertain
11	I'm confident I can understand English lessons by self-study.	3.00	.000	Uncertain
12	If I pay much attention to learning English, then I will be able to understand it by myself.	3.25	.754	Uncertain
13	I prefer English self-study activities that arouse my curiosity, even if it is difficult to learn.	2.83	.577	Uncertain
14	If I study English by myself seriously enough, then I will understand it.	2.75	.622	Uncertain
15	I'm confident that I can do well in English activities by myself.	3.08	.289	Uncertain
16	The most satisfying thing for me in doing English self-study activities is trying to understand lessons as thoroughly as possible.	2.92	.515	Uncertain
17	In English self-study, I choose activities that I can learn from.	3.17	.577	Uncertain
18	If I don't understand lessons in English self-study activities, it is because I didn't try hard enough.	3.17	.577	Uncertain
19	I like studying English by myself.	3.25	.622	Uncertain
20	I try to find information via online resource available such as dictionary online, Google or learning English vocabulary online etc.	3.50	.522	Uncertain

Table 5: Paired - sample t-test of students' autonomous learning capacity of the experimental group before and after learning vocabulary via WALL

		Paired Differences					t	df	Sig. (2-tailed)
					95% Confidence Interval of the Difference				
		Mean	SD	SE	Lower	Upper			
Pair 1	Statement 1	-1.667	.492	.142	-1.980	-1.354	-11.726	11	.000**
Pair 2	Statement 2	-1.250	.754	.218	-1.729	-.771	-5.745	11	.000**
Pair 3	Statement 3	-1.333	.651	.188	-1.747	-.919	-7.091	11	.000**
Pair 4	Statement 5	-2.000	.603	.174	-2.383	-1.617	-11.489	11	.000**
Pair 5	Statement 5	-1.583	.515	.149	-1.911	-1.256	-10.652	11	.000**
Pair 6	Statement 6	-1.250	.622	.179	-1.645	-.855	-6.966	11	.000**
Pair 7	Statement 7	-1.500	.674	.195	-1.928	-1.072	-7.707	11	.000**
Pair 8	Statement 8	-1.917	.669	.193	-2.341	-1.492	-9.931	11	.000**
Pair 9	Statement 9	-1.417	.996	.288	-2.050	-.784	-4.926	11	.000**
Pair 10	Statement 10	-1.250	.754	.218	-1.729	-.771	-5.745	11	.000**
Pair 11	Statement 11	-1.583	.515	.149	-1.911	-1.256	-10.652	11	.000**
Pair 12	Statement 12	-1.417	.793	.229	-1.920	-.913	-6.189	11	.000**
Pair 13	Statement 13	-1.667	.778	.225	-2.161	-1.172	-7.416	11	.000**
Pair 14	Statement 14	-1.833	.718	.207	-2.289	-1.377	-8.848	11	.000**
Pair 15	Statement 15	-1.500	.674	.195	-1.928	-1.072	-7.707	11	.000**

Pair 16	Statement 16	-1.750	.754	.218	-2.229	-1.271	-8.042	11	.000**
Pair 17	Statement 17	-1.333	.985	.284	-1.959	-.708	-4.690	11	.001*
Pair 18	Statement 18	-1.667	.651	.188	-2.081	-1.253	-8.864	11	.000**
Pair 19	Statement 19	-1.167	.937	.271	-1.762	-.571	-4.311	11	.001*
Pair 20	Statement 20	-1.250	.866	.250	-1.800	-.700	-5.000	11	.000**

**P <. 05;*P <.001*

6. Discussions

RQ1: Student's performance in integrating Web-Assisted Language Learning (WALL) between the experimental and control groups

The data analyzed by using the independent sample t-test statistically revealed that there are significant differences in students' vocabulary enhancement between the experimental group and the control group (t-2.392, $p < .05$). In addition, there exist differences in the mean of the post-test score of both groups. The post-test score of the experimental group (M=15.75) is slightly higher than the post-test score of the control group (M=12.92). The findings in table 1 support that the integration of modern technologies can enhance students vocabulary knowledge. WALL is considered a useful resource for learning especially in the contexts that use English as a foreign language, Thai EFL context in this present study. WALL consisting of multimedia allows the integration of text, graphics, audio, and motion video in a range of combinations in this vocabulary learning process (Killickaya & Krajka, 2010; Son, 2011). Additionally, WALL supports the learners to overcome the environment that is limited to the EFL context.

To solve the problems of the complexity of the word meaning, it is important to note that receiving a comprehensible input (Krashen, 1994). It allows the learners to be able to use the language effectively because the learners can interact with multimedia. This helps students determine what they are learning or using while notice what is happening in a given context of the language used (Schmidt, 2010). Moreover, it should be noted that the students who have opportunities to interact with various forms of the authentic materials based on multimedia have a chance to negotiate the meaningful input with their prior knowledge (Peres, 2008; Kern and Warschauer, 2000). Based on the comprehensible input in class activities, the WALL enables students to seek information by themselves and provide the real contexts for learning vocabularies and expressions that establish explicit learning environments. In addition, the authentic materials in WALL help the learners comprehend the input while they are utilizing and engaging themselves with the real contexts of the language used via WALL (Fotos, 2002; Peres, 2008). Furthermore, WALL enables students to communicate, exchange information, and negotiate the meaning in what they are learning vial WALL (Lightbown & Spada, 1999; Peres, 2008), and they can notice and compare the meaningful input with their prior knowledge what they have known and have not learnt. Finally, they are able to produce preferable output in their own principles (Swain, 1995; Peres, 2008)

RQ2: Students' attitudes of the experimental group before and after learning vocabulary via WALL

The attitude is one of the most influent factors in the learning process (Gardner, 1982, 1985; Ellis, 1994, 2008). The previous studies revealed that attitude has an important impact on language learning. The negative attitude will block the process of foreign language learning whereas the positive attitude support and promote towards language learning (Gardner, 1982). The results of students' attitude before integrating WALL in traditional teaching shows that they are uncertain about the learning vocabulary via the WALL. The Mean is between 2.51-3.50, indicating the uncertain level of students' attitude before utilizing WALL in vocabulary learning. According to the findings shown in table 2, the student expressed their attitudes at the uncertain level, indicating that the students have never been exposed to the integration of multimedia such as WALL, visual materials in class. Although they are using computer and mobile phone to play games, interact with people in social media, it seems that WALL is something new for them. Therefore, they are uncertain about how can WALL be applied to learning the language. In addition, most English teachers follow the traditional teaching style by focusing on the textbooks, which can cause the negative attitudes towards the language learning (Gardner, 1982; Brown, 2007; Sandoval-Pineda, 2011)

Moreover, there is a significant difference in students' attitudes towards integrating WALL in vocabulary learning in the experimental group before and after using WALL. The results show that there are considerably significant differences in students'attitudes towards before and after learning via WALL ($p < .001$) which indicates that the students have positive attitudes towards integrating WALL in class. This improvement supports that the integration of WALL in class can enhance the students' attitude towards because the students have acknowledged and perceived the WALL as a new tool for the language learning (Lasagabaster & Sierra, 2003) as well as develops English vocabulary learning. This is because the integration of the WALL, a modern technology with multimedia that contains interesting learning materials, helps students reduce the stress in an environment of L2 learning; therefore, L2 learners express positive attitudes towards using CALL in class and it could be more flexible for them to manage their learning on their own principle (Jalali & Dousti, 2014).

In addition, the results from the data collected revealed that the modern technologies have been used in students' daily life, and play an important role in various fields of education including the integration of CALL and WALL in the language learning (Mokhatari, 2012; Sandoval-Pineda, 2011), while these technologies have been continuously progressed (Mokhatari, 2012). The qualitative data from interviewing four students in the experimental group support that they express positive attitudes towards WALL.

In sum, the overall findings imply that the students welcome to accept the integration of WALL in the language learning classes (Greenfield, 2003). The present study supports that the application of CALL and WALL in English classes not only supports the students to gain a higher level of language proficiency, enhance the positive attitudes towards CALL but also have confidence in utilizing the computer (Greenfield, 2003; Sandoval-Pineda, 2011; Mokhatari, 2012). It is recommended that there are advantages in utilizing CALL in promoting positive attitudes in L2 learning, the ELL teachers as facilitators should apply CALL in EFL class in order to facilitate L2 learning (Lasagabaster & Sierra, 2003; Greenfield, 2003; Jalali & Dousti, 2014).

RQ3: Students' autonomous learning capacity of the students in the experimental group before and after learning vocabulary via WALL

The results of learner autonomy in the experimental group show at the uncertain level in all 20 statements. They are uncertain whether they are able to learn independently or not. After, the results have changed into favorable level indicated by a considerably significant difference at the $p < .001$ in 18 pairs and significant difference at $p < .05$ in two pairs; statement 17 (In English self-study, I choose activities that I can learn from) and 19 (I like studying English by myself).

The findings show that students in the experimental group are willing to participate in learning vocabulary by their own principles. In this regard, the findings reveal that students develop their autonomous learning, having the ability to be responsible for their learning (Holec, 1980; Benson, 2008, 2011). The results of this study show that the integration of WALL in learning the language can promote the learner autonomy can promote individual, meaningful, flexible, and effective learning (Holec, 1980; Dickinson, 1995; Benson, 2011). Base on the present study, WALL can enhance the learner autonomy in learning a second language in two aspects; individuality in the language learning and group language learning.

In conducting this present study relevant to the individuality in learning, students in the experimental group with low language proficiency are able to control their learning environments via WALL because they realize that they sometimes cannot follow what the teacher has taught in class, they themselves attempt to find out the information from the web. This is because they have the freedom to control the speed of learning and sequence on their learning (Dickinson, 1995; Benson, 2011; Yiamkhamnuan, 2016; Roussel & Tricot, 2012). Furthermore, WALL can encourage the student autonomy in the sense that it enables students to explore the information such as the meaning of vocabularies and grammar rules by using their own principle via many webs (Mutlu & Tuga, 2013).

In addition to the learner autonomy in terms of the individuality in the language learning, the findings from interview also found that the integration of WALL in class could promote the group language learning (Yiamkhamnuan, 2016). Four students who are given the interview similarly

express that one of the favorite tasks is the vocabulary game. They often spend free time after lunch or before the class starts to play a vocabulary game together. They are happy when they win, and laugh together. In addition, when they have finished playing vocabulary competition in WALL recommended by the teacher, they try to search for vocabulary game on another website to play. This notion reflects that the students are willing to participate in language learning with the integration of WALL in class because they can learn in a less stressful environment (Maliqi, 2016; Yiamkhamnuan, 2016).

7. Conclusion

The vocabulary enhancement by integrating Web-Assisted Language Learning (WALL) is the primary interest in this study. The results in the post-test of the experimental group, show that WALL is one of the interesting tools for learning vocabulary, can be useful in integrating WALL in the langue learning environment of EFL context because it provides authentic material for learning a language that the learners can interact and participate (Son, 2011). In addition, the integration of WALL in class not only enhances students' performance in language learning but also it promotes a positive attitude towards the use of new technology in class. The integration of WALL in learning also activate leaning autonomous capacity since the study is able to be responsible for their learning (Holec, 1980; Benson, 2008, 2011).

8. Implications for WALL in English Vocabulary Learning

The present study investigates the vocabulary enhancement via the integration of WALL that can facilitate the students in activating the positive attitudes towards learning English in Thai EFL context and enhancing the learner autonomy in language learning. The results significantly reveal that the integration of WALL in EFL class is useful for enhancing the vocabulary knowledge of the students. However, it does not mean that the WALL and other technologies can replace the role of the teachers (Maliqi, 2016; Norati, 2015). The teacher should play a role as a language teaching facilitator who provides suitable WALL for vocabulary learning and teaching (Son, 2011). This is because the contents of the language teaching that contain multimedia such as graphics, audios, pictures, movie clips, and other visual media are more authentic that can overcome the limitations of the language learning environments and the complexity of words(Mohsen & Balakumar, 2011; Esit, 2011; Hossieni & Pourmandnia, 2013; Brown, 2007; Sandoval-Pineda, 2011). Moreover, the multimedia allows students to retain the vocabulary in long-term and use the vocabulary knowledge more effective (Young, 2008; Killickaya & Krajka, 2010; Son, 2011).

In addition, teacher quality improvement should be taken into consideration (Yiamkhamnuan, 2016). The teacher should have sufficient knowledge of SLA frameworks and CALL approaches in order that they can appropriately apply the technologies to determine how to design the vocabulary lesson and integrate based on the support of the SLA theories (Yiamkhamnuan, 2016, Peres, 2008). For this reason, the teacher should have opportunities to attend the teaching program based on the application of SLA theories and improve skills on how to integrate appropriate WALLs in teaching in classes. This would enable the students in EFL contexts to explore the use of WALL for language learning, in particular, vocabulary learning.

9. Recommendations for Future Research

Firstly, this present study consists of only 24 students, 12 students in the experimental group and 12 students in the control group, which is considered small. Future research is recommended to have more students participating in the experimental group and control group because the sample size may affect the results of the study (Son, 2011; Norati, 2015).

Secondly, the present study is conducted in only five sessions. It is important that the future research provides insufficient time for the EFL students to get familiar with the integration of WALL in both studying in class and outside of class (Mahmoud, et al. 2012; Yiamkhamnuan, 2016).

Additionally, the teacher would have more time to prepare the lessons in order to make sure that the students receive the vocabulary knowledge in several contexts providing in the WALL.

Finally, further research should be conducted to examine whether the teachers have positive or negative attitudes towards integrating WALL in EFL classes or not. This may affect the results of the research because some teachers may prefer to follow the traditional teaching styles (Maliqi, 2016; Norati, 2015).

10. References

Ado, A. (2017). *Challenges Encountered by Learners of English as a Second Language*. Retrieved December 01, 2017, from Owlcation website: https://owlcation.com/academia/amaado.

Benson, P. (2006). Autonomy in language teaching and learning. *Language Teaching,40*(1), 21-40.

Benson, P. (2008). Teachers' and learners' perspectives on autonomy. In T. Lamb & H. Reinders (Eds.), *Learner and teacher autonomy* (pp. 15-31). Amsterdam, the Netherlands: John Benjamins.

Benson, P. (2011). *Teaching and researching autonomy* (2nd ed.). New York, NY.

Brown, D. H. (2007). Principles of language learning and teaching. (5th Eds.). Pearson: Longman.

Conrad, K. (1996). Call–non-English L2 instruction. Annual Review of Applied Linguistics, *16*, 158-181. doi:10.1017/S0267190500001495.

Dickinson, L. (1995). Autonomy and motivation: A literature review. *System, 23*(2) doi:10.1080/09588221.2011.631144.

Du, X. (2009). The affective filter in second language teaching. *Asian Social Science, 5* (8), 162-165.

Ellis, R. (2008). The Study of Second Language Acquisition. Oxford: Oxford University Press.

Ferit Killickaya F. & Krajka, J. (2010)**.** Comparative usefulness of online and traditional vocabulary learning. *The Turkish Online Journal of Educational Technology. 9* (2), 55-63.

Fotos, S. (2002). Structured-based interactive tasks for the EFL learner. In E. Hinkel & S. Fotos (Eds.), *New perspectives on grammar teaching in second language classrooms* (pp. 135-154). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Gardner, R. C. (1983). Learning Another Language: a True Social Psychological Experiment. *Journal of Language and Social Psychology*, *2*(2-3-4), 219-239. doi:10.1177/0261927x8300200209.

Gardner, R.C. (1982). Language attitudes and language learning. In E. Bouchard Ryan & H. Giles (Eds.), *Attitudes towards language variation* (pp. 132-147). London: Edward Arnold.

Goodfellow, R. (1995). A review of the types of CALL programs for vocabulary instruction. *Computer Assisted Language Learning*, *8*, 205-226.

Greenfield, R. (2003). Collaborative email exchange for teaching secondary ESL: A case study in Hong Kong. *Language Learning and Technology*, *7*(1), 46-70.

Gu, P. Y., & Johnson, R. K. (1996). Vocabulary learning strategies and language learning outcomes. Language Learning, *46*(4), 643-679.

Holec, H. (1980). *Autonomy and foreign language learning*. Strasbourg, France: Council of Europe.

Hosseini, S.B. & Pourmandnia, D. (2013). Language learners' attitudes and beliefs: Brief review of the related literature and framework. *International Journal on New Trends in Education and Their Implications, 4* (4), 63-74.

Huckin, T., & Coady, J. (1999). Incidental vocabulary acquisition in a second language: A review. *Studies in Second Language Acquisition*, *21*(2), 181-193. doi.org/10.1017/S0272263199002028.

Hurwitz, E.K., Horwitz, M.B. and Cope, J.A. (1986) Foreign Language Classroom Anxiety. *The Modern Language Journal, 70,* 125-132. Retrieved from http://dx.doi.org/10.1111/j.1540-4781.1986.tb05256.x.

Jalali S., & Dousti, M. (2014). Attitudes of Iranian EFL learners towards CALL. *Self-Access Learning Journal*, 6(2), 191-215.
Kern, R. (2006). Perspectives on Technology in Learning and Teaching Languages. *TESOL Quarterly*, 40(1), 183-210. doi:10.2307/40264516.
Kern, R., & Warschauer, M. (2000). Theory and practice of network-based language teaching. In M. Warschauer & R. Kern (Eds.), *Network-based language teaching: concepts and practice* (pp. 1-19). New York: Cambridge University Press.
Krashen, S. (1994). The input hypothesis: Issues and implications. London: Longman.
Krashen, S. (2004). *Applying the Comprehension Hypothesis: Some Suggestions. Presented at 13th International Symposium and Book Fair on Language Teaching*. English Teachers Association of the Republic of China, Taipei, Taiwan.
Lasagabaster, D. & Sierra, J. (2003). Student's evaluation of CALL software programs', Education Media international. *40* (3-4), 293-304.
Latifi et.al. (2013). The comprehension hypothesis today: An interview with Stephen Krashen. *Electronic Journal of Foreign Language Teaching*, *10* (2), 221–233.
Lightbrown, P., & Spada, N. (1999). *How languages are learned*. Oxford: Oxford University Press.
McCarthy, M. (1990). *Vocabulary*. Oxford: Oxford University Press.
Miller, G., & Gildea, P. (1987). How children learn words. *Scientific American*, *27,* 94-99.
Nation, I.S.P. (1997). L1 and L2 use in the classroom: a systematic approach. *TESL Reporter* 30, 2: 19-27.
Nation, I.S.P. (2001). *Learning vocabulary in another language*. Cambridge: Cambridge University Press.
Oroujlou, N. & Vahedi M. (2011). Motivation, attitude, and language learning. Procedia - Social and Behavioral Sciences, *29*, 994 – 1000. doi:https://doi.org/10.1016/j.sbspro.2011.11.333.
Peres, T. (2008). Where do SLA and CALL meet?. *Entre Lenguas*. *13*, 85-105. Retrieved from http://www.saber.ula.ve/bitstream/123456789/28680/1/articulo6.pdf.
Sandoval-Pineda, A. (2011). Attitude, Motivation and English Language Learning in a Mexican College Context. In: The University of Arizona.
Skinner, B. F. (1957). *Verbal behaviour*. New York: Appleton-Century-Crofts.
Schmidt, R. (1995). Consciousness and foreign language learning: A tutorial on the role of attention and awareness. In Schmidt, R. (Ed.), *Attention and awareness in foreign language teaching and learning* (Technical Report No. 9) (pp. 1-64). Honolulu: University of Hawaii at Manoa.
Schmitt, D (2010). *Are learners getting the knowledge they need?* Pearson Education Ltd. Retrieved from htp://www.pearsonlongman.com/newtotalenglish/pdfs/vocab_trainer. Pdf.
Schmitt, N. (2010). *Researching vocabulary: A vocabulary research manual*. New York: Palgrave Macmillan.
Son, J.B. (2001). CALL and vocabulary learning: A review. *English Linguistic Science, 7*, 27-35. Study in Hong Kong. *Language Learning and Technology, 7*(1), 46-70.
Tuncok, B. (2010). *A Case Study: Students' Attitudes towards Computer Assisted Learning, Computer Assisted Language Learning, and Foreign Language Learning*. Master's Thesis. Ankara, Turkey: Middle East Technical University.
Wilkins D. (1972). *Linguistics in language teaching*. London: Arnold.
Yiamkhamnuan, J. (2016). *Computer-assisted Language Learning (CALL), Learner Autonomy, and Learning Achievement: The Use of CALL Software in English as a Foreign Language (EFL) Tertiary Education in Thailand*. Dissertation, Ph.D. (Education). The University of Auckland.

Clinical Comparison Between Topical 2.5%Benzoyl Peroxide + 5% Niacinamide and 2.5%Benzoyl Peroxide in Reducing Facial Pore Size of Patients with Facial Acne Vulgaris

[a]Tarnyamas Kaewsanit, [b]Asst.Prof.Panlop Chakavittumrong

[a] Division of Dermatology, Chulabhorn International College of Medicine, Thammasat University, Pathum Thani, Thailand, tarnyamas@hotmail.com

[b] Division of Dermatology, Faculty of Medicine, Thammasat University Hospital, Pathum Thani, Thailand, panlop078@yahoo.com

Abstract

Background: Topical Niacinamide or Nicotinamide is an amide of vitaminB3(niacin) which widely used in cosmetic preparations. It can help improving acne lesions and also can reduce facial sebum production but reducing facial pore size property is await to be proven.

Objective: To evaluate and compare clinical efficacy between topical 2.5% Benzoyl peroxide + 5% Niacinamide and 2.5% Benzoyl peroxide in reducing pore size of patients with mild to moderate facial acne vulgaris.

Methods: Patient with mild to moderate facial acne vulgaris, aged 18 to 40 years were enrolled. The treatment was randomly assigned to left or right side of face in an individual participant. One side received topical 2.5% Benzoyl peroxide + 5% Niacinamide and another side received only topical 2.5%Benzoyl peroxide for 4 weeks. The pore size was assessed by ANTERA 3D camera at 2nd week and 4th week.

Results: The mean pore size in Niacinamide group (2.5% Benzoyl peroxide + 5% Niacinamide) was decreased from 0.895 to 0.827 mm^3 and in cream base group (2.5%Benzoyl peroxide + cream base) was increased from 0.767 to 0.777 mm^3. The percentages change from baseline were decreased in both group, 28% and 18% in Niacinamide group and cream base group respectively but there was no statistically difference between two groups (P=0.225).

Conclusion: Combination of topical 2.5% Benzoyl peroxide + 5% Niacinamide tends to be more effective than topical 2.5% Benzoyl peroxide in pore size reduction but no statistical significant difference due to the small simple size.

Keywords: Antera3D camera, Benzoyl peroxide (BP), Facial pore size, Niacinamide

1.Background

Enlarged facial pores is a common dermatologic concern found in all types of patients, especially those with acne. It is difficult to treat this condition due to multifactorial pathogenesis. Main pathogenic factors include high sebum production, loss of skin elasticity and tension from aging, and hair follicles size. Other causative factors are genetic predisposition, acne, comedogenic xenobiotics and chronic photodamage

2.Literature

Current treatments for enlarged facial pores have been used to aim at each pathogenetic factors. For topical therapies include topical retinoids, which is the first line treatment, that can help in skin laxity and reduce sebum production, chemical peeling with

various formulations helps in skin rejuvenation, and topical botanical gels act at minimizing pilosebaceous opening by improving facial seborrhea and skin aging but. For oral therapies commonly use antiandrogen drugs such as oral contraceptive pills and spironolactone to reduce facial sebum production. Other treatments are devices that can produce heat to improve skin elasticity and decrease sebum production such as many kinds of LASER, radiofrequency and ultrasound devices.

Niacinamide or nicotinamide is an amide of vitamin B_3 or niacin. It has been used widely in cosmetic products. There are many pharmacological properties of Niacinamide that relate with dermatologic conditions. Firstly, it has sebo-suppressive effect which has thought to be by induction exfoliation within the duct connecting the sebaceous gland to the skin surface. The second one is photoprotective effect by unblocking glycolysis and replenish ATP in UV-irradiated cultured human keratinocytes and also regulates PARP-1, an important DNA repair enzyme that is activated by UV radiation. Others are anti-inflammatory effect, lightening effect, anti-pruritic effect, and antimicrobial effect including *P.acnes*

As Niacinamide has sebo-suppressive effect and photoprotective effect. It can act against main pathologic factor of enlarged facial pores which is high sebum production. It can also help in other causative factors including acne and chronic photodamage. Hence, this study aimed to evaluate and compare clinical efficacy between topical 2.5% Benzoyl peroxide + 5% Niacinamide and 2.5% Benzoyl peroxide in reducing pore size of patients with mild to moderate facial acne vulgaris.

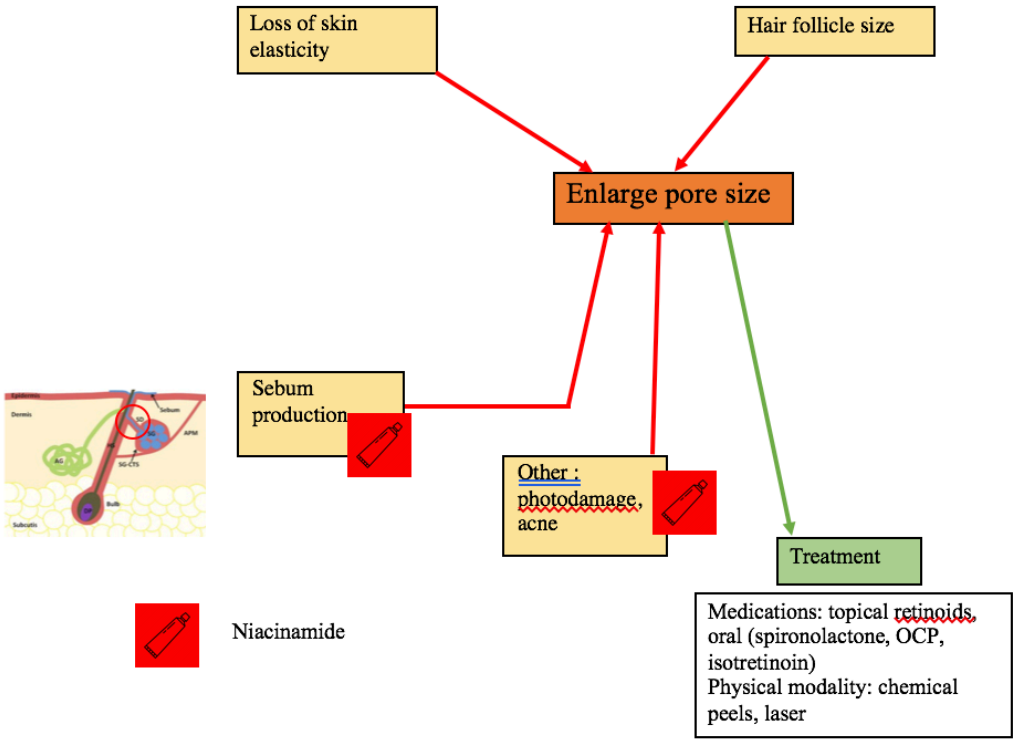


Fig.1 Conceptual framework

3.Methods

This study is a controlled, split-sided trial. The protocol was approved by Thammasat University Institutional Review Board and conducted at the outpatient department at Tobacco

Monopoly hospital, Thailand during November 2018 to February 2019. An Informed consent was signed by an individual subject prior to the treatment procedure.

Patients aged equal or more than 18 years old with mild to moderate facial acne vulgaris evaluated by the Leeds Revised Acne Grading System were included into this study. Patients who use topical acne medication 2 weeks prior to study, receive oral retinoid 1 year prior to study, receive dermabrasion, laser resurfacing 2 month prior to study, have underlying diseases: endocrine disease, liver disease, active gastrointestinal ulcers or a history of gastrointestinal ulcers, or gout, receive intramuscular injection of contraceptive, estrogen, steroid within 3 months prior to the study, use medical soap, anti-acne cream within 7 days, have history allergic to topical Benzoyl peroxide or Niacinamide and female patients who are pregnant or breastfeeding were excluded from the study.

The patients were asked to apply 2.5%Benzoyl peroxide water-base gel 2 FTU (1g) on the entire face 10 minutes before facial washing. After washing 2.5%Benzoyl peroxide water-base gel, the patients were randomly assigned to apply 5%Niacinamide cream 1 FTU (0.5g) on one half-face and cream base 1 FTU(0.5g) on another half. This procedure was done twice daily for 4 weeks

The facial pore size was evaluated by photographs using digital camera and ANTERA 3D camera at baseline, 2nd week and 4th week.

4.Findings

Study Population

19 patients (14 females and 5 males) with facial acne vulgaris (5 patients with moderate facial acne vulgaris and 14 patients with mild facial acne vulgaris) were included in this study. The age of the patients was in a range from 18 to 36.

Efficacy

The Pore size was measured by ANTERA3D camera. At baseline the mean pore sizes were not different between 2 group (p=0.21). After 4 weeks of treatment, the pore size in Niacinamide group (2.5% Benzoyl Peroxide + 5% Niacinamide) were gradually decrease from 0.895 to 0.827 mm^3. In contrast to placebo group (2.5% Benzoyl Peroxide + Cream base), the pore sizes were slightly increase from 0.767 to 0.777 mm^3. But there is no statistically significant difference between groups in any visits as shown in the **Table I** and **Fig.2**

Table I : The pore size (mm^3) at each visit

Time	Treatment	mean	SD	Co ef.	Lower 95%	Upper 95%	P value
Base line	BP+ Niacinamide	0.895	0.528	0.1286	-0.071	0.329	0.21
	BP+Cream base	0.767	0.479				
Week 2	BP+ Niacinamide	0.868	0.575	0.0241	-0.176	0.224	0.81
	BP+Cream base	0.844	0.630				
Week 4	BP+ Niacinamide	0.827	0.600	-0.0507	-0.250	0.149	0.62
	BP+Cream base	0.777	0.614				

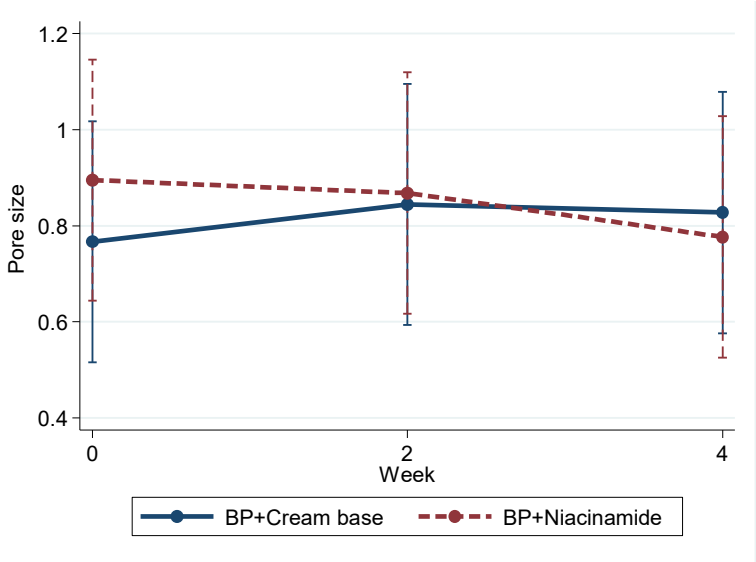


Figure 2: The pore size (mm^3) at each visit

The change in pore size at week 4 was decreased 28% and 18% from baseline in Niacinamide group (2.5% Benzoyl Peroxide + 5%Niacinamide) and placebo group (2.5% Benzoyl Peroxide + Cream base) respectively. But the change between 2 groups were not statistically difference (P=0.225) as shown in **Table II** and **Table III**

Table II: Pore size change from baseline(mm^3) in each visit

Time	BP+ Niacinamide	Lower 95%	Upper95%	P value
Wk0	0	-	-	-
Wk2	-0.027	-0.231	0.176	0.794
Wk4	-0.118	-0.322	0.085	0.254
Wk4 vs Wk2	-0.091	-0.295	0.112	0.379
Time	BP + Cream base	Lower 95%	Upper95%	P value
Wk0	0	-	-	-
Wk2	0.078	-0.123	0.278	0.448
Wk4	0.061	-0.140	0.261	0.551
Wk4 vs Wk2	-0.017	-0.217	0.184	0.871

Table III: Pore size change from baseline (%) to week 4

Treatment	Median	P value
BP + Niacinamide	-28.04233	0.225
BP + Cream base	-17.78846	

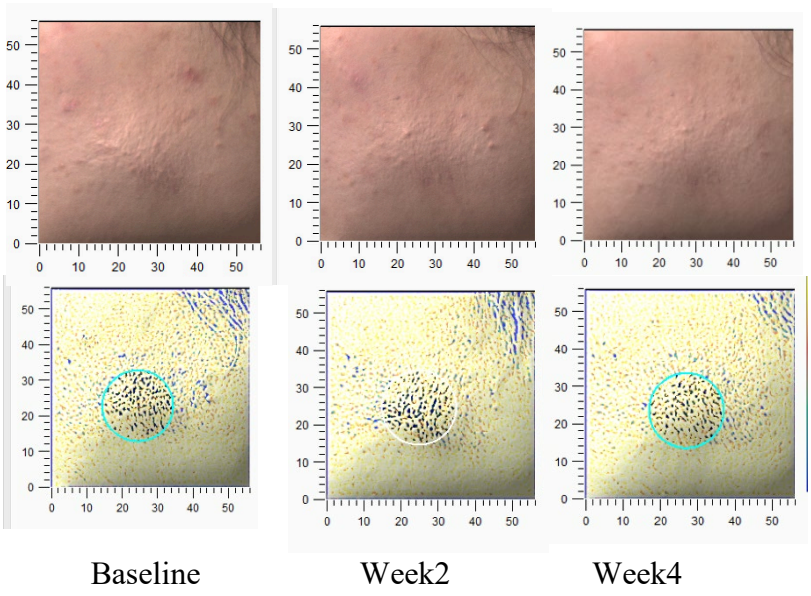


Figure 3 ANTERA 3D picture (Niacinamide group) at baseline, week 2 and week 4

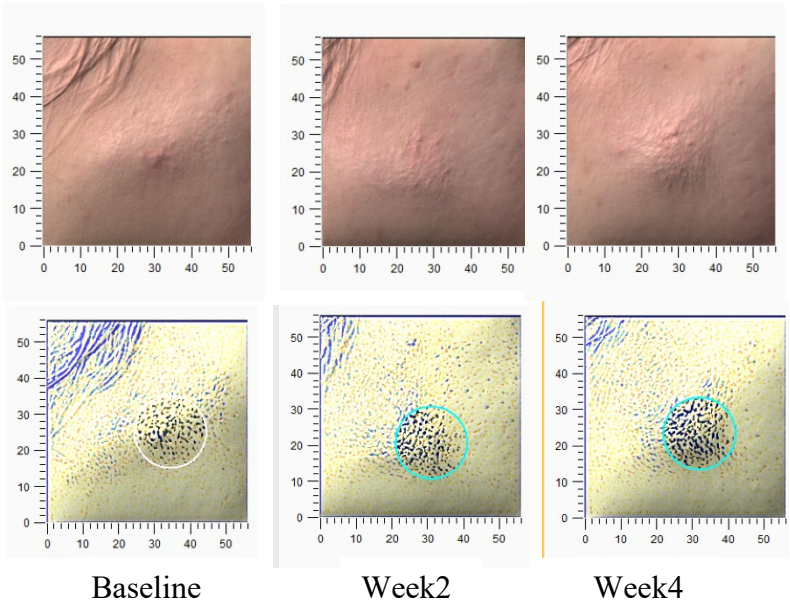


Figure 4 ANTERA 3D picture (Cream base group) at baseline, week 2 and week 4

5.Discussions

Our study presented that combination therapy of topical 2.5%Benzoyl peroxide + 5%Niacinamide is an effective treatment in reducing facial pore size but no significant difference compared to 2.5%Benzoyl peroxide alone.

From previous study using topical Niacinamide showed that Niacinamide can reduce sebum excretion from skin by inducing exfoliation within the duct connecting the sebaceous gland to the skin surface and encouraged sebum flow to the skin surface faster leads to depletion of the reservoir of sebum in the duct. This might lead to reduction in facial pore size in our study.

The limitations of our study are the small number of participants and short follow-up period, so we cannot see the obvious result and long-term efficacy of the treatment. Further studies with more participants and longer duration of follow up should be performed to validate this possible hypothesis.

6.Recommendations

Combination therapy with the topical 2.5%Benzoyl peroxide and 5% Niacinamide appears to be effective in the treatment of enlarged facial pore size for acne vulgaris patients. In our study found no significant difference of the efficacy between topical 2.5%Benzoyl peroxide + 5%Niacinamide and topical 2.5%Benzoyl peroxide alone due to the limitations of the small sample size and short follow up period.

7.References

Dong, J., J. Lanoue, and G. Goldenberg, *Enlarged facial pores: an update on treatments.* Cutis, 2016. **98**(1): p. 33-6.

Endly, D.C. and R.A. Miller, *Oily Skin: A review of Treatment Options.* J Clin Aesthet Dermatol, 2017. **10**(8): p. 49-55.

Wohlrab, J., *Niacinamide-Mechanism of Action and Its topical Use in Dermatology.* skin pharmacology and physiology, 2014. **27**: p. 311-315.

Draelos, Z.D., A. Matsubara, and K. Smiles, *The effect of 2% niacinamide on facial sebum production.* J Cosmet Laser Ther, 2006. **8**(2): p. 96-101.

Biedermann K, L.K., Mrowczynski E, Coombs M, Lepp C, El-Nokaly M, Burton E, *regulation of sebum production by niacinamide.* 60th Annual Meeting American Academy of Dermatology, New Orleans, 2002.

Gensler, H.L., *Prevention of photoimmunosuppression and photocarcinogenesis by topical nicotinamide.* Nutr Cancer, 1997. **29**(2): p. 157-62.

Linming, F., et al., *Comparison of two skin imaging analysis instruments: The VISIA((R)) from Canfield vs the ANTERA 3D((R)) CS from Miravex.* Skin Res Technol, 2018. **24**(1): p. 3-8.

Exploring the English Self-Efficacy of L2 Graduate Students

Sudkanung Naruponjirakul

Faculty of Arts, Dhurakij Pundit University, Thailand

skanung@dpu.ac.th

Abstract

Self-efficacy is the belief in one's capacity in performing a specific task, and many studies have shown that self-efficacy is associated with academic achievement. The objectives of this research were 1) to examine the level of English self-efficacy of L2 graduate students, and 2) to compare the difference in the English self-efficacy of graduate students with respect to genders and major subjects. The subjects in this research were 108 graduate students of Dhurakij Pundit University in Thailand. The research instrument included the Questionnaire of English Self-Efficacy (QESE) containing 32 five-point Likert scale items. The data were analyzed by using mean scores, standard deviation, a t-test, and Welch's ANOVA analysis. The findings showed that the average scores for the English self-efficacy of L2 graduate students were at a moderate level. In terms of English language skills, the average scores for self-efficacy in all skills were at a moderate level. Listening self-efficacy was at the highest rank, followed by reading self-efficacy, speaking self-efficacy, and writing self-efficacy. In addition, there was no statistically significant difference in the English self-efficacy in terms of gender or major subject. It is recommended to enhance the English self-efficacy of L2 students in order to develop their language learning.

Keywords: self-efficacy, L2, graduate students

1. Introduction

Nowadays English is widely used throughout the world. Learners studying at the master's degree are expected to use English as a major tool in quest for truth and to expand their knowledge in specific areas of interest. Advanced reading skills, such as reading academic textbooks and writing for academic purposes, including reports, research summaries, essays, and theses are essential skills for graduate students. However, a study conducted by Punpruk and Mahapoonthong (2007) revealed that Thai students face huge difficulties in using English at postgraduate levels. The study showed that students were not able to define their ideas, discuss conceptual frameworks, or propose their work by using English effectively. They also were limited in using English for communication purposes, demonstrating critical thinking skills, and writing research papers in relation to their own area of study. Even though students were aware of the importance of English, they were not confident in producing the target language and were not capable of using English to respond to various situations.

According to the English requirements of the Graduate Program at Dhurakij Pundit University, students are required to attain the minimum criteria on the TOEFL, the IELTS, or the DPU Graduate English Test. Those who reach the designated scores are interpreted as an intermediate user that is able to use English to study at a more advanced level. However, it turns out that some students, with limited competence in English, cannot pass the mentioned criteria, so it is necessary for them to take the English for Graduate Study course. In order to be successful in English language learning, learners require a number of variables and attributes, such as language competence, learning styles, learning strategies, confidence, and motivation (Dörnyei, 2005). Additionally, self-efficacy is one of the key elements that can be used to predict students' success or failure. Self-efficacy is significantly correlated with learning achievement (Schunk, 2003; Usher & Pajares, 2009), and many studies have demonstrated that low-achieving students also have a low level of self-efficacy, while high-achieving students, on the other hand, reflect a high degree of self-efficacy (Kitikanan & Sasimonton, 2017; Mills, Pajares, & Herron, 2006; Tilfarlioglu & Cinkara, 2009). In this study, English self-efficacy will be explored in order to find the level of beliefs that students perceive in

their own abilities. The results from the study will encourage language teachers to design teaching methods that can enhance the self-efficacy and self-confidence of their L2 students in terms of English language learning.

2. Literature Review

2.1 What is self-efficacy?

Self-efficacy as derived from Albert Bandura's Social Cognitive Theory refers to the belief in one's capacity in performing a specific task (Bandura, 1997). Self-efficacy simply answers the question, "Can I do this task in this situation?" (Linnenbrink & Pintrich, 2003). Learners have their own judgment about their capacity and then they will decide and organize their actions in relation to a particular task. Learners with high self-efficacy tend to have perseverance and show persistence in their learning. When they face difficult tasks or problems, they attempt to overcome those obstacles by using various learning strategies. On the other hand, students with low self-efficacy are likely to have low motivation, avoid difficult tasks, and have limited ideas on how to solve problems. For all these reasons, high-efficacious learners are likely to be successful in learning. Many studies have pointed out that self-efficacy can be used to predict an individual's learning achievement and learning retention (Schunk, 2003; Usher & Pajares, 2009; Zimmerman, 2000). In addition, many studies have shown that self-efficacy has a positive correlation with academic achievement (Rahemi, 2007; Raoofi, Tan & Chan, 2012; Wang, 2007). Self-efficacy, therefore, is an essential affective factor in predicting an individual's performance, patience, effort, and judgment in performing a task (Bandura, 2006; Schunk & Pajares, 2002).

2.2 Self-efficacy and English language learning

Self-efficacy plays a vital role in English language learning. Numerous studies relating to self-efficacy and English language learning have been carried out. For example, Rahemi (2007) studied the correlation between self-efficacy and learning achievement, and the results showed a significant correlation between self-efficacy and English achievement. In this study, low-efficacious students exhibited poor performance since they had negative attitudes and had a bad experience with English learning. Further, research conducted by Tilfarlioglu and Cinkara (2009) showed that students that demonstrated various performances had different levels of self-efficacy. The self-efficacy of upper-intermediate students was higher than that of pre-intermediate students, for example. A study done by Mills, Pajares and Herron (2006) also presented the notion that self-efficacy had a positive effect on academic achievement. To illustrate, students that have high self-efficacy tend to show perseverance, patience, and put great effort into difficult tasks. They know how to use various learning strategies to tackle language obstacles. Moreover, the study conducted by Kitikanan and Sasimonton (2017) revealed that English self-efficacy in relation to all four skills had a significant positive correlation with the English language achievement of Thai learners. In other words, Thai students with high self-efficacy have high achievement in language learning.

Apart from positive correlations between self-efficacy and language achievement, Wang (2007) indicated some of the factors that influence one's level of self-efficacy: expertise in the content area, self-perception of English proficiency, attitudes towards English language learning, and social-cultural context. Additionally, Siritararatn (2013) identified some of the factors in language learning success, which included interests and attitudes towards English language learning, teaching methods, patience and perseverance, awareness of the importance of English, and fun activities. The negative factors that were seen to cause failure in language learning were bad experience with English, the grammar-translation method, and negative feedback from teachers.

3. Research Objectives

The main objective of this research was twofold: 1) to examine the level of English self-efficacy of L2 graduate students, and 2) to compare the difference in the English self-efficacy of graduate students with respect to genders and major subjects. The following hypotheses were tested:

1 The level of English self-efficacy of L2 graduate students is moderate.
2 There is a significant difference in the level of English self-efficacy among L2 graduate students with respect to their genders.
3 There is a significant difference in the level of English self-efficacy among L2 graduate students with respect to their major subjects.

4. Methods

4.1 Subjects

The subjects in this study were 108 graduate Dhurakij Pundit University students from several programs enrolled in the English for Graduate Study course in the third semester of academic year 2017 (June - July 2018).

4.2 Instrument

The Questionnaire of English Self-Efficacy (QESE), which was developed by Wang et al. (2014), was employed. The questionnaire consisted of 32 five-point Likert scale items. According to Wang et al. (2014), this questionnaire had acceptable reliability and validity coefficients: Cronbach's alpha reliability coefficient value was 0.96, the concurrent validity was 0.55, and the predictive validity was 0.41. The students were required to rank the items according to how they perceived their own abilities in performing different tasks and skills. The answers ranged from 1 (I cannot do it at all) to 5 (I can do it very well). The items were designed to measure four English skills: (a) self-efficacy for listening (Items 1, 3, 9, 10, 15, 22, 24, 27); (b) self-efficacy for reading (Items 2, 12, 16, 21, 25, 26, 29, 32); (c) self-efficacy for speaking (Items 4, 6, 8, 17, 19, 20, 23, 30); and (d) self-efficacy for writing (Items 5, 7, 11, 13, 14, 18, 28, 31).

4.3 Data collection and analysis

The QESE was delivered to 108 graduate students during the final week of the course (July 2018). It took about 15 minutes for them to complete the questionnaire. After collecting all of the questionnaires, the data were analyzed and interpreted using the SPSS program. Descriptive statistics, t-test, and Welch's ANOVA were utilized to reveal the findings of the study.

4.4 Interpretation of mean scores of the English self-efficacy level

The mean scores from the questionnaire were applied to measure the level of English self-efficacy based on the following criteria (Siljaru, 2017):

Score range	Self-efficacy level
4.50 – 5.00	Very high
3.50 – 4.49	High
2.50 – 3.49	Moderate
1.50 – 2.49	Low
1.00 – 1.49	Very low

5. Findings

Table 1: Demographic characteristics

Variables	*N* = 108	Percentage
Gender		
Male	50	46.3
Female	58	53.7
Age		
Below 24	17	15.7
25-29	40	37.0
30-34	28	25.9
35-39	12	11.1
40 and above	11	10.2
Major subject		
Education and Social Sciences	40	37.0
Engineering and Technology	52	48.1
Health Science	16	14.8

The table shows that 58 students were female (53.7%) and 50 students were male (46.3%). The majority of the students' age was between 25 and 29 years (37.0%). The major subjects of the students were classified into three main areas: engineering and technology (48.1%), education and social sciences (37.0%), and health science (14.8%).

Table 2: Level of English self-efficacy of L2 graduate students

Statements	Mean	SD
1. I can understand the stories told in English.	3.00	.76
2. I can do homework/ assignments alone when they include reading English texts.	3.23	.82
3. I can understand American TV programs in English.	2.84	.74
4. I can describe my university to other people in English.	2.70	.87
5. I can compose messages in English on social media channels such as Facebook and Instagram.	3.19	.72
6. I can describe the way to the university from the place where I live.	3.08	.89
7. I can write a text in English.	2.62	.77
8. I can tell a story in English.	2.72	.87
9. I can understand English radio programs.	2.78	.78
10. I can understand English TV programs made in Thailand.	3.05	.66
11. I can leave a note for another student in English.	3.23	.72
12. I can guess the meaning of unknown words when I am reading an English text.	3.08	.71
13. I can form new sentences from words I have just learned.	2.94	.72
14. I can write e-mails in English.	3.08	.86
15. I can understand English dialogue in audio recordings about everyday school matters.	3.15	.82
16. I can understand messages or news items in English on the Internet.	3.02	.82
17. I can ask my teacher questions in English.	2.81	.78
18. I can produce English sentences with idiomatic phrases.	2.59	.83
19. I can introduce my teacher to someone in English.	2.90	.75
20. I can discuss subjects of general interest with my fellow students in English.	2.82	.79

Statements	Mean	SD
21. I can read short English narratives.	3.03	.84
22. I can understand English films without subtitles.	2.74	.91
23. I can answer my teacher's questions in English.	2.80	.78
24. I can understand English songs.	2.89	.71
25. I can read English-language newspapers.	2.81	.83
26. I can find out the meanings of new words using a monolingual dictionary.	3.20	.85
27. I can understand telephone numbers spoken in English.	3.66	.83
28. I can write diary entries in English.	2.78	.88
29. I can understand English articles about the Thai culture.	2.69	.85
30. I can introduce myself in English.	3.45	.75
31. I can write an essay in two pages about my lectures in English.	2.55	.94
32. I can understand new reading materials selected by my teacher.	2.83	.79
Overall Mean	**2.95**	**.84**

According to the first research objective, the results in Table 2 reveal that the overall level of the English self-efficacy of L2 graduate students was at a moderate level (*M* = 2.95, *SD* = .84). Item 27 (I can understand telephone numbers spoken in English) was ranked the highest (*M* = 3.66, *SD* = .83), while Item 31 (I can write an essay in two pages about my lectures in English) was ranked the lowest (*M* = 2.55, *SD* = .94).

Table 3: Level of English self-efficacy of L2 graduate students in relation to English language skills

English language skills	Mean	SD	Interpretation	Rank
Self-efficacy in listening	3.01	.78	Moderate	1
Self-efficacy in reading	2.99	.83	Moderate	2
Self-efficacy in speaking	2.91	.84	Moderate	3
Self-efficacy in writing	2.87	.85	Moderate	4

In terms of English language skills, Table 3 reveals that self-efficacy in listening was at the highest rank (*M* = 3.01, *SD* = .78), followed by self-efficacy in reading (*M* = 2.99, *SD* = .83), self-efficacy in speaking (*M* = 2.91, *SD* = .84), and self-efficacy in writing (*M* = 2.87, *SD* = .85).

Table 4: English self-efficacy of L2 graduate students with respect to genders

	Male		Female		t	p
English self-efficacy	**Mean**	**SD**	**Mean**	**SD**	1.173	0.470
	3.02	.57	2.88	.61		

The results in Table 4 show that the level of English self-efficacy of the male graduate students (*M* = 3.02, *SD* = .57) was higher than that of the female students (*M* = 2.88, *SD* = .61). However, there was no statistically significant difference in the English self-efficacy between the male and female graduate students (*p* = 0.470, > .05).

Table 5: English self-efficacy of graduate students with respect to major subjects

Major subject	Mean	SD
Education and Social Sciences	2.85	.65
Engineering and Technology	3.07	.48
Health Science	2.78	.73

	Statistic	df1	df2	p
English self-efficacy	2.328	2	37.226	0.112

When comparing the English self-efficacy among the graduate students from the three different major subjects, the students that studied in the field of engineering and technology had the highest average mean score (M = 3.07, SD = .48). The Welch's ANOVA statistic for English self-efficacy, as shown in Table 5, revealed that there were no significant differences among the different major subjects (p = 0.112, > .05). Based on the second research objective, it can be claimed that the students' genders and their major subjects had no effect on their belief in their English language self-efficacy.

6. Discussion

This study aimed to examine the level of English self-efficacy of L2 graduate students and to compare the difference in the English self-efficacy of graduate students with respect to their genders and major subjects. The findings for this study support the first hypothesis that the overall level of self-efficacy of the L2 graduate students was moderate (M = 2.95, SD = .84). It can be explained that the students' self-efficacy was not high because they could not pass the English requirements of the graduate study programs. This finding was in line with a study conducted by Siritararatn (2013), which found that the levels of English self-efficacy of low EFL graduate students were moderate and quite low. This could be supported by students' opinions, which claimed that English is a difficult subject according to their perception, and students require tremendous effort to develop English language skills. This finding is also consistent with many studies that have shown that low-achieving students have a low level of self-efficacy (Kitikanan & Sasimonton, 2017; Rahemi, 2007; Tilfarlioglu & Cinkara, 2009). If students have strong self-efficacy, their English proficiency will be high as well. Bandura (2006) stated that individuals have different degrees of self-efficacy and this leads to how they perform tasks. When they believe in their own ability, they will find ways to achieve the task. However, learners with a low level of self-efficacy will judge the difficulty of the task and believe that they are not able to achieve it. Self-efficacy, as a result, is the key factor for a successful language learner.

Regarding self-efficacy for each language skill, the overall mean was also at a moderate level. To put it in order, listening self-efficacy came first, followed by reading self-efficacy, speaking self-efficacy and writing self-efficacy. It can be assumed that Thai students are more confident concerning their receptive skills. In the traditional Thai classroom, students are familiar with drill exercises, reading comprehension questions, and rote learning. Productive skills, on the other hand, cause anxiety and fear among students. They fear making mistakes and find it difficult to communicate with others using spoken and written English. (Schunk, 2003). This is consistent with a study of Ritthirat (2014), which indicated that Thai students are always nervous when they need to produce the target language. They also have limited vocabulary and find L1 interference when trying to speak or write in English.

However, this study does not support the second and third hypothesis that there is a significant difference in the level of English self-efficacy with respect to their genders and major subjects. The results showed no statistically significant difference. This is in line with several studies that have shown no significant differences in the self-efficacy beliefs between male and female learners (Ayoobiyan & Soleimani, 2015; Husain, 2014; Sawari & Mansor, 2013). This could be explained that self-efficacy beliefs vary from person to person, and it associates with academic achievement. Another reason to support this finding is the similar background and experience in English language learning of the L2 graduate students. None of them could pass the English language requirements that could indicate their English proficiency. Failure to learn English can lead to negative attitudes and motivation and can lower one's level of self-efficacy.

7. Conclusion

This study showed that the overall mean scores of the English self-efficacy of L2 graduate students were moderate. In addition, there is no significant difference in the level of English self-efficacy with respect to their genders and major subjects. The findings can provide some information for learners that they do not fully believe in their own capacity in language learning. What students believe they can do when a task is given can predict what they can actually do and how they feel about the task. Accordingly, self-efficacy can be used to predict the learning outcomes of a student; a low level of self-efficacy leads to low confidence in one's ability. English language teachers should place emphasis on enhancing the self-efficacy of their L2 students. Practical ways to boost such self-efficacy are, for example, encouraging them to set proximal goals and to break these goals down into smaller tasks. When L2 students achieve each small task, they will realize that their goals are attainable. Students that can see their progress in language learning will gradually increase their self-efficacy. Furthermore, teachers should convince their students that self-efficacy is specific to a particular task, and it can be changeable, controlled and developed. The more self-efficacy that students gain, the higher will be their English language achievement.

8. References

Ayoobiyan, H. & Soleimani, T. (2015). The relationship between self-efficacy and language proficiency: A case of Iranian medical students. *Journal of Applied Linguistics and Language Research*, *2*(4), 158-167.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W.H. Freeman and Company.

Bandura, A. (2006). Adolescent development from an agentic perspective. In F. Pajares, & T. Urdan (Eds.), *Self-Efficacy Beliefs of Adolescents* (pp. 1-43). Greenwich, Connecticut: Information Age Publishing.

Dörnyei, Z. (2005). *The psychology of the language learner: Individual differences in second language acquisition*. Mahwah, New Jersey: Lawrence Erlbaum Associates.

Husian, U. K. (2014). *Relationship between self-efficacy and academic motivation*. Paper presented at the International Conference on Economics, Education and Humanities (ICEEH'14), 10-11 December 2014. http://dx.doi.org/10.15242/ICEHM.ED1214132

Kitikanan, P. & Sasimonton, P. (2017). The relationship between English self-efficacy and English learning achievement of L2 Thai learners. *Language Education and Acquisition Research Network (LEARN) Journal*, *10*(1), 149-164.

Linnenbrink, E. A., & Pintrich, P. R. (2003). The role of self-efficacy beliefs in student engagement and learning in the classroom. *Reading & Writing Quarterly*, *19*, 119-137.

Mills, N., Pajares, F., & Herron, C. (2006). A reevaluation of the role of anxiety: Self-efficacy, anxiety, and their relation to reading and listening proficiency. *Foreign Language Annals, 39*(2), 276-295.

Rahemi, J. (2007). Self-efficacy in English and Iranian senior high students majoring in Humanities. *Novatis-Royal, 1*(2), 98-111.

Raoofi, S., Tan, B. H, & Chan, S. H. (2012). Self-efficacy in second/foreign language learning contexts. *English Language Teaching*, *5*(11), 60-73.

Ritthirat, N. (2014). *Thai university students' English oral proficiency and problems to developing English speaking skill* (Master's thesis). Songkhla: Prince of Songkhla University.

Punpruk, S., & Mahapoonthong, C. (2007). A study of English language proficiency, language usage problems and language needs among graduate and postgraduate students at King Mongkut's Institute of Technology North Bangkok. *The Journal of KMITNB, 17*(3), 66-72.

Sawari, S. S., & Mansor, N. (2013). A study of student's general self-efficacy related to gender differences. *International Journal of Informative and Futuristic Research, 1*(4), 62-67.

Schunk, D. H. (2003). Self-efficacy for reading and writing: Influence of modeling, goal-setting and self-evaluation. *Reading and Writing Quarterly, 19*, 159-172.

Schunk, D. H., & Pajares, F. (2002). The development of academic self-efficacy. In A. Wigfield & J. S. Eccles (Eds.), *Development of achievement motivation* (pp.15-31). California: Academic Press.

Siljaru, T. (2017). *Research and data analysis with SPSS and AMOS*. Nonthaburi: S.R. Printing Mass Product.

Siritararatn, N. (2013). English self-efficacy beliefs of EFL low proficiency graduates students. *Academic Journal of Interdisciplinary Studies*, *2*(3), 461-468.

Tilfarlioglu, F. T., & Cinkara, E. (2009). Self-efficacy in EFL: Differences among proficiency groups and relationship with success. *Novatis-Royal, 3*(2), 129-142.

Usher, E. L., & Pajares, F. (2009). Sources of self-efficacy in mathematics: A validation study. *Contemporary Educational Psychology*, *34*(2009), 89-101.

Wang, C. (2007). A first grade Chinese student's self-efficacy beliefs about learning English in American classrooms and a Chinese community. *Multicultural Learning and Teaching*, *2*(2), 14-28.

Wang, C., Kim, D. H., Bai, R., & Hu, J. (2014). Psychometric properties of a self-efficacy scale for English language learners in China. *System*, *44*(2014), 24-33.

Zimmerman, B. J. (2000). Self-efficacy: An essential motive to learn. *Contemporary Educational Psychology*, *25*, 82-91.

Graffiti Removal using CO_2 laser

Piyaporn Detudom[a] and Amarin Ratanavis[b]

[a] Department of Industrial Physics and Medical Instrumentation, Faculty of Applied Science, Lasers and Optics Research Center (LANDOS), Science and Technology Research Institute, King Mongkut's University of Technology North Bangkok, Thailand, toontoon7654321@gmail.com

[b] Department of Industrial Physics and Medical Instrumentation, Faculty of Applied Science, Lasers and Optics Research Center (LANDOS), Science and Technology Research Institute, King Mongkut's University of Technology North Bangkok, Thailand, amarinphysics@gmail.com

Abstract

In this study, a carbon dioxide (CO_2) laser operating in the long pulse mode with infrared (IR) radiation at the wavelength 10.6 μm is investigated for graffiti removal on smooth and rough surfaces of steel samples. Paint spraying is performed as graffiti on the 5×5 cm^2 size samples. The paint spraying consists of red, green, blue and black colors. Drying of paints occurs at atmosphere. The averaged thickness of graffiti layer is 65 μm. The steel samples were scanned at various speeds as 25, 50, 75 and 100 mm/s, respectively. The laser fluences for the graffiti removal at 0.25 and 0.15 J/cm^2 were examined. The surface inspection was carried out using an optical microscope. Based on the observation, both laser fluencies were sufficient to removal graffiti layer on the samples. The surface temperature caused by laser radiation also plays as an important parameter for graffiti removal that is strongly related to the surface roughness.

Keyword: Laser cleaning, CO_2 laser, Graffiti removal, Smooth and Rough surface

1. Background

Graffiti problems have been concerned as treats on historic buildings, architectonic heritage, wall and bridge [1]. Conventional methods of graffiti removal including mechanical polishing, water jet, chemical for corrosion may cause to surface damage of material [1]. However, there are recent activities that propose the technological advance of laser technology as an alternative tool for graffiti removal [1-2]. The laser cleaning method offers the exceptional benefits such as toughness, compactness, selective cleaning position, long operating lifetime of laser systems and noncontact cleaning process [2].

This research is performed as a preliminary study the use of a CO_2 laser for graffiti removal. A CO_2 laser system operating in the long pulse mode with infrared (IR) radiation was examined for graffiti removal in smooth and rough surfaces of steel samples.

2. Literature

In several studies, the graffiti removal using lasers was dominated by the nanosecond pulse laser operating IR region [3-6]. The IR laser radiation in this short pulse duration produces the photo-thermal ablation process that can remove graffiti effectively. However, there are some drawbacks especially the surface damages that can be the critical consideration [6].

It has been interested of using long pulse IR lasers for laser cleaning applications [7-8]. In very recent years, a free running Nd: YAG lasers at wavelengths of 532 nm and 1064 nm were proposed as the long pulse laser cleaning systems [8]. The maximum laser energies at 100 mJ for 1064 nm and 1 mJ for 532 nm were attempted as an approach of dual laser beam cleaning. The dual wavelength laser system of 1064 nm and 532 nm was demonstrated as a candidate of a new kind of the laser cleaning system [8].

3. Methods

In this study, a CO_2 laser operating at the wavelength of 10.6 µm with pulse duration of 100 µs is used for the graffiti removal application. Samples were radiated with the laser beam with laser fluencies. The microscope inspection was applied on the samples after the laser removal. The laser energies in this study were 1.5 mJ and 2.5 mJ. This limitation of these two laser energies is due to the energy stability of the laser system. The scanning speeds of 25, 50, 75 and 100 mm/s were introduced to the graffiti surfaces of the samples. It should be mentioned that the sample size is about 5×5 cm^2. These samples had smooth and rough surface which have paint spraying with the red, green, blue and back colors. The averaged-paint spraying thickness of smooth and rough surface is about 65 µm.

It should be noted that the laser fluences were calculated by the laser energy on a sample surface per unit area. Figure 1 shows the experimental setup for graffiti removal by using the CO_2 laser.

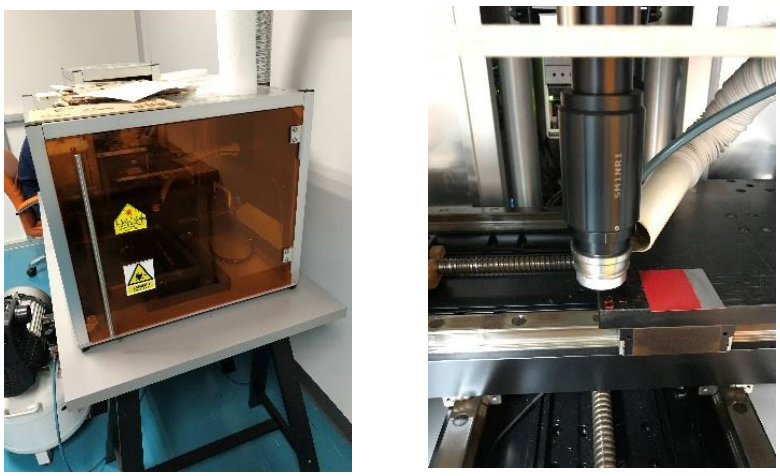


Figure 1: Experiment setup for graffiti removal using CO_2 laser

4. Findings

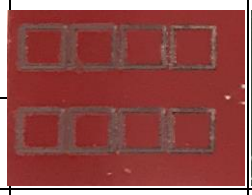
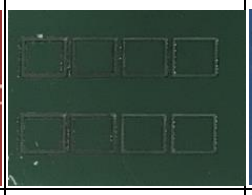
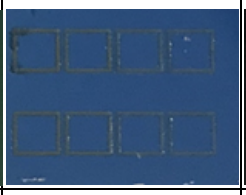
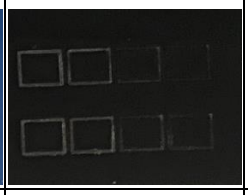
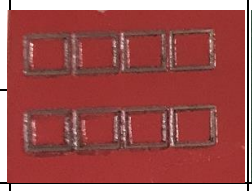
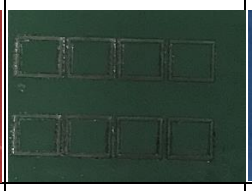
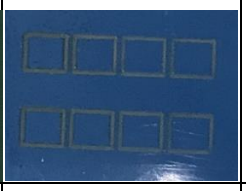
Fluence (J/cm^2)	Speed (mm/s)																Side	Surface
	25	50	75	100	25	50	75	100	25	50	75	100	25	50	75	100		
0.15																	Front (with spray paint)	Smooth
0.25																		
0.15																	Back	
0.25																		
0.15																	Front (with spray paint)	Rough
0.25																		
0.15																	Back	
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Figure 2: Images of the removal of the averaged graffiti thickness of 65 µm using CO_2 laser at fluencies of 0.15 J/cm^2 and 0.25 J/cm^2 respectively.

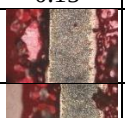
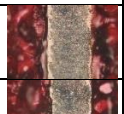
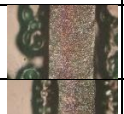
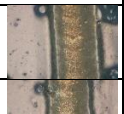
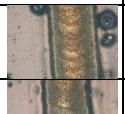
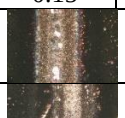
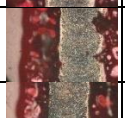
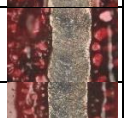
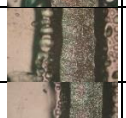
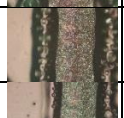
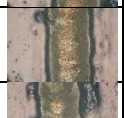
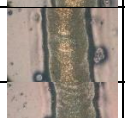
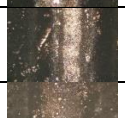
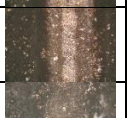
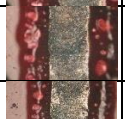
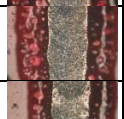
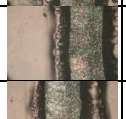
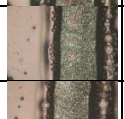
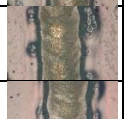
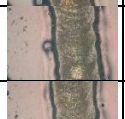
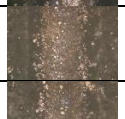
Speed (mm/s)	Red		Green		Blue		Black	
	Fluence (J/cm^2)		Fluence (J/cm^2)		Fluence (J/cm^2)		Fluence (J/cm^2)	
	0.15	0.25	0.15	0.25	0.15	0.25	0.15	0.25
25								
50								
75								
100								

Figure 3: Microscope images (10X) of smooth surface samples of CO_2 laser at the fluences of 0.15 J/cm^2 and 0.25 J/cm^2 of the Red, Green, Blue and Black colors.

Speed (mm/s)	Red		Green		Blue		Black	
	Fluence (J/cm^2)		Fluence (J/cm^2)		Fluence (J/cm^2)		Fluence (J/cm^2)	
	0.15	0.25	0.15	0.25	0.15	0.25	0.15	0.25
25								
50								
75								
100								

Figure 4: Microscope images (10X) of rough surface samples of CO_2 laser at the fluences of 0.15 J/cm^2 and 0.25 J/cm^2 of the Red, Green, Blue and Black colors.

5. Discussions

Figure 2 shows the graffiti removal images at the fluencies of 0.15 J/cm^2 and 0.25 J/cm^2 using a CO_2 laser. The infrared (IR) of the CO_2 laser with long pulse mode leads to evaporation process. Higher laser fluencies are expected to empower the graffiti removal. However, these high laser fluencies with low scanning speed can damage the surface samples. The caution should be also considered with the absorption of graffiti colors as the observation of damage occurred the black-color samples.

Figure 3 shows the microscope images of the laser removing on smooth and rough surfaces. There is no significant difference between the two laser fluencies examined on this study in the sense of graffiti removal. However, it is evident that the considerable damage on the back of samples was found for the graffiti removal on rough surfaces since the rough surface allows higher heat deposition caused by laser beam.

The CO_2 laser can be a potential candidate for laser graffiti removal. The laser fluence of 0.15 J/cm^2 and 0.25 J/cm^2 were testified to the graffiti removal the steel samples which have the averaged graffiti thickness of 65 µm. The laser fluence of 0.25 J/cm^2 at speed 25 and 50 mm/s that cause surface damage of the black-color sample. As the results, factors affecting removal of a CO_2 laser are the laser fluences with scanning speeds, absorption of graffiti and surface roughness of samples.

6. Recommendations

CO_2 laser can be a potential candidate for graffiti removal. The CO_2 laser system can be considered as an economic removal system. The further study could aim to investigate the optimal parameters for types of sample, varying thickness of graffiti layer and comparisons with other lasers for graffiti removal.

Acknowledgments

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Contract no. KMUTNB-61-GOV-B-19

7. References

Sasha Chapman. (2000). Laser technology for graffiti removal. 75-78. Retrieved from http://www.sciencedirect.com/science/article/abs/pii/S1296207400001539

Patricia Sanmartín. (2014). Current methods of graffiti removal: A review. 363-374.Retrieved from https://www.sciencedirect.com/science/article/abs/pii/S0950061814010058

Gómez, C., Costela, A., García-Moreno, I., & Sastre, R. (2006). Comparative study between IR and UV laser radiation applied to the removal of graffitis on urban buildings. 2782-2792. Retrieved from https://www.sciencedirect.com/science/article/pii/S0169433205008172

Siano, S., Agresti, J., Cacciari, I., Ciofini, D., Mascalchi, M., Osticioli, I., & Mencaglia, A. A. (2011). 419-446. Laser cleaning in conservation of stone, metal, and painted artifacts: state of the art and new insights on the use of the Nd: YAG lasers. Retrieved fromhttps:////link.springer.com/article/1-0.1007/s-00339-011-6690-8

Gobernado-Mitre, I. (1996). 474-478. Laser cleaning in art restoration. Retrieved from https://www.sciencedirect.com/science/article/pii/0169433295004610

Mazzinghi, P., & Margheri, F. (2003). A short pulse, free running, Nd: YAG laser for the cleaning of stone cultural heritage. 191-202. Retrieved from www.sciencedirect.com/science/article/abs/pii/S-0143816601001336

Penide, J. (2012). Laser cleaning of graffiti from building Stone using high power diode laser. 596-600. Retrieved from https://www.researchgate.net/publication/328363454/

Chongcharoen, K. (2017). Feasibility study of a dual wavelength laser cleaner. 1-4.Retrieved fromhttps://iopscience.iop.org/article/

Laser based fabrication of Microfluidics devices

Jumpon Yangomoot[a] and Amarin Ratanavis[b]

[a]Department of Industrial Physics and Medical Instrumentation, Faculty of Applied Science,

Lasers and Optics Research Center (LANDOS), Science and Technology Research Institute,

King Mongkut's University of Technology North Bangkok, Thailand,

jumpon.yangomoot@gmail.com

[b]Department of Industrial Physics and Medical Instrumentation, Faculty of Applied Science,

Lasers and Optics Research Center (LANDOS), Science and Technology Research Institute,

King Mongkut's University of Technology North Bangkok, Thailand,

amarin.r@sci.kmutnb.ac.th

Abstract

In this study, a CO_2 laser system operating at the wavelength of 10.6μm is evaluated as a tool for fabrication microchannel on acrylic plates to make microfluidics devices. The fabrication is based on the laser direct writing approach with different speeds and laser fluences.The microchannel is investigated as an example using optical microscope for visual inspection. This study aims to find the relation between speed, laser fluence, microchannel depth and microchannel width. Theobservations reveal that the speed and power laser are the key parameters of the microchannel fabrication for microfluidicsdevices.

Keywords: Laser fabrication, CO_2 laser, Microfluidics devices

1. Background

Microfluidic device is a technology that controls the flow of the low volume of fluids allowing small physical footprint, speed and efficiency of chemical separations. Microfluidic devices are now used in modern analytical laboratory. Microfluidic devices offer various applications such as biomedical diagnostic, microfuel cell and cooling in microelectronics [1-3].

In recent years, the microfluidic devices have been made by silicon and metal that reaches high expense. In this research, we demonstrate a CO_2 laser system as an economic tool for the laser direct-write technique applying on acrylic plates to produce microfluidic devices. The optimal parameters to fabricate the microchannel on microfluidic devices using the CO_2 laser system are also discussed.

2. Literature

The laser direct-write technique provides fast and low-cost approach for fabricating microchannel on metal, glass and polymerbased microfluidics devices [4-5]. Developments of the microchannel fabrication on microfluidics devices are aimed to the laser writing technique equipped with computer that enables the control of moving states changing and varying the pattern rapidly [6]. Such a development offers an excellent method for the precision and automated fabricating microchannel on microfluidic devices [6].

It has been suggested that a solid-state laser (Nd:YVO_4 laser) operating at wavelength of 1064 nm with pulse width of 20 ns and tunable repetition rate from single-shot to 200 kHz can

be a candidate to fabricate microchannels on glass [3].In the study, a Heraeus mufla furnace offers the thermal treatment and a microscope can serve as visual inspection tool of the samples [3]. A confocal microscope provides the surface roughness measurement of the microfluidic devices [3]. The speed of laser can be varied and the results can be evaluated before and after thermal treatment. The optimum speeds in the value between 40 mm/s and 80 mm/s were reported [3]. The microchannel width and microchannel depth of 12 µm and 8 µm respectively were demonstrated [3].

3. **Methods**

A CO_2 laser operating at the wavelength of 10.6 µm with pulse duration of 100 µs ismeant to be used for fabrication of microfluidics devices. The fabrication of Y-junction is used as an example. It should be mentioned that Y-junction is a microfluidic pattern consisting of two fluid streams and a single outlet to acts as a mixer [7].

Figure 1 shows the experimental setup to fabricate the microchannel on the thickness 5 mm of 50 mm x 50 mm acrylic plates. In the experiments, the energies of laser beam were varied to enable the alteration of laser fluencies while the laser spot size was remained as a constant. In addition, the laser beam was scanned to create the Y-junction pattern on the acrylic surfaces. The laser fluences were varied to 0.03, 0.06, 0.09 and 0.12 J/cm^2 respectively. The laser beam was controlled by moving of CNC state. In addition, the CNC speeds were varied in the range of 40, 60, 80 and 100 mm/s. The visual inspection by optical microscope allows the measurements of microchannel depths and microchannel widths.

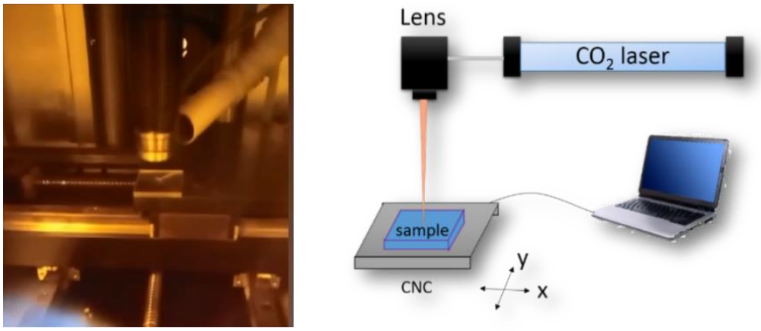

Figure 1: Experimental setup to fabricate microfluidics devices using the CO_2 laser

4. Findings

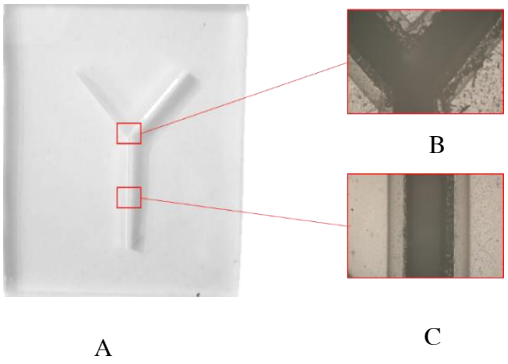

Figure 2: (A) Camera image of microfluidics obtained by laser writing Y-junction of acrylic samples. (B) Microscope image (50X) at the connection of microchannel and(C) microscope image (50X) at the line of microchannel.

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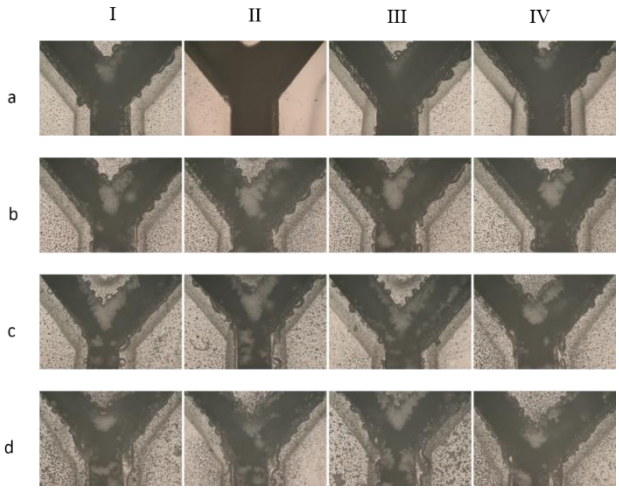

Figure 3: Microscope images (50X) of the connection of microchannels obtained by laser writing of acrylic at laser fluences of (I) 0.03 J/cm^2, (I) 0.06 J/cm^2, (III) 0.09 J/cm^{2}and (IV) 0.12 J/cm^2 for scanning speeds of (a) 40 mm/s, (b) 60 mm/s, (c) 80 mm/s and (d) 100 mm/s.

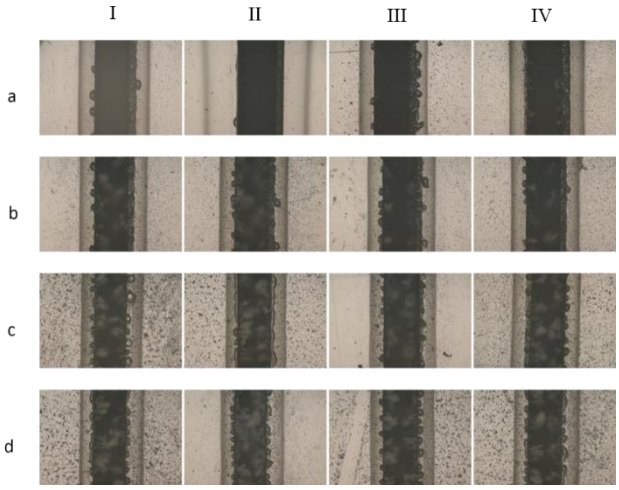

Figure 4: Microscope images (50X) of the line of microchannels obtained by laser writing of acrylic at laser fluences of (I) 0.03 J/cm^2, (II) 0.06 J/cm^2, (III) 0.09 J/cm^{2}and (IV) 0.12 J/cm^2 for scanning speeds of (a) 40 mm/s, (b) 60 mm/s, (c) 80 mm/s and (d) 100 mm/s.

Figure 5: Microscope images (50X) of the microchannels obtained by laser writing of acrylic at laser fluences of 0.06 J/cm^2 for scanning speeds of 40 mm/s.

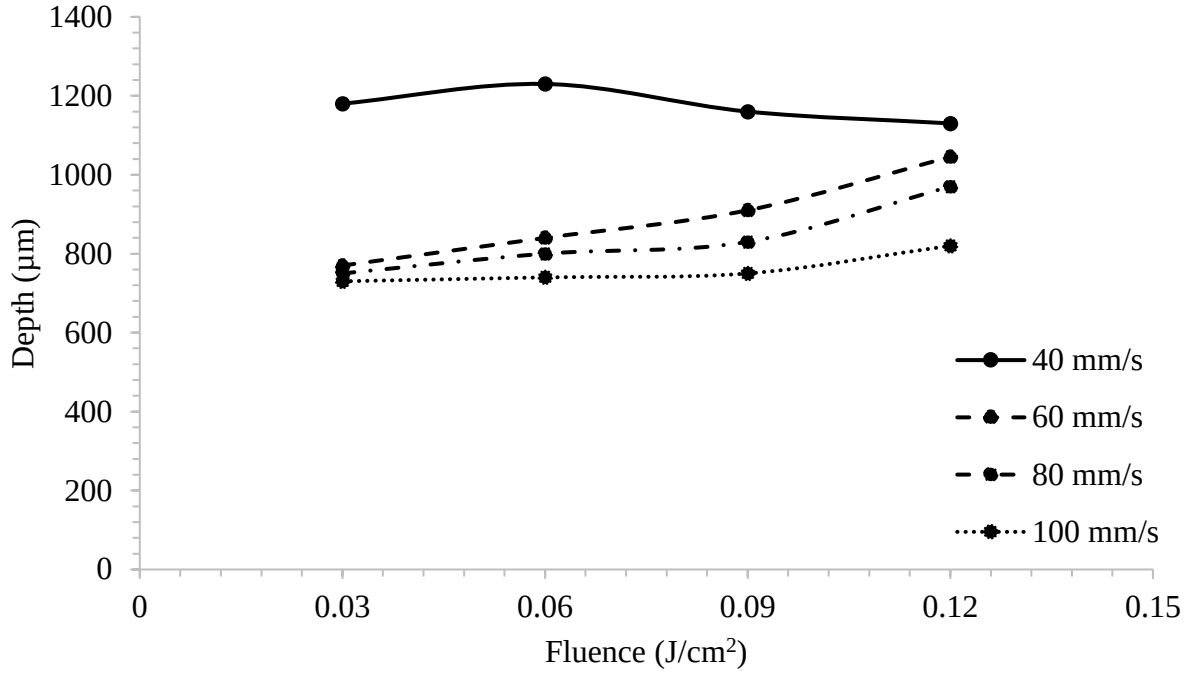

Figure 6: The relation between speeds, laser fluences and microchannel depths.

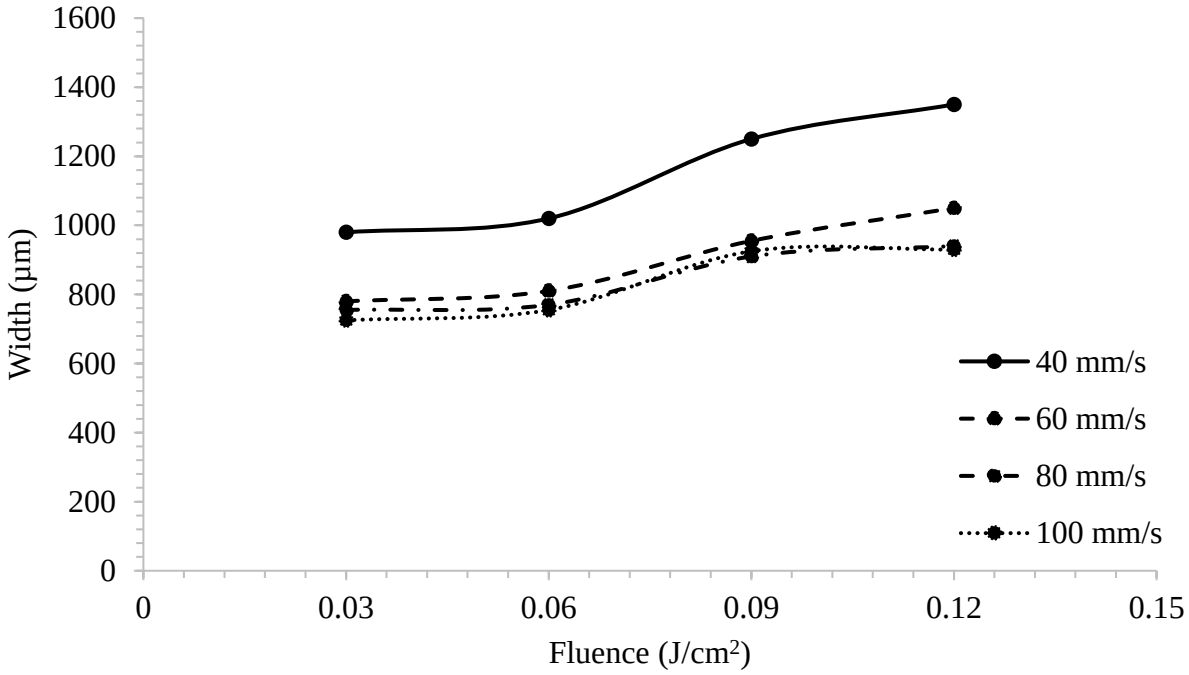

Figure 7: The relation between speeds, laser fluences and microchannel widths.

5. Discussions

Figure 3 and Figure 4 show the images of microchannels obtained by laser direct-write technique of acrylic plates at fluence values between 0.03 J/cm^2 and 0.12 J/cm^2 with the scanning speed varying between 40 mm/s and 100 mm/s. At scanning speed higher than 40 mm/s, there are incomplete patterns of microchannel. It was an evidence that the optimal parameters were indicated at the speed of 40 mm/s and the laser fluence of 0.06 J/cm^2. These parameters allow the fabrication of microchannels with excellent qualities.

Figure 6 and Figure 7 show that the effects of laser fluence and writing speed on microchannel depths and microchannel widths. The speed at 40 mm/s and fluence value 0.06 J/cm^2 can achieve the deepest depth at 1,300 μm. This is significant in the sense of the optimal parameters that provide the clear writing pattern as shown in Figure 3-5. However, the optimal parameters suffer to the wider width due to their low speed resulting to high heat deposition.

6. Recommendations

A CO_2 laser system was demonstrated as a microchannel fabrication tool. The moving speed of CNC state at 40 mm/s equipped with the laser fluence at 0.06 J/cm^2 was demonstrated as the optimal condition of the fabrication of microchannel in normal Y-junction. The microchannel width and microchannel depth are strongly influenced by the laser fluencies and scanning speeds.

7. Acknowledgments

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References

David Erickson and Dongqing Li (2004).Integrated microfluidic devices, AnalyticaChimicaActa. 57,11-26. Retrieved from https://doi.org/10.1016/j.aca.2003.09.019.

Ya Cheng, Koji Sugioka and KatsumiMidorikawa (2004). Microfluidic laser embedded in glass by three-dimensional femtosecond laser microprocessing, Optics Letters. 29(17), 2007-2009. Retrieved from https://doi.org/10.1364/OL.29.00200

Daniel Nieto García et al (2016). Laser-based fabrication for microfluidics devices on Glass for Medical Applications, Advances in Microfluidics.258-272. Retrieved from https://www.researchgate.net/publication/310808920_LaserBased_Fabrication_for_Microfluidics_Devices_on_Glass_for_Medical_Applications

Qiuling Chen et al (2013). Fabrication of microstructures on different materials by diode-pumped solid state laser writing for microfluidicsapplications, Microsystem Technol.19, 1185-1194. Retrieved from https://link.springer.com/article/10.1007%2Fs00542-012-1718-3

Qiuling Chen et al (2011). Fabrication of large-area microfluidics structures on glass by imprinting and diode-pumped solidstate laser writing techniques, Microsystem Technol. 17,1611–1619. Retrieved from https://link.springer.com/article/10.1007%2Fs00542-011-1348-1

Joohan Kim et al (2002).Excimer laser fabrication of polymer microfluidic devices. JOURNAL OF LASER APPLICATIONS. 15(4), 255-260. Retrieved fromhttps://doi.org10.2351/1.1585085

Jue Nee Tan and Adrian Neild (2012).Microfluidic mixing in a Y-junction open channel, AIP ADVANCES 2, 032160. 1-11. Retrieved fromhttps://aip.scitation.org/doi/10.1063/1.4750483

Marketing relations, Integrated Marketing, internal marketing overview that affects the achievement of business operations Accounting Business in Thailand

Rattana Srinuan*

*DBA Candidate, Doctor of Business Administration in Marketing Program,

Siam University

*Email:aandapro@hotmail.co.th

ABSTRACT

The purpose of this research was to study the relationship of marketing factors, relationships Marketing, Integrated Marketing, internal marketing strategy effecting achievement of accounting business in Thailand and to find out the marketing strategy for accounting business in Thailand. The study population was the accounting business in Thailand. Quantitative research examples combined with 400 owner of accounting business. The data were collected by questionnaires. The statistics employed in the research were descriptive and multiple regression analysis. The research found that factors effecting the achievement of accounting business in Thailand. There were 3 factors influencing on the marketing achievement of accounting business in Thailand were marketing relationships, integrated marketing and Internal Marketing. After analyzed marketing strategies that affected the achievement of the accounting business in Thailand, the most important component were integrated marketing strategy, Internal Marketing Strategy and Marketing Relationships Strategy respectively.

Keywords: Marketing Relationships, Integrated Marketing, Internal Marketing, Business Achievement

Introduction

Business performance achievement is an important factor in business operations. Studying what affects a business is a challenge. Each company can control differently. The company can change the internal and external factors that affect the company. Learning more about work factors will help improve the company's performance. (Pestleanalysis, 2015).

80% of business in Thailand is medium and small businesses and most SMEs that use accounting services. The accounting office plays a very important role in supporting businesses to have accounting and financial reports correctly. Causing benefits to economic decisions of entrepreneurs and users of information in financial statements. In 2016, there were 5,134 accounting offices in the country. Which the overall accounting office business in 2015 were 532 Increased from 2014 and in 2016 Increased from 2015 by 138 accounting offices. Can be seen that there is an increase every year. (Department of Business Development Ministry of Commerce, 2560)

From the study, it was found that relationship marketing is one strategy used to maintain the existing customer base to create competitive advantage. By customer relationship marketing concept from education of Gronroose (1991, p.12)

Found that relationship marketing is all marketing activities that are conducted to build relationships with customers. Expand relationships and make existing relationships with customers sustainable. As for the integrated marketing (Lovelock and Wirtz, 2007) has integrated the marketing concept to be the most suitable for the customer's behavior in response to the satisfaction of the target customers of the organization. For internal marketing, good internal marketing will affect the success of implementing policies or the organization's plan which depends on the important internal factors which will affect the long-term operation of the organization (Barney, 1991)

Therefore forming literature review confirming that Business operation achievement is the most important thing that influences the business emphasis on achievement analysis of business is something that entrepreneurs should not overlook. Therefore the researcher is interested in studying about the factors affecting business operation achievement. The results of this research will be useful to academics. For future research As well as entrepreneurs can know how to improve and develop the level of importance of business performance achievement.

Research objectives

The objective of this study is to study the relationship of marketing factors, relationships Marketing, Integrated Marketing, Internal marketing, within the organization that influences the achievement of business operations.

Method

This study uses literature review, document analysis and present analytical descriptive reports use education from secondary sources. By studying and collecting information from documents and various sources including research books, others published documents and searching through the internet by using an open online database include Google scholar, Elsevier science direct, Scopus etc. The key words used for finding information in research are Marketing Relationships, Integrated Marketing, Internal Marketing; Business Achievement Which comes from the title of the research. Data analysis and statistics used were descriptive statistics and analysis of the influence of marketing strategies Statistics used in data analysis include multiple regression. Accounting offices are populated to study. Therefore, the researcher chose to use the sampling method and select the appropriate statistics to find the sample number. By sampling methods to be reliable and able to represent the population. Collecting quantitative data with questionnaires

This research namely the executives of the accounting office business, 5,134 companies. (Department of Business Development, 2560) Determining sample size using the table of Taro Yamane get the sample size of 375 samples but in order to get more regular dispersed samples s, the actual number of samples collected is 400.

Theories and literature reviews

1. Achievement of business operations

Organizational performance measurement is a commitment that executives and organizations must implement. To clarify to all stakeholders of the organization the success and failure that occurred, including explaining the main reasons that caused such situations In order to help decision makers to diagnose and is an administrative tool. Kaplan and Norton (1992) said that in the first stage, the balanced scorecard was designed to be used only in the organization's performance evaluation system. Therefore realized that the tools used to measure the performance of old companies are weak and ambiguous Such as looking at the financial status of the company which is the only corner of the company's success and often from the past does not show the potential and outlook of the company in the future. Therefore both proposed the concept of organizational evaluation. By presenting the concept that the organization brings evaluation through 4 perspectives Namely (1) the financial perspective is a view that answers the question In order to achieve financial success How does the organization have to be in the eyes of the shareholders or the owners or shareholders / owners who want the organization to be financially successful? 2) Customer perspective is a view that answers the question: To achieve the goals of the business How will the organization be in the eyes of customers? That is how customers want the organization to be in the customer's perspective (3) the internal business process is a view to answer the question: In order to make the shareholders and customers satisfied in the organization, how must be managed internally? Quality, response time, cost, and service model recommendations (4) Learning and growth is a perspective that answers the question: How does the organization need to develop and improve? To achieve sustainable goals, such as employee satisfaction, information systems

2. Factors affecting the achievement of business operations

From the literature review, it was found that many factors affecting the achievement of business operations have many factors. This study will be based on strategic management. To bring business to success, details are as follows.

2.1 relationships Marketing

Marketing, relationship or customer relationship management Starting from the United States in 1980, based on the concept of marketing, building relationships management is the basic concept of Customer Relationship Management Customer relationship management strategy is a development strategy and maintain a long-term relationship between the organization and customers, allowing businesses to have loyal customers and able to generate sales And long-term profit Relationship marketing is one of the four elements of holistic marketing concepts (Kotler & Keller, 2016, p. 44) By marketing relationships is a strategy to create long-term satisfaction and marketing relationships are resulting in the achievement of long-term business operations Marketing relationship variables include (1) customer relationship management (2) relationship management with partners (3) relationship management with employees (4) relationship management with financial institutions. Relationship Marketing strategy influence on the achievement of the business performance according to the concept of (Kotler & Keller, 2016, p. 44) and in accordance with the research of Afsaneh and Saeed (2016) that found that marketing relationships strategies have a positive influence on the performance of business performance Cheng and Lee (2011) found that marketing relationships strategies were applied to the service business rather than the business organization that sold the product. Marketing relationships strategies have a positive influence on customer satisfaction and marketing relationships strategies have positive influence on customer loyalty Heini (2015) found that marketing relationships strategies in B2 B business had a positive influence on business performance Krishnan, Groza, Groza, Peterson, & Fredericks (2014) found that customer relationship management (CRM) systematically had a positive influence on business performance.

2.2 Integrated Marketing

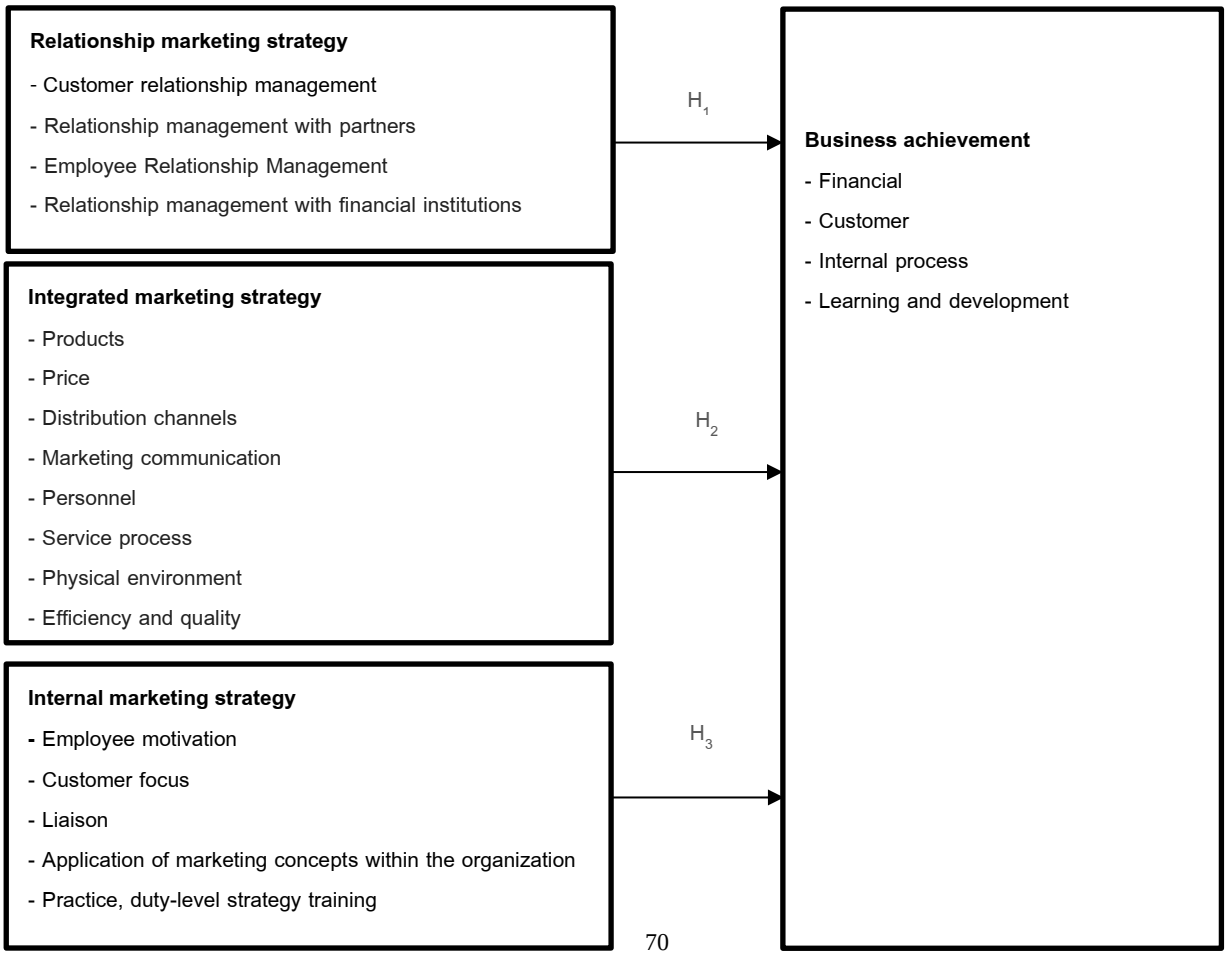
Integrated marketing strategy is an effective plan for doing business. Good planning will make the service grow with style. Not obsessed with economic conditions or pressure from competitors and also makes the company clear. When the market position is clear would make the strategy to be effective. According to the concept of McCarthy and Perreault (1996, pp. 46-49) Used as a marketing planning strategy which the principle of use is to plan each part to fit perfectly and appropriately. By measuring the part of the customer's perception of the actual service received in order to cut off the bias caused by expectations. Using tools to create marketing activities and combined with integrated marketing programs to create communication, delivering value for customers (Lovelock and Wirtz, 2007) Marketing program consisting of decisions on the use of formal activities Marketing to promote value from marketing activities from many forms. In the past, marketing activities to promote value Which is a group of marketing tools that the organization has used to achieve its objectives he researcher has studied the variables in this research consisting of 8 variables, namely (1) products (2) prices (3) distribution channels (4) marketing communications (5) personnel (6) service processes (7) environmental environment Physical and (8) efficiency and quality. Integrated marketing strategy factors influence the achievement of business according to the concept of (Lovelock & Wirtz, 2007) and in accordance with the research of Vikram, Bixia, & Tao (2016) found that the pricing strategy of the Big Four accounting firm has an influence on the pricing strategy of local accounting firms which affects the performance of the accounting office business.

2.3. Internal marketing

Internal marketing is a concept that is very important to business organizations that provide services to external customers who come to receive services. At present, there is intense business competition. Organizations required to do internal and external marketing at the same time. Holistic marketing is very important in doing business today in order to effectively manage the business.

Kotler and Keller (2016) Said that internal marketing is part of the holistic marketing concept that internal marketing is a function of employment, training and motivation for employees who want to serve customers well. The company should be important or more important than marketing activities that are out The Company should make employees satisfied so that employees provide excellent service to customers. The concept of (Kotler and Keller, 2016, p. 44) Internal marketing consists of 3 components in all measurements, namely (1) Marketing Department (2) Management (3) Other Departments and in this research, the researcher introduced the concept Ahmed and Rafiq (2002) the internal marketing has 5 elements to measure are 1. Motivation and satisfaction of employees 2. Focus on giving importance to customers and customer satisfaction 3.Collaboration Cross-functional work and integration 4. Marketing methods applied within the organization 5. Various operations within the organization or implementing the previous level of strategy. Internal marketing strategy factors influence the achievement of business according to the concept of Ahmed and Rafiq (2002) and in accordance with the research of Feng-Hua, Chih-Hua, & Chin-Yei (2015) Research results according to the first hypothesis Found that there is a relationship between internal marketing and service quality. According to the second hypothesis, internal marketing has a positive relationship with the well-being of employees. According to the third hypothesis, the well-being of employees is positively correlated with service quality. Javad Khazaei, Masood, & Ezat Amirbakzadeh (2017) found that internal marketing has a positive impact on both financial and non-financial performance and in addition, the results also indicate that non-financial performance. Customer, internal process, learning and growth has a direct impact on company operations Weber, J. Michael (2015) found that internal marketing processes, including delivery of services, had a great influence on the needs of customers and internal marketing process management are involved in service development and support for service quality to customers through the work environment**.**

From research on "The results of marketing relations, Integrated Marketing, internal marketing overview that affects the achievement of business operations" Concluded as a conceptual framework of research as follows.



Picture 1 Marketing strategies that affect the achievement of business operations

Results & Research Summary

This study aims to study the impact of internal factors contain with relationship marketing strategy, Integrated Marketing, internal marketing that affects the achievement of business operations The study uses literature review methods and document analysis. The results of the study can be summarized as follows:

1. Relationship marketing strategies that affect the achievement of business operations. The results of the analysis can be written as a linear equation showing the relationship as follows: Achievement of the accounting office business in Thailand = 1.532+0.149 (Customer relationship management)+0.141 (Relationship management with partners) +0.239 (Relationship management with employees) by adjusted R2=0.234, SEE=5.781, F=31.471, Sig. of F=.000.

2. Integrated marketing strategies that affect the achievement of business operations. The results of the analysis can be written as a linear equation showing the relationship as follows: Achievement of the accounting office business in Thailand = 1.001+0.092(distribution channels) +0.083(marketing communication)+ 0.260 (physical environment) + 0.271(efficiency and quality) by adjusted R2=0.540, SEE=4.507, F=59.550, Sig. of F=.000.

3. Internal marketing strategies that affect the achievement of business operations. The results of the analysis can be written as a linear equation showing the relationship as follows: Achievement of the accounting office business in Thailand = 1.138+0.245 (employee motivation)+0.153 (customer focus) +0.102 (application of marketing concepts within the organization)+ 0.130 (Practice, duty-level strategy training) by adjusted R2=0.569, SEE=4.340, F=106.628, Sig. of F=.000.

Suggestions

This study is based on strategic management and the achievement of business operations and this study uses literature review methods and content analysis from secondary sources which is mostly both domestic and international documents. Therefore, this concept should be used to test the statistics to confirm the data elements. The executive or business owner of the accounting office in Thailand can apply the information found from the research applied to the management. Which are marketing strategies that are suitable for the business, internal marketing by focusing on motivation and employee satisfaction, relationship marketing strategy focus on customer relationship management and integrated marketing focus on efficiency and quality.

Reference

Department of Business Development Ministry of Commerce. (2560). Estimate registration of company establishment. Search March 13, 2018, from http://www.dbd.go.th

Afsaneh, M. & Saeed, S. N. (2016). Effect of customer relationship management (CRM) on organizational performance with emphasis on PSP Companies. *Indian Journal of Fundamental and Applied Life Sciences. 6*(S1), 147-156.

Ahmed, P.K., & Rafiq, M. (2003). *Internal marketing: Tools and concepts for customer-focused management.* Oxford, UK: Butterworth Heinemann.

Cheng, F. C. & Ai-H. L. (2011). The influences of relationship marketing strategy and transaction cost on customer satisfaction, perceived rish and customer loyalty. *African Journal of Business Management. 5*(13), 5199-5209.

Deborah, J. M. (2011). A Framework for Conceptual Contributions in Marketing. *Journal of Marketing, 75*(4), 136-154.

Feng-Hua, Y., Chih-Hua, H., & Chin-Yei, W. (2015). The relationship between internal marketing, employee well-being, and customer service quality-the service industry in Taiwan. *International Journal of Organizational Innovation, 8*(2), 40-57.

Heini, S. M. (2015). CRM in the digital age: implementation of CRM in three contemporary B2B firms. *Journal of Systems and Information Technology, 17*(1), 2-19.

Javad, K. P., Masood, K., & Ezat A. K. (2017). Linking internal marketing orientation to balanced scorecard outcomes in small businesses: The case of travel agencies. *International Journal of Culture,Tourism and Hospitality Research, 11*(3), 297-308.

Kaplan, R. & Norton, D. (1992). The Balanced Scorecard—Measures That Drive Performance. *Harvard Business Review*, 70(1), pp. 71-79.

Kotler, P & Keller, K. L. (2016). *Marketing management.* (15thed.). upperSaddl River, NJ: Pearson/Prentice-Hall.

Krishnan, V., Groza, M. D., Groza, M. P., Peterson, R. M., & Fredericks, E. (2014). Linking customer relationship management (CRM) processes to sates performance: the role of CRM technology. *Marketing Management Journal, 24*(2), 162-171.

McCarthy, E. J., & Perreault, W. D., Jr. (1996). *Basic marketing: A global managerial approach (12th ed.).* Chicago: Irwin.

Pestleanalysis (2015). *Internal factors that may affect the business organization.* Search 2019 March, 18, from http://www.pestleanalsis.com

Lovelock, C. & Wirtz, J. (2007). *Services Marketing People, Technology, Strategy.* New Jersey: Prentice Hall.

Sridhar, S., & Walter W. (2014). Cause marketing communications: Consumer inference on attitudes towards brand and cause. *European Journal of Marketing, 48*(7/8), 1333-1353.

Vikram, D., Bixia, X., & Tao, Z. (2016). Local accounting firms' pricing responses to entry of the Big Four accounting firms into China. *Journal of Accounting in Emerging Economies*, *6*(1), 50-68.

Weber, J. M. (2015). The development of a scale for the measurement of internal marketing in service firms. *International Academy of Marketing Studies Journal, 19*(2), 145-157.

Do Thai People Know Their Own Thai Birth Elements?

Nuengwong Tuaycharoen[a], Yanisa Kwandee[a], and Naparat Srilapan[b]

[a]The Department of Computer Engineering, College of Innovative Technology and Engineering, Dhurakij Pundit University, Thailand, nuengwong.tun@dpu.ac.th

[b]Wellness Knowledge Institute, College of Integrative Medicine, Dhurakij Pundit University, Thailand, nprsrilapan@yahoo.com

Abstract

Both Western and Oriental Traditional Medicine have studied about birth elements. They suggest that human consists of four elements, including earth, water, air, and fire. Each element has its own strengths and weaknesses. However, one or more elements can occupy over others by one's date of birth. Therefore, people should take care of their health according to their birth element in order to balance all elements in their bodies. Thai Traditional Medicine also includes birth elements theory in its literature. Even though, birth elements theory has been existed in Thai Traditional Medicine for many centuries, many Thai people may not realize their birth elements. We developed a web-based application to inform Thai people about their birth elements, and collected data weather they actually know what element occupies their body. We interviewed 30 Thai people, who are between 15-60 years old. Among those, 73.33 percent have at least a bachelor degree. We found that only 26.67 percent of Thai people could specify their element correctly. In conclusion, though they are originally Thai, Thai people may not have knowledge about their birth elements.

Keywords: Thai Traditional Medicine, birth element, Traditional Medicine, web-based application

1. Background

The theory of Four Elements exists for thousands of years in both oriental and western parts of the world. The theory stated that all substances consists of the four elements, including earth, water, air, and fire. Western astrology uses the four elements to divide twelve signs of the zodiac. Ancient Greek added *aether* as the fifth element, and used the five elements to describe all substances in the universe. Four elements are also used to describe human body associated with the four humors. Ancient Tibetan philosophy stated that the five elemental processes of earth, water, fire, air and space are the causes of all existent phenomena. In Chinese philosophy, Yin, Yang, along with the five elements (wood, fire, earth, metal, and water) are associated with an ancient system of cosmology and philosophy. In early Buddhism, the four elements are a basis for understanding suffering and for liberating oneself from suffering. Japanese traditions also inherited the four elements concept from Buddhism.

Thai Traditional Medicine also uses four elements theory to described human body, called "Tad-Chao-Ruen", or elements occupying human body. The theory stated that the human body is composed of the

four elements, including Earth, Water, Wind, and Fire. However, a person may have one element dominated one's body. One can determine a person's dominated element by one's date of birth, called *birth element*. The birth elements are determined from a person's date of birth in lunar calendar. The birth elements theory has its recommended food and health conditions that a person should be aware of, associated with each element. Thai Traditional doctors should prescribe a patient's herbal medication according to the patient's birth element. Additionally, a person should generally take care of one's health according to one's birth element recommendations.

Nevertheless, Thai birth elements theory has been with Thai Traditional Medication for several centuries, many modern Thai people may not have proper knowledge with the theory. In order to caring for one's health effectively, a person must know one's birth element, so he can behave as recommended. It is obvious that all Thais know that the elements include earth, water, wind, and fire, but *do they know their birth element?* This article survey the general knowledge about Thai Birth Element among modern Thai people, whether they know their birth elements. Then, we analyze the classification of Thai people, both the groups of knowing and of not-knowing their birth elements.

2. Literature

Since ancient time, the four elements, including earth, water, air, and fire, are the main components of all matter (Home Science Tools). This concept was the foundation of philosophy, science, and medicine for two thousand years in many cultures all over the world. Western astrology uses the four elements to divide twelve signs of the zodiac: *Fire* signs are Aries, Leo and Sagittarius, *Earth* signs are Taurus, Virgo and Capricorn, *Air* signs are Gemini, Libra and Aquarius, and *Water* signs are Cancer, Scorpio, and Pisces. Ancient Greek added *aether* as the fifth element. All five elements are used to describe substances in the universe. Later, Hippocrates also described the four "humors" found in the body with the four elements, and suggested that humors needed to be in balance with each other in order for a person to be well both mentally and physically. In modern science, the four elements also align with the four states of matter: solid (earth), liquid (water), gas (air), and plasma (fire).

Additionally, four elements theory is also found in many ancient oriental literatures, such as Tibetan, Chinese, Korean, Japanese, and Thai literatures. Ancient Tibetan philosophy stated that the processes of the five elements: earth, water, fire, air and space, are the essential materials of all existent phenomena. In Chinese philosophy, Yin, Yang, and the five elements (wood, fire, earth, metal, and water) are associated with an ancient system of cosmology and philosophy. Islamic philosophers connected the four elements with the four natures heat and cold, and dryness and moisture. In early Buddhism, the four elements are a basis for understanding suffering and for liberating oneself from suffering. Inheriting from Buddhism, Japanese traditions use five elements, i.e. earth, water, fire, wind/air, and void.

Each of the four elements contains its own unique properties, which work harmoniously to create one united universe. Each element has both positive and negative qualities, and all elements relate to others.

The Earth provides the soil for agriculture, and consists of rocks and minerals. Most common elements in the earth's crust are oxygen (46%) and silicon (28%), while metal ores are also found. These metal ores are heat, refine and shaped with Fire, and then they can be used in the production of machinery, tools, buildings, and weapons.

Water can dissolve many substances, i.e. salt, sugar, acids, alkalis, some gases, and organic material. So, it is known as the universal solvent. Water carries chemicals, minerals, and nutrients through our bodies or through the ground. Water's ability to dissolve substances also helps keep the planet healthy, and keeps suitable temperature for the planet. Comparing the fluctuations of temperature, you can notice little temperature change near the ocean, whereas in the desert temperature changes significantly in daytime and nighttime.

Air is made up of various gases: mostly nitrogen and oxygen, with almost 1% argon and small amounts of carbon dioxide and other elements. The mixture of gases in the air is suitable for life on Earth. Human and animals consume the oxygen from the air, and breathe out carbon dioxide. On the other hand, plants use carbon dioxide to produce their food, and give off oxygen during photosynthesis. Although air is invisible, it does take up space, it has volume, and it exerts pressure. Air is also inside our bodies, and we need to balance the pressure of both inside and outside air.

Fire requires three components to exist, including oxygen, fuel, and heat. It then creates light, heat, and smoke by its combustion, which is a rapid chemical reaction. The intensity of a fire varies by the amount of oxygen, fuel, and heat available to it. The earth provides fuel, including wood and fossil fuels such as coal. Water also removes the heat from a fire. Therefore, when the oxygen, fuel, or heat is removed, the fire is extinguished.

In western literature (Gaia Staff , 2016), a person's personality includes with both strengths and weaknesses of the four elements. However, a person may have one element dominate depending on one's date of birth. Finding one's birth element is important to understand the person base emotions and desires. In addition, the person will be able to appreciate one's own strengths and realize one's weaknesses better. This understanding will help the person to build stronger relationships with people around him.

We can summarize the personality of each element as shown in Table 1.

Table 1 Strengths and Weaknesses of Each Person's Element in Western Literature

Element	**Earth**	**Water**	**Air**	**Fire**
Sign of the Zodiac	• TAURUS (April 20-May 20) • VIRGO (August 23-September 22) • CAPRICORN (December 22-January 19)	• CANCER (June 22-July 22) • SCORPIO (OCTOBER 23-November 21) • PISCES February 19-March 20)	• GEMINI (May 21-June 21) • LIBRA (September 23-October 22) • AQUARIUS (January 20-February 18)	• ARIES (March 21-April 19) • LEO (July 23-August 22) • SAGITTARIUS (November 22-December 21)
Strengths	• Stable and consistent • Hard-working	• Understanding • Trusting • Devoted	• Thoughtful • Witty • Charming	• Passionate • Bright • Charismatic

Element	Earth	Water	Air	Fire
	• Loyal • Nurturing • Logical • Empathetic	• Forgiving • Flexible	• Care free • Independent • Flexible	• Focused • Decisive • Daring
Weaknesses	• Lazy • Scornful • Overly cautious • Stubborn to the point of impractical • Rigid	• Unstable • Prone to depression • Irrational • Gullible • Lack of self •	• Inconsistent • Insensitive • Selfish • Flaky • Dishonest	• Prone to anger and rage • Obsessive • Unfaithful • Jealous • Easily irritated • Vindictive

Thai Traditional Medicine also has four elements theory in the same manners (Department for Development of Thai Traditional Medicine and Alternative Medicine, 2013), called "Tad-Chao-Ruen", meaning elements which is dominated human body. The theory includes Earth, Water, Wind, and Fire. These four elements are the compositions of human body, which includes 20 of earth components, 12 water components, 6 wind components, and 4 fire components. Excluding all invisible wind and fire components, human body includes 32 components. If a baby is born with all organs, Thai people call them "born with complete-32". There are two types of Thai Traditional Elements Theory, including birth elements and present elements. Birth elements are determined from a person's date of birth in lunar calendar, while present elements are determined from the person's current appearance and personalities.

In Thai birth elements theory, we can summarize the food and health conditions of each element as shown in Table 2.

Table 2 Food and Health Conditions of Each Thai Birth Element

Element	Earth	Water	Wind	Fire
Month of Birth	• October • November • December	• July • August • September	• April • May • June	• January • February • March
Recommended Flavor	• astringent, sweet, oily, salty	• sour	• spicy	• bitter, cold, tasteless
Food	• mangosteen, raw guava, pumpkin, taro	• lemon, lime, pineapple, tomato, olive, Kaffir lime,	• ginger, galangal, Lemon grass, pepper, basil	• morning glory, gourd, water melon, gotu

Element	Earth	Water	Wind	Fire
				kola, gac fruit, cassia
Causes of Sickness	• body organs, including heart, food, and feces.	• liquid in the body, including throat phlegm, chest phlegm, feces and urine.	• blood circulation and nervous system, including mental status, nervous system, and blood circulation.	• metabolism process, including liver bile, intestine bile, and body temperature.

As a result, a Thai Traditional doctor usually asks a patient for their date of birth, so they can prescribe food and herbal medications suitable for the patient's birth element. In addition, Thai people can obtain personal health care by themselves according to their birth elements, including awareness for food intake and health issues. This might reduce the cost of treatment and prevent sickness among Thai people.

However, although Thai birth elements theory has been with Thai Traditional Medication since ancient time, many modern Thai people may not have proper knowledge with the theory. It is obvious that all Thais know that the elements include earth, water, wind, and fire, but *do they know their birth elements?* This article survey the general knowledge about Thai Birth Elements among modern Thai people, whether they know their birth elements. Then, we classify our Thai people samples in both the knowing group and the not-knowing group to find the factors that affect the knowledge perceived.

3. Methods

First, we developed a web-based application to inform user's birth elements. The application collect a user's date of birth, and then match the month of birth with the month in the four elements. Finally, the application displays the user's birth element with the element's recommended food and sickness causes as described in Table 2. Our web-based application was developed with JavaScript, HTML, CSS for the front-end. In addition, we used Node.js and MySQL for our backend system development.

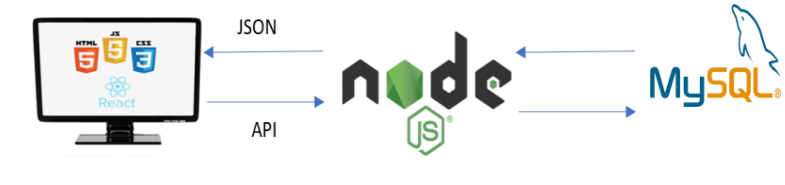


Figure 1 The Software Architecture of the Web-Based Application's

For our database, our system used only two entities, including *Customer* and *AnsElement* entities to collect the user's input information and the birth element description as the output of this article survey.

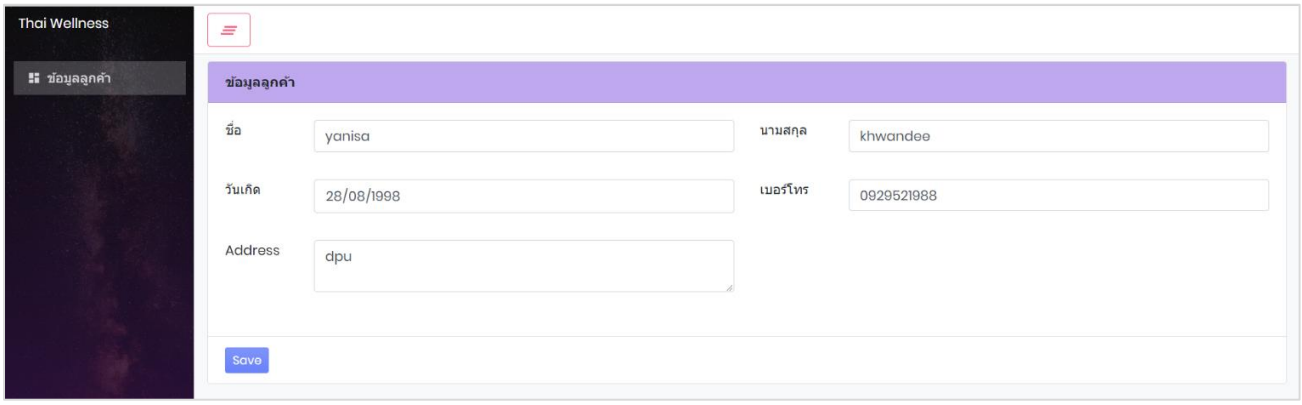


Figure 2 The Input Screen

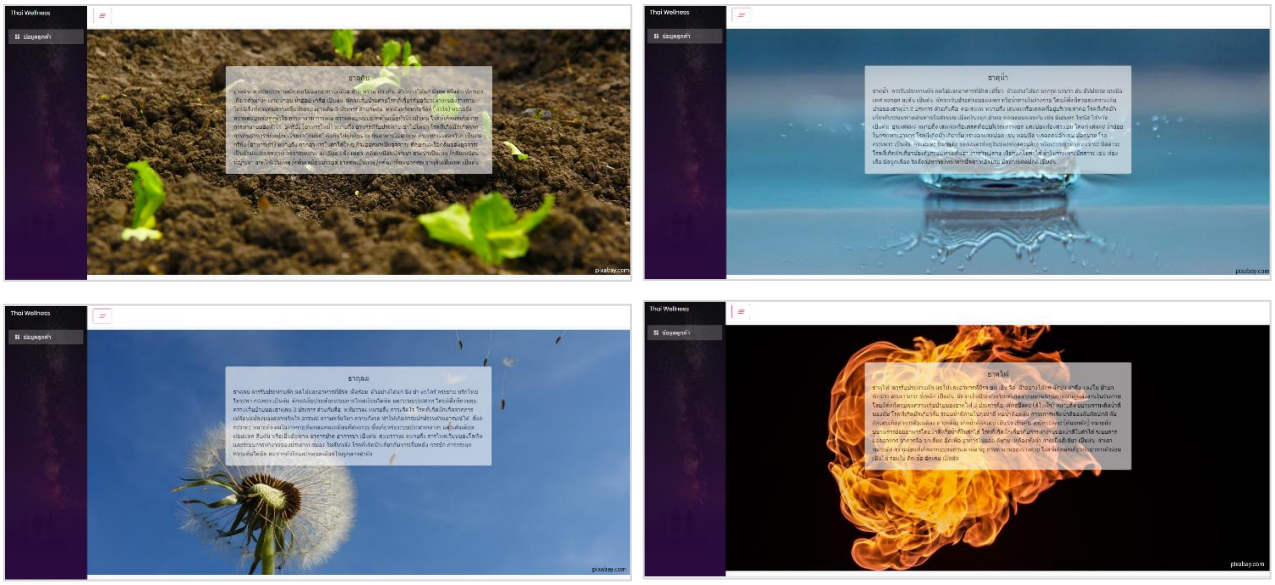


Figure 3 The 4 Output Screens

The web-based application has the input and output screens as shown in Figure 2 and Figure 3. Figure 2 shows the input screen, which includes input fields according to the user's information, i.e. first name, last name, date of birth, and the user's contacts. Figure 3 shows the output screen, which specifies the user's birth element and the element's recommended food and sickness causes. We test our application, and it can show the output according to the month of birth of the users properly.

After we complete our web-based application development, we conduct a survey with random 30 Thai people in Bangkok area as our samples. Table 3 shows the description of the samples. Our survey process is as the followings:

1. We interview the samples' demographic information.
2. We have them read the description of all elements.
3. We ask what element they think their birth element is.
4. We enter their date of birth into our web-based application, and let them see the results as their birth element and how they can care for their health and food.

Table 3 The Description of the Samples

		Number of respondents (NR)	**Percentage of NR to total respondents**
Sex	Male	12	40.00
	Female	18	60.00
Age	15-19	2	6.67
	20-24	15	50.00
	25-29	6	20.00
	30-34	1	3.33
	35-39	1	3.33
	40-44	2	6.67
	50-54	1	3.33
	55-60	2	6.67
Education	Master or Above	3	10.00
	University	19	63.33
	Junior College	3	10.00
	High School or below	5	16.67

4. Findings

The survey results show in Table 4 to Table 6. Table 4 shows the number of samples in each birth element we have interviewed, identified by our web-based application. We found that our samples accidentally have Wind people twice as many as other elements.

Table 4 Number and Proportion of Sample's Birth Elements

Birth Element	**Birth Elements (count)**	**Percentage of Elements**
Earth	6	20.00%
Water	6	20.00%
Wind	12	40.00%
Fire	6	20.00%
Grand Total	**30**	**100.00%**

For our experimental results, among 30 Thai people we have interviewed, we found that only eight can correctly identify their birth elements, which is accounted for only 26.67 percent. This is insignificantly more than the possibility of purely guessing of a question with four answers, which is 25 percent. We wonder what should be the factors that make Thai people know about their birth element.

One assumption is people with higher education may have knowledge about the birth elements. In Table 5, we classified the samples by their education and the correctness of answer. While samples with Master Degree and above and College Degree can answer correctly the most, the percentage is not significant, comparing with samples from other education levels. Therefore, according to the sample's level of education, we can conclude that Thai people in any education level may not have proper knowledge about the birth element.

Table 5 The Survey Results Classified by the Level of Education

Education	**Master and above**	**Bachelor's Degree**	**College**	**High School and below**	**Grand Total**
Correct	1	5	1	1	8
Wrong	2	14	2	4	22
Grand Total	**3**	**19**	**2**	**1**	**30**

We have another assumption that older people may know about the birth elements better because it is in Thai Traditional Medicine literature. So, we classified our samples by their age ranges. Table 6 shows the results of the survey by the age ranges. We can see that the correctness of the answer is not dependent with the sample's age ranges.

Table 6 The Survey Results Classified by the Age Ranges

Age Range	**15-19**	**20-24**	**25-29**	**30-34**	**35-39**	**40-44**	**50-54**	**55-60**	**Grand Total**
Correct	-	4	2	-	-	1	-	1	8
Wrong	2	11	4	1	1	1	1	1	22
Grand Total	**2**	**15**	**6**	**1**	**1**	**2**	**1**	**2**	**30**

5. Discussions

We have conduct an experiment with our web-based application to see whether Thai people can identify their birth element correctly. We find that only 26.67 percent can answer correctly. After classifying by education and age, so far, we still cannot find any factors that make our samples correctly identify their birth elements. We may conclude that, even though the study of Four Elements has been in Thai Traditional Medicine for centuries, Thai people may not actually have proper knowledge about it, and they cannot apply the knowledge to their personal health care effectively.

6. Recommendations

In this article, we have survey the knowledge of Thai people about their birth elements with our web-based application. We conduct a survey with the samples of 30 people. From our survey indicates that our samples do not have enough knowledge about the birth elements. Therefore, a proper education about Four Elements in Thai Traditional Medicine should be established among Thai people, so they can personally care for their health, and reduce the cost of their health care. Along with the birth elements, Thai people should be educated about the present element theory, also. Consequently, not only the food and sickness causes in each birth element, our web-based application may recommend appropriate life style and health care to the users according to their present elements as well. With all of these, the user can care for their health holistically with little dependence on expensive Health Care System.

7. References

Department for Development of Thai Traditional Medicine and Alternative Medicine. (2013). *Manual to Health Care with Thai Traditional Medicine and Alternative Medicine*. . Ministry of Public Health.

Gaia Staff . (2016, April 25). *THE FOUR ELEMENTS: FINDING YOUR ELEMENT AND WHAT IT MEANS*. Retrieved from Gaia: https://www.gaia.com/article/the-four-elements-finding-your-element

Home Science Tools. (n.d.). *WHAT ARE THE 4 ELEMENTS?* Retrieved from Home Science Tools: https://learning-center.homesciencetools.com/article/four-elements-science/

A Pilot Study of Body Composition, Blood Sugar and Lipid Profile Effect of Nutrilite® Plant-Based Protein Supplement in Overweight Subjects

Tarin Charoensetthasilp

Department of Anti-Aging and Regenrative Science, College of Integrative Medicine,

Dhurakij Pundit University, Thailand, 605159110030@dpu.ac.th

Abstract

Overweight is a major epidemic symptom globally which leads to the development of the metabolic syndrome of which can cause either acute or chronic diseases in both mental and physical illnesses. Also, a substantial amount of countless expenses occurred in Public health sector will be seriously taken into account. There are a lot of researches about protein consumption related to weight loss. Some explained about beneficial properties of plant-based protein in bettering lipid profile. This thematic paper aims to investigate body composition, blood sugar and lipid profile effect from Nutrilite® All-Plant Protein Powder Supplement Consumption in Overweight Subjects.

The research was analyzed using descriptive statistics such as mean, frequency, percentage and standard deviation of 20 overweight samples of Bangkok-based population whose age was between 25-75 years. They had been assigned to consume all-plant protein powder supplement for 30 days at the weight-loss recommended dosage of 1.2 gram per kilogram weight (NutrMetab(Lond)). Then, recorded pre and post-research measurement of body composition using TANITA model MC980 body composition analyzer-- and blood sugar and lipid profile by medical staff at the specified clinic to analyze collected data by comparing means between pre and post-test with paired samples t-test.

The research found that the tendency of body compositions was likely to be better apparently after taking all-plant protein powder supplement. Body weight was reduced ($p<0.05$). Body fat percentage was reduced also ($p<0.05$). Body muscle mass was increased ($p<0.05$). Waist circumference was lower ($p<0.05$). These concluded that high-protein diet can improve body compositions. In the meantime, clinical results: Total cholesterol, LDL-C, HDL-C, triglyceride, and fasting blood sugar (FBS) were not statistically significant. Therefore, the samples size should be larger to strengthen these outcomes conclusion from data analysis.

Keywords: Plant protein, Body compositions, Lipid profile, High-protein diet, Overweight

1. **Background**

As overweight is a major epidemic symptom worldwide and becomes pro-illnesses. Public health sector has been aware of the uprising country's expenditures in healthcare which will be the main economic problems. Currently, Thai men have been ranked fourth of overweight preference in ASEAN economic countries whereas Thai women have been ranked second following Malaysia. (Misra, A. & Bhardwaj, 2014)

Many articles wrote about high-protein diet related to weight loss. Since there are different sources of protein for examples, plant protein and animal protein, the research reviewed pros and cons in each type of protein. Some explained about beneficial properties of plant-based protein in bettering lipid profile. Plant protein has different constituents from animal protein. For examples, soy protein contains isoflavones that can help reduce bad cholesterol and improve good cholesterol. Typically, plant protein contains no cholesterol itself, low calories unlike animal protein.

To be concluded, this research aims to examine the true effects from plant protein using one famous dietary plant protein, Nutrilite® All-Plant Protein Powder supplement through body compositions, Lipid profile and blood sugar.

2. Literature

In 2006, isoflavones from soy protein was examined in randomized group for 22 samples. The result represented that LDL was reduced by 3% when compared to other experimental group with dairy protein. This was because isolated soy protein with isoflavones has high unsaturated fat and less saturated fat. (Circulation. 2006;113:1034-1044.) Isoflavones can reduce LDL-C. (Am J ClinNutr.2007 Apr;85(4):1148-56.) Later related research in 2014 with a systematic review, soy isoflavones also increased HDL-C in Asians. (J Endocrinol Metab. 2014;4(3):51-55.)

There was an interesting research about protein consumption for weight loss in 2008. The research compared effect between different amounts of protein dosage in 6-month protein intake for 60 overweight subjects to investigate effects regarding different dosage. The result from high-protein intake (128-139 gram per day) had a better doubled outcome in weight loss when compared to medium-protein intake (76-80 gram per day). High-protein intake even increases satiety and body metabolism. (Doulas Paddon-Jones et al, 2008)

There was adversarial among users about caloric restriction for weight loss until in 2009, one clear research studied about what is the major macronutrient between low-carbohydrate diet and high-

protein diet that manipulates weight the best. The result represented that high-protein diet manipulated weight better not low-carbohydrate. (Soenen S et al, 2009)

In 2014, there was a study of high-protein diet in reducing body fat. The research described about a mechanism that protein induced satiety by help increase secretion of satiety hormones (GIP, GLP-1), whereas ceasing hunger hormone, Ghrelin. Furthermore, high-protein diet increases thermogenic effect of digestive system in body metabolism which helps burn body fat. It was reported that protein can help control blood sugar (Nutr Metab (Lond). 2014; 11: 53) The research also warned about too much animal protein consumption leads to higher acidosis deteriorating bone mass and heavy workload of acid elimination in kidneys.

Sources of protein is quintessential to determine future body weight. In most recent 2015, Researchers from The Harvard school of Public Health conducted a 20-year prospective cohort study of population of 120,000 to observe change of their weights. The result represented that in every four years, red meat lover gained 1 pound (0.45 kg) but legumes lovers gained only 0.5 pound (0.23 kg) (Smith JD et al, 2015)

However, some are allergic to specific particular source of protein. Allergic symptoms can be breathe difficulty, indigestive, etc., Some have renal condition which restricts amount of protein consumption. They should be in supervision of their medical doctor and clinical treatment. Consuming variety of food is still necessary not just plant protein but eating habit anticipates future health as classic proverb, you are what you eat.

In this research, the paper aims to study effect from taking plant protein powder supplement in overweight subjects to observe possible outcomes related to past research in terms of body compositions, blood sugar, and lipid profile improvement. The research conducted recommended high-protein dosage for weight loss at 1.2 gram per kilogram weight (NutrMetab(Lond)) for every subjects.

Research Hypothesis

1. **All-plant protein powder supplement is related to body compositions as following**

   1.1 Body weight

   All-plant protein powder supplement is related to reduce body weight lower than pre-research measurement.

   1.2 Body fat percentage

   All-plant protein powder supplement is related to lower body fat percentage lower than pre-research measurement.

1.3 Muscle mass percentage

All-plant protein powder supplement is related to increase muscle mass percentage higher than pre-research measurement.

1.4 Body Mass Index (BMI)

All-plant protein powder supplement is related to lower BMI lower than pre-research measurement.

1.5 Waist circumference

All-plant protein powder supplement is related to reduce waist circumference muscle mass percentage lower than pre-research measurement.

2. All-plant protein powder supplement is related to clinical result as following

2.1 Total Cholesterol

All-plant protein powder supplement is related to reduce total cholesterol lower than pre-research measurement.

2.2 LDL-C

All-plant protein powder supplement is related to reduce LDL-C lower than pre-research measurement.

2.3 HDL-C

All-plant protein powder supplement is related to increase HDL-C lower than pre-research measurement.

2.4 Triglyceride

All-plant protein powder supplement is related to reduce triglyceride lower than pre-research measurement.

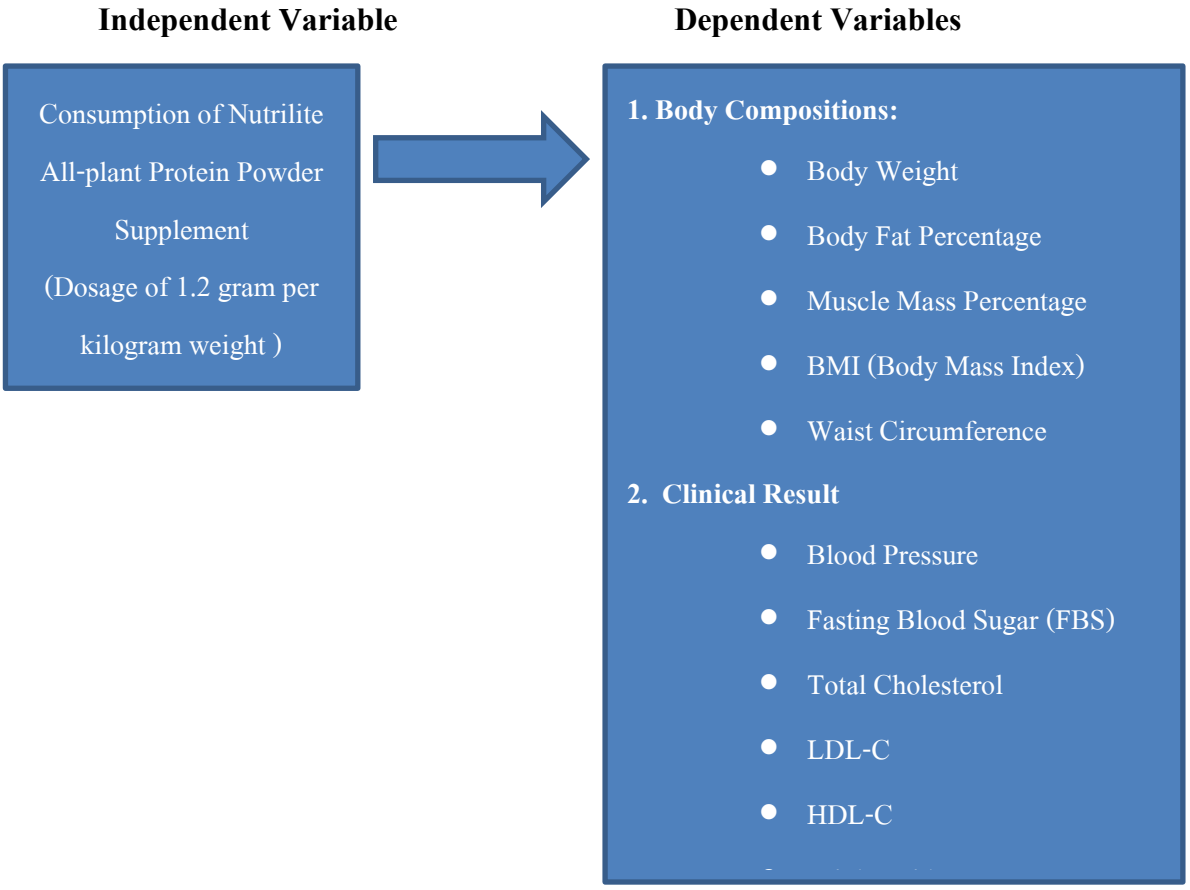
2.5 Fasting Blood Sugar (FBS)

All-plant protein powder supplement is related to reduce FBS lower than pre-research measurement

2.6 Blood Pressure (Both Systolic and Diastolic)

All-plant protein powder supplement is related to reduce blood pressure in both systolic and diastolic lower than pre-research measurement

Conceptual Framework



3. **Methods**

The research was an experimental research and was analyzed using descriptive statistics such as mean, frequency, percentage and standard deviation of 20 samples of Bangkok-based population who have age period between 25-75 years old without kidney or related disease and constriction of protein consumption. They had been assigned to consume all-plant protein powder supplement for 30 days at the weight-loss recommended dosage of 1.2 gram per kilogram weight (NutrMetab(Lond)). Samples comprised of 14 female subjects, 4 male subjects, and the rest twos were dropped out due to no continuous consumption. Then, recorded pre and post--research measurement of --body composition using TANITA model MC980 body composition analyzer-- and blood sugar and lipid profile by medical staff at the specified clinic to analyze collected data by comparing means between pre and post-test with paired samples t-test.

4. Findings

Table 4.1 Summary of Data analysis

	Mean		Mean Difference ($\overline{D}_i$)	S.D	T	P-value
	Pre	Post				
Body Compositions						
Body Weight	69.74	68.96	0.78	1.43	2.248	$p < 0.05$
Body Fat Percentage	34.63%	33.82%	0.81	0.80	4.163	$p < 0.05$
Muscle Mass Percentage	25.38%	25.81%	-0.43	0.37	-4.775	$p < 0.05$
BMI	27.67	27.26	0.41	0.70	2.438	$p < 0.05$
Waist Circumference	92.86	91	1.86	2.18	3.513	$p < 0.05$
Clinical Result						
Systolic BP (mmHg)	-	-	-	-	-	-
Diastolic BP (mmHg)	-	-	-	-	-	-
Total Cholesterol (mg/dl)	202.50	203.06	-0.56	39.50	-0.061	$p > 0.05$
LDL-C (mg/dl)	127.00	125.83	1.17	7.09	0.136	$p > 0.05$
HDL-C (mg/dl)	54.39	56.11	-1.72	35.49	-1.001	$p > 0.05$
TG (mg/dl)	120.00	105.17	14.83	36.93	1.656	$p > 0.05$
FBS (mg/dl)	99.67	97.56	2.11	7.93	1.097	$p > 0.05$

In conclusion, the tendency of body compositions was likely to be better to some extent after taking all-plant protein powder supplement. Body weight was reduced ($p < 0.05$). Body fat percentage was reduced also ($p < 0.05$). Body muscle mass was increased ($p < 0.05$). Waist circumference was lower ($p < 0.05$). In the meantime, clinical results: Total cholesterol, LDL-C, HDL-C, triglyceride, and fasting blood sugar (FBS) were not statistically significant.

5. Discussions

The findings satisfy past related researches. Consumption of high-protein diet is consistent to weight loss. Subjects had lower body fat percentage compared to pre-research measurement. This finding is related to the research in 2014 of which stated that protein induces thermogenic effect in cellular metabolism lowering body fat percentage.)Nutr Metab (Lond). 2014; 11: 53. (Theoretically, protein help synthesize body muscle and the finding showed overall muscle mass percentage rose after high-protein diet. Furthermore, the summary of data analysis represented that overall BMI and waist circumference were decreased. These findings strengthen past research outcomes about better weight loss with the higher-protein meal plan)Doulas Paddon-Jones et al, 2008) that allows reader with interest in losing weight to apply pragmatically in daily life. Notwithstanding, selecting sources of protein is also vital. Once, animal protein contains high-saturated fat, bad cholesterol and high calories as compared to plant-based protein.

6. Recommendations

6.1 General recommendations

1. High-protein diet is constricted in patient with renal or related diseases.
2. In public health sector such as hospital, clinic in both private and government ought to promote nutrition for weight loss and lifestyle modification most.

6.2 Research Recommendations

1. The sample sizes should be larger to strengthen reliability of data analysis and data interpretation.
2. The medical staff should be well assigned more clear to prevent missing data.
3. For researcher who is interested in this topic, can study usage of plant protein in comparison among different ethics. It may further more discoveries.
4. This research aimed to study overweight subjects. Interested researcher can study in metabolic subjects.
5. The outcome in this research was narrow, therefore the study should extend time phase or comparing short to long term.

7. **References**

J Endocrinol Metab. 2014;4(3):51-55. Effects of Soy Protein and Isoflavones Intake on HDL Metabolism in Asian Populations.

Misra, A. & Bhardwaj, S. (2014). Obesity and the metabolic syndrome in developing countries: focus on South Asians. Nestle Nutr Inst Workshop Ser, 78, 133-40.

NutrMetab(Lond). 2004; 1: 5. 2004; 1: 5. Diet induced thermogenesis

Overweight and metabolic syndrome. Retrieved on 2nd April 2019, from https://www.thaihealth.or.th/Content/20399-ภาวะน้ำหนักเกินและโรคอ้วน.html

Paddon-Jones, D., Westman, E., Mattes, R. D., Wolfe, R. R., Astrup, A., & Westerterp-Plantenga, M. (2008). Protein, weight management, and satiety. *American Journal of Clinical Nutrition*, *87*(5).

Smith JD, Hou T, Ludwig DS, Rimm EB, Willett W, Hu FB, Mozaffarian D. Changes in intake of protein foods, carbohydrate amount and quality, and long-term weight change: results from 3 prospective cohorts–. *The American journal of clinical nutrition. 2015 Apr 8;101(6):1216-24.*

TranslAndrolUrol.2014 Sep;3(3):303-12. Fad diets and their effect on urinary stone formation. Protein, weight management, and satiety

Westerterp-Plantenga, M. S., Nieuwenhuizen, A., Tome, D., Soenen, S., & Westerterp, K. R. (2009). Dietary Protein, Weight Loss, and Weight Maintenance. Annual Review of Nutrition, *29*, 21-41. https://doi.org/10.1146/annurev-nutr-080508-141056

Comparison of Second Derivative of Photoplethysmography Indices and 10-Year Cardiovascular Risk Predictor Tool

[a]Picha Suwannahitaorn, [b]Jarasphol Rintha

[a]School of Anti-Aging and Regenerative Medicine, Mae Fah Luang University, Thailand, atnox25@live.com

[b]School of Anti-Aging and Regenerative Medicine, Mae Fah Luang University, Thailand, jarasphol@hotmail.com

Abstract

Cardiovascular (CV) disease is acknowledged as a leading cause of illness and death. Using a risk predictor tool to assess 10-year risk for developing CV disease is a practical prevention strategy. Currently, health assessment using SDPTG (second derivative of photoplethysmography) indices has become more popular due to its feasibility and noninvasive method. However, using SDPTG indices to assess CV risk as a screening test still lacks validity details in a Thai population.

An oximeter was used in this study to measure resistance from arterial vessels producing SDPTG indices interpreted as health indices including b/a ratio, d/a ratio, augmentation index, SDPTG aging index, SVR (systemic vascular resistance) and MAP (mean arterial pressure). The study aimed to evaluate the validity of health indices and Thai CV Risk Score with blood tests using cholesterol, HDL and LDL levels as the main predictors and Thai CV Risk Score without blood test using waist circumference and height as main predictors. The study also aimed to study the association of heath indices and clinical factors including age, waist circumference, BMI, blood pressure, cholesterol, HDL and LDL levels.

From 116 participants, SDPTG indices were associated with waist circumference and BMI indicating the relationship of indices and visceral fat. The indices associated with Thai CV Risk Score without blood test using waist circumference instead of lipid profiles suggested a relationship of visceral fat accumulation assessed by waist circumference and increased risk of CV diseases as reported from the RAMA EGAT study. Indices including the b/a ratio and augmentation index provided high sensitivity to detect CV high risk groups. In conclusion, SDPTG indices may be useful as a screening test to assess CV risks. More studies should be conducted as SDPTG indices are being tested in portable devices for the general population.

Keywords: Cardiovascular disease, Risk predictor tool, Visceral fat, Screening test, SDPTG

Background

Cardiovascular disease (CVD) is one of the major health problems on a global scale (Collins et al., 2017) and a leading cause of illness and death in many countries including Thailand (Aekplakorn et al., 2007).

CVD is strongly related with metabolic syndromes (D'Agostino et al., 2008; Mahmood, Levy, Vasan, & Wang, 2014). Factors including age, sex, ethnicity and genetics are nonmodifiable and characterize individual risk to CVD. However, modifiable factors including lifestyle, diet and exercise could also potentially contribute to the risk of CVD development. Sedentary life style, improper diet and stressful lifestyle are associated with insulin resistance and metabolic syndrome which could result in CVD. As these factors are modifiable; thus, proper management could reduce cardiovascular risk in the long term (Goff et al., 2014; Stone et al., 2014).

CV risk scores are developed to predict the likelihood among individuals for developing CVD within 10 years. Several known 10-year risk score models such as the Framingham Risk Score (D'Agostino, Grundy, Sullivan, Wilson, & CHD Risk Prediction Group, 2001; D'Agostino et al., 2008; Wilson et al., 1998) or ACC/AHA Risk Score (Goff et al., 2014) have been developed by constructing predictive models using demographics, body measurements and blood test results such as age, sex, blood pressure and serum lipid level.

In Thailand, CV risk score is derived from data obtained from the RAMA/EGAT Study , (Sritara et al., 2003) a large cohort investigation. Results from data analysis also indicated that waist circumference is strongly related to insulin resistance and could serve as a potential marker to predict metabolic syndrome. Therefore, the Thai CV Risk Score (TCVRS) comprises 2 models; one model with and one without blood test.

Computer-aided health screening systems have become more popular for their noninvasive, multipurpose and convenience in assessing overall function of the body system (Ivorra et al., 2005; Maarek, 2012). Main functions include measuring waveforms from circulation known as plethysmography, wherein collected waveforms will be processed using an algorithm result in standardized waveform or the second derivative of photoplethysmography (SDPTG) (Otsuka, Kawada, Katsumata, & Ibuki, 2006; Otsuka, Kawada, Katsumata, Ibuki, & Kusama, 2007). SDPTG indices incorporate factors reflecting cardiovascular status from arterial function. Related research has suggested an association exists between SDPTG indices and metabolic syndrome. However, data is lacking to support the use of SDPTG indices in Thai populations to evaluate CV risk based on the Thai CV Risk Score.

The study aimed to determine the association between SDPTG indices and Thai CV Risk Score to assess its correlation and validity as a screening tool of CV risk.

Literature

SDPTG is derived from pulse plethysmography. When the heart contracts and forces blood into the artery, the arterial wall stretches as a response to blood flow, generating a pulse and waveform, that can be measured from the arterial pulse (Otsuka et al., 2007). SDPTG indices comprise the b/a ratio, d/a ratio, Augmentation index, SDPTG aging index, SVR (systemic vascular resistance) and MAP (mean arterial pressure). The analysis of indices is shown in Fig 1 and 2.

Fig 1 Photoplethysmogram

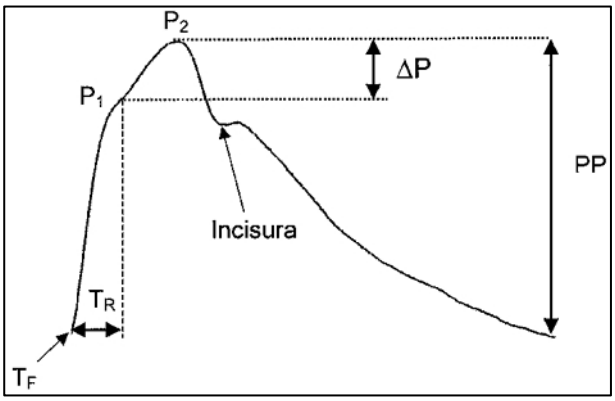


Fig 2 SDPTG

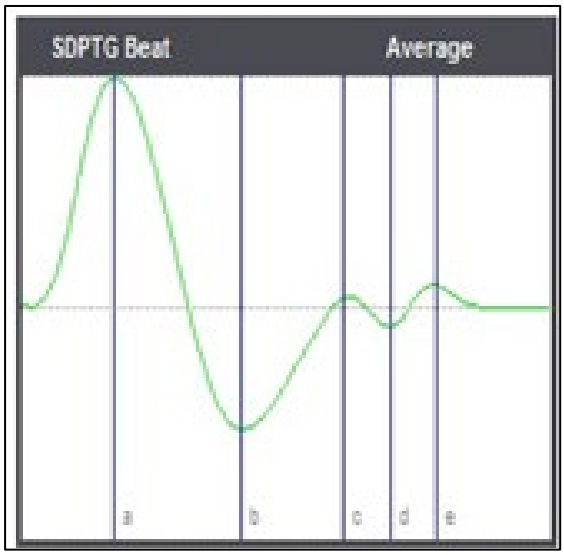


Fig 1, adapted from (Otsuka et al., 2006), shows a photoplethysmogram, generated from the arterial waveform reflecting the pressure and resistance in the artery. Fig 2 shows SDPTG after the photoplethysmogram was standardized. From Fig 1, P_2 represents peak systolic pressure and T_R represents the baseline diastolic. The difference between P_2 and T_R represents the pulse pressure (PP), while P_1 and P_2 reflect systolic pressure in the artery. Augmentation index is derived from (P_2-P_1)/PP reflecting arterial stiffness of the carotid artery, which is associated with hypercholesterolemia (Lewis et al., 2011; Liao et al., 1998; Otsuka et al., 2007).

Fig 2 shows 5 waves from 1 heartbeat – a, b, c, d and e. The b wave reflects pressure of blood being recently pushed from the heart with minimal interference from peripheral vascular resistance, so b wave represents stiffness of the central large artery. The d wave reflects stiffness of the peripheral artery, which also accounts for vascular resistance. Increasing stiffness in the large artery usually comes from atherosclerosis while increased stiffness in the peripheral artery is usually the result of aging. Therefore, b/a represents the large artery stiffness, while d/a represents peripheral artery stiffness. The c and e waves are in the diastolic phase and the SDPTG aging index is calculated as (b-c-d-e)/a. MAP reflects the power to push blood out of the heart, so the pressure needs to exceed vascular resistance for blood to be pushed to the end organ. SVR reflects vascular resistance from the peripheral artery, while MAP and SVR reflect stiffness in arterial circulation.

The Thai CV Risk Score (Aekplakorn et al., 2007; Sritara et al., 2003) with blood test is calculated from age, sex, smoking status, diabetes, hypertension, systolic blood pressure and cholesterol, HDL and LDL levels. Risk Score without blood test may increase feasibility using height and waist circumference (Aekplakorn et al., 2007) instead of cholesterol, HDL and LDL levels.

Evidence is lacking to support the association of SDPTG indices and Thai CV Risk Score for Thai populations. A similar work was conducted in a Japanese population using SDPTG indices and Framingham Risk Score. The results showed that SDPTG indices provided a sensitivity of 85% and specificity of 58% to determine high CV risk populations using the Framingham Risk Score (Otsuka et al., 2006).

Conceptual framework

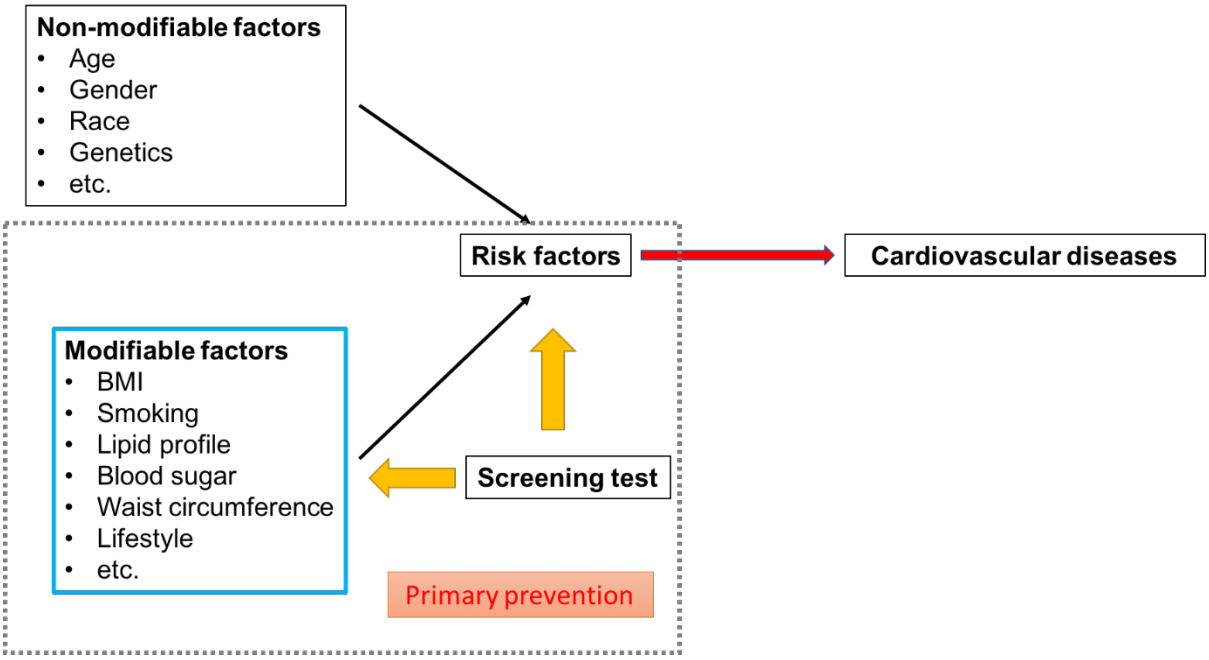


Fig 3 Conceptual framework of the study

The study determined the correlation, sensitivity and specificity of SDPG indices to use as a screening test for 10-year CV risk compared with the Thai CV Risk Score.

SDPTG indices should provide another alternative method for populations to assess their CV risk. Screening tools allow individuals to raise their awareness toward 10-year CV risk. Factors such as BMI, smoking, lipid level or life style can be modified and reduce risk as an effective primary prevention as shown in Fig 3.

Methods

The study was conducted among participants aged ≥20 years without history of CVD. Participants provided personal health data measured within 2 months to calculate Thai CV Risk Score. Health data comprised anthropometric measurement and blood test.

The Thai CV Risk Score was categorized in 2 models. The model using the blood test required age, sex, smoking status, history of type 2 diabetes, history of treatment for hypertension, systolic blood pressure and blood test lipid profile including cholesterol, LDL and HDL levels. The model without blood test required height and waist circumference instead of lipid profile.

After collecting data, risk score was calculated and reported as % of risk for developing CVD in 10 years and ratio of risk compared with age-adjusted baseline risk. Risk ratio >1 indicated a higher risk of CVD compared to individuals in the same sex and age group (details described elsewhere). CV risk outcome was reported in 2 groups, low to average risk and higher risk group.

SDPTG was obtained using an oximeter. Firstly, the finger oximeter was placed at the tip of finger. Light was emitted in red and infrared wavelength to measure blood flow and to collect the pulse waveform. The waveform was processed through an algorithm providing 5 digital waves; a, b, c, d and e, which was later transformed to SDPTG indices. The 6 indices comprised b/a ratio, d/a ratio, augmentation index, SDPTG aging index, SVR and MAP. Each SDPTG index and anthropometric measurement was analyzed for correlation using Pearson's correlation coefficient. Diagnostic testing was conducted using SDPTG indices as a screening test to assess 10-year CV risk from the Thai CV Risk Score as the gold standard using correlation, sensitivity, specificity and positive predictive value.

The research protocol of this study was approved by the Institutional Review Board, Mae Fah Luang University, Thailand (approval code REH-61064).

Findings

In all, 116 participants joined this study and the majority, 69.8%, was female. Age ranged from 20 to 89 with mean age of 56.8 years and 14.0 SD. Most participants were ≥40 years of age (90.9%). From BMI, 26.4% of participants were overweight and 5.4% were considered obese. Type 2 DM and hypertension were found in 8.6% and 19.0% of participants, respectively. Mean waist circumference among males was greater than those among females (p <0.001).

TCVRS with blood test ranged from 1.01 to 30.0% with 52.9% of participants classified as higher than 10-year risk of CVD. TCVRS without blood test ranged from 1.54 to 30.0% with 41.9% of participants classified as higher than 10-year risk of CVD. CV risk obtained from both models were highly correlated (r = 0.96, p <0.001).

Age was correlated with the following SDPTG indices: augmentation index, SDPTG aging index, b/a ratio, d/a ratio and SVR, (p <0.05). The b/a ratio correlated with waist circumference, while the augmentation index, SDPTG aging index and SVR correlated with BMI. Lipid profile, cholesterol LDL and HDL levels did not appear to be correlated with any SDPTG indices.

Table 1 Correlation between SDPTG indices and Thai CV Risk Score

	β	***p*-value**	**R^2**
b/a ratio			
TCVRS with blood test	0.13	0.62	0.02
TCVRS without blood test	0.45	0.003*	0.20
d/a ratio			
TCVRS with blood test	0.45	0.07	0.20
TCVRS without blood test	0.52	<0.001*	0.27
Augmentation index			
TCVRS with blood test	0.07	0.80	0.005
TCVRS without blood test	0.51	0.001*	0.26
SDPTG aging index			
TCVRS with blood test	0.45	0.07	0.20
TCVRS without blood test	0.59	<0.001*	0.35
SVR			
TCVRS with blood test	0.22	0.40	0.05
TCVRS without blood test	0.53	<0.001*	0.28
MAP			
TCVRS with blood test	0.26	0.32	0.07
TCVRS without blood test	0.20	0.21	0.04

From Table 1, SDPTG indices did not correlate to TCVRS with blood test. The b/a ratio, d/a ratio, augmentation index, SDPTG aging index and SVR were positively correlated with TCVRS without blood test (p <0.01).

Table 2 Diagnostic testing of SDPTG indices for higher 10-year CV risk screening

	Sensitivity	**Specificity**	**ROC area**	**PPV**	**NPV**
b/a ratio					
TCVRS with blood test	50.0	45.5	0.48	33.3	62.5
TCVRS without blood test	100.0	62.5	0.81	11.8	100

	Sensitivity	Specificity	ROC area	PPV	NPV
d/a ratio					
TCVRS with blood test	44.4	37.5	0.41	44.4	37.5
TCVRS without blood test	36.8	56.5	0.47	41.2	52.0
Augmentation index					
TCVRS with blood test	75.0	66.7	0.71	66.7	75.0
TCVRS without blood test	41.2	60.0	0.51	41.2	60.0
SDPTG aging index					
TCVRS with blood test	11.1	100.0	0.56	100.0	50.0
TCVRS without blood test	0	92.0	0.46	0	57.5
SVR					
TCVRS with blood test	0	40.0	0.20	0	75.0
TCVRS without blood test	20.0	56.8	0.38	5.9	84.0
MAP					
TCVRS with blood test	66.7	65.5	0.61	44.4	75.0
TCVRS without blood test	54.5	64.5	0.60	35.3	80.0

Table 2 shows diagnostic testing results from using SDPTG indices for higher than 10-year CV risk screening. For TCVRS with blood test, augmentation index provided the highest sensitivity of 75.0% with a specificity of 41.2%. For TCRVS without blood test, the b/a ratio had 100.0% sensitivity with 62.5% specificity. SDPTG aging index and SVR exhibited low sensitivity in both models as a screening test.

Discussion

For study participants, the prevalence of type 2 DM (8.6%) was close to that of the NHES V Study in a Thai population (8.9%) (*Thai National Health Examination Survey, NHES V*, n.d.). Hypertension was lower than that in the NHES V study, 19.0 and 24.7% respectively.

In all, 5 of 6 SDPTG indices correlated to age suggesting that a degenerative process was involved in arterial stiffness through increasing age. Some SDPTG indices were associated with waist circumference and BMI, possibly suggesting a relationship between SDPTG indices and visceral body fat.

CV risk scores obtained from TCVRS with or without blood test differed significantly. Therefore, TCVRS without blood test might be more feasible in assessing risk in a general population where blood tests to obtain the lipid profile are unavailable in some areas of Thailand and it comprises a noninvasive method.

SDPTG indices correlated with TCVRS without blood test. Given the correlation of SDPTG indices and waist circumference and BMI, these factors were also incorporated in the TCVRS model while lipid profile, which was also used in TCVRS with blood test, was not associated with any SDPTG indices.

For screening purposes, the b/a ratio and augmentation index provided high sensitivity compared with other indices to detect higher than 10-year CV risk. For TCVRS without blood test, b/a showed a 100% sensitivity and 62.5% specificity which might be suitable for practical use.

In conclusion, TCVRS without blood test provided a feasible test for Thais to assess their CV risk using a noninvasive and convenient method. SDPTG indices could play a practical role for CVD screening tests considering health screening devices are becoming popular.

Recommendations

The study employed a cross-sectional design, so temporal relationships between factors would be limited. Further studies such as cohort or clinical trials are suggested to extend knowledge and expand the application of SDPTG indices and CV risk score.

Thai populations should be assessed using CV risk score to properly manage and emphasize primary prevention. SDPTG indices, which now are built in many health screening machines including handheld or portable devices, are promising screening tools for CV risk.

References

Aekplakorn, W., Pakpeankitwatana, V., Lee, C. M. Y., Woodward, M., Barzi, F., Yamwong, S., … Sritara, P. (2007). Abdominal Obesity and Coronary Heart Disease in Thai Men. *Obesity*, *15*(4), 1036–1042. https://doi.org/10.1038/oby.2007.604

Collins, D. R. J., Tompson, A. C., Onakpoya, I. J., Roberts, N., Ward, A. M., & Heneghan, C. J. (2017). Global cardiovascular risk assessment in the primary prevention of cardiovascular disease in adults: systematic review of systematic reviews. *BMJ Open*, *7*(3), e013650. https://doi.org/10.1136/bmjopen-2016-013650

D'Agostino, R. B., Grundy, S., Sullivan, L. M., Wilson, P., & CHD Risk Prediction Group. (2001). Validation of the Framingham coronary heart disease prediction scores: results of a multiple ethnic groups investigation. *JAMA*, *286*(2), 180–187. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/11448281

D'Agostino, R. B., Vasan, R. S., Pencina, M. J., Wolf, P. A., Cobain, M., Massaro, J. M., & Kannel, W. B. (2008). General Cardiovascular Risk Profile for Use in Primary Care. *Circulation*, *117*(6), 743–753. https://doi.org/10.1161/CIRCULATIONAHA.107.699579

Goff, D. C., Lloyd-Jones, D. M., Bennett, G., Coady, S., D'Agostino, R. B., Gibbons, R., … American College of Cardiology/American Heart Association Task Force on Practice Guidelines. (2014). 2013 ACC/AHA guideline on the assessment of cardiovascular risk: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Journal of the American College of Cardiology*, *63*(25 Pt B), 2935–2959. https://doi.org/10.1016/j.jacc.2013.11.005

Ivorra, A., Genescà, M., Sola, A., Palacios, L., Villa, R., Hotter, G., & Aguiló, J. (2005). Bioimpedance dispersion width as a parameter to monitor living tissues. *Physiological Measurement*, *26*(2), S165-73. https://doi.org/10.1088/0967-3334/26/2/016

Lewis, J. E., Tannenbaum, S. L., Gao, J., Melillo, A. B., Long, E. G., Alonso, Y., … Tiozzo, E. (2011). Comparing the accuracy of ES-BC, EIS-GS, and ES Oxi on body composition, autonomic nervous system activity, and cardiac output to standardized assessments. *Medical Devices (Auckland, N.Z.)*, *4*, 169–177. https://doi.org/10.2147/MDER.S24291

Liao, D., Sloan, R. P., Cascio, W. E., Folsom, A. R., Liese, A. D., Evans, G. W., … Sharrett, A. R. (1998). Multiple metabolic syndrome is associated with lower heart rate variability. The Atherosclerosis Risk in Communities Study. *Diabetes Care*, *21*(12), 2116–2122. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/9839103

Maarek, A. (2012). Electro interstitial scan system: assessment of 10 years of research and development. *Medical Devices (Auckland, N.Z.)*, *5*, 23–30. https://doi.org/10.2147/MDER.S29319

Mahmood, S. S., Levy, D., Vasan, R. S., & Wang, T. J. (2014). The Framingham Heart Study and the epidemiology of cardiovascular disease: a historical perspective. *The Lancet*, *383*(9921), 999–1008. https://doi.org/10.1016/S0140-6736(13)61752-3

Otsuka, T., Kawada, T., Katsumata, M., & Ibuki, C. (2006). Utility of second derivative of the finger photoplethysmogram for the estimation of the risk of coronary heart disease in the general population. *Circulation Journal : Official Journal of the Japanese Circulation Society*, *70*(3), 304–310. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/16501297

Otsuka, T., Kawada, T., Katsumata, M., Ibuki, C., & Kusama, Y. (2007). Independent determinants of second derivative of the finger photoplethysmogram among various cardiovascular risk factors in middle-aged men. *Hypertension Research : Official Journal of the Japanese Society of Hypertension*, *30*(12), 1211–1218. https://doi.org/10.1291/hypres.30.1211

Sritara, P., Cheepudomwit, S., Chapman, N., Woodward, M., Kositchaiwat, C., Tunlayadechanont, S., … Electricity Generating Authority of Thailand. (2003). Twelve-year changes in vascular risk factors and their associations with mortality in a cohort of 3499 Thais: the Electricity Generating Authority of Thailand Study. *International Journal of Epidemiology*, *32*(3), 461–468. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/12777437

Stone, N. J., Robinson, J. G., Lichtenstein, A. H., Bairey Merz, C. N., Blum, C. B., Eckel, R. H., … American College of Cardiology/American Heart Association Task Force on Practice Guidelines. (2014). 2013 ACC/AHA guideline on the treatment of blood cholesterol to reduce atherosclerotic cardiovascular risk in adults: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Journal of the American College of Cardiology*, *63*(25 Pt B), 2889–2934. https://doi.org/10.1016/j.jacc.2013.11.002

Wilson, P. W., D'Agostino, R. B., Levy, D., Belanger, A. M., Silbershatz, H., & Kannel, W. B. (1998). Prediction of coronary heart disease using risk factor categories. *Circulation*, *97*(18), 1837–1847. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/9603539

Thai National Health Examination Survey (NHES V) (in Thai). n.d.

Influence of Marketing Factors to the Behavior of Spa-Hot Spring Users in Ranong Province, Thailand

Monruadee Keeratipranon

College of Integrative Medicine, Dhurakij Pundit University, Thailand, monruadee.kee@dpu.ac.th

Abstract

The purpose of this study was to find the important level of marketing factor in the spa business from hot spring users who used spa service. This study also revealed relationship between spa user personal factor and marketing factor. Result from this study can be used by both Ranong administrative and wellness entrepreneur to establish a supportive collaboration and improve spa service to better suit spa users.

The study was used purposive sampling and collected information from users at 3 hot springs, the Raksawarin Hot Spring, Pu Lum Pee Hot Spring and Pron Rang Hot Spring in Ranong province between 25 and 27 August 2017. A questionnaire was used to collect information from 111 hot spring users where 57 persons have experienced with spa service. The results were analyses using percentage, mean, and standard deviation. Hypothesis was tested using t-test (Independent Sample) and F-test (One-way ANOVA).

The results shown that most of spa-hot spring users were female, 26-35 years old, bachelor degree holder, white collar employees, and income between 20,001 – 30,000 baht. In overall spa user mentioned the marketing factor is in fairly important level. The most important factors were people, physical, and price accordingly.

Keywords : Marketing factors, Hot Spring, Spa, Behavior, Ranong Province

1. Introduction

Global Wellness Institute (2017) reported that the expenditure in wellness economy was 4.2 trillion dollar with average 12.8% growth. Wellness tourism and spa are a global trend for tourism in the world, wellness tourism value is 639 billion dollar and spa economy value is 119 billion dollar.

In order for Thailand to become a major destination for health tourism, we should develop a health resort along with wellness activities. Therefore, it is important to study the tourist behavior and what are they expect. According to Uemthip (2016), tourist prefer to visit a hot spring which has spa and Thai massage services. Thus, it is interesting to have a tourist attraction that combines both hot springs and spa business together. This can be a beginning of local Wellness Center.

In the past several years, there was no research that studied the behavior of both hot springs and spa users together. Therefore, this study decided to further study about hot spring users and spa users in Ranong province. This paper is an extension of the previous work of Monruadee and Warunpun (2018). However, this paper focused on the influence of marketing factor to the spa user behavior. Spa users in this paper refer to person interviewed at hot springs and have experienced with spa.

The reason of using Ranong province because Ranong province has strategy plan to be wellness tourism and good living city. Ranong province is suitable in both transportation and natural resource to be a wellness tourism city. Ranong province has national airport and 7 hot springs which are Raksawarin Hot Spring, Pu Lum Pee Hot Spring, Pornrang Hot Spring, Hat Yai Hot Spring, Rat Cha Kood Hot Spring, Huai Nam Rong Hot Spring, Klong Bang Hot Spring (Tourism Authority of Thailand, n.d., p.6-7 in Oracha, Sarunya and Yingyong, 2011)

These hot springs locate across Ranong province make it ideal destination for wellness tourists which can enjoy natural and learn culture of each local region. Tourists will learn a way of living, recreation, and receive treatment for a diagnosed disease or condition. Spa and hot springs in Ranong are well known for their clear, clean and purification. They have less carbon monoxide and less sulfur compare to others especially Raksawarin Hot Spring which is one of the tourism landmark of Ranong province.

The objective of this paper is to investigate the important level of marketing factor in the spa business via hot spring users who used spa service. However, the result from this study and the earlier study of Monruadee and Warunpun (2018) can be used by both Ranong administrative and wellness entrepreneur to improve spa services leading to be a modern wellness center.

2. Literature review

2.1 Hot spring's literatures

Wanarat, Nuanphan and Sunan (2011) had studied hot springs in Kamphangphet province and found that community participation is one of the major success factor for develop a sustainable tourism.

Veerada (2011) had studied sustainable health and wellness tourism development of Ban Pornrang Hot Spring in Ranong province, Thailand and found that Ban Pornrang Hot Spring should organize and manage its natural resources. Usefulness of hot spring can be presented to public for attracting wellness and natural lover tourists.

Aracha, Sarunya and Yingyote (2011) had studied management factors of tourist sites at Raksawarin Hot Spring, Raksawarin Public Park. Muang District, Ranong Province and found that the most important factors are physical appearance of the destination and popularity of the place. Other important factors are money value, safety, and fragile of the environment. Most of tourists traveled for recreation, 2-4 persons per group, use own transportation, one day trip not stay overnight, average spend less than 500 baht per day per person, and visit this place more than 7 times.

Sunisa and Pawanrat (2012) had studied behavior and satisfaction of Thai tourist towards Raksawarin Hot Spring, Ranong province, Thailand. Most of tourist traveled for recreation, visit 1-2 times per week, traveled in group using own transportation with family and friend in weekend and stay 1 night. Overall tourist satisfaction level is high especially in hot spring place, recreation activities, facilities, and service staffs accordingly.

Uemthip (2016) had studied hot spring in term of tourism management and classified hot springs into 5 groups according to its potential. The first group does not has potential anymore as the temperature of water already decrease which is Mae Wong Hot Spring, Khampangphet province. The second group does not has potential and does not open for public such as Pong Nam Rong Hot Spring, Khampangphet province, Pong Pu Fuenang Hot Spring, Chiang Rai Province. The third group has limited management such as Pong Ka Ting Hot Spring, Ratchaburi Province, Pu Lum Pee Hot Spring, Ranong Province, Huy Mak Leam Hot Spring, Chiang Rai Province. The fourth group start to develop as a wellness tourist destination such as Boe Klueng Hot Spring, Ratchaburi Province, Pong Phra Bat Hot Spring, Chiang Rai Province. Huy Mak Leam Hot Spring, Chiang Rai Province, Phasert Hot Spring, Chiang Rai Province, Lanna Onsen Chiang Rai Province, Saket Hot Spring, Chiang Mai Province and Pron Rang Hot Spring, Ranong Province. The fifth group has potential and manage to be wellness tourism such as Phra Ruang Hot Spring, Kamphaengphet Province, Raksawarin Hot Spring, Ranong Province, Sankampaeng Hot Spring, Chiang Mai Province, and Mae Khachan Hot Spring, Chiang Rai Province.

Narumon and Saisanit (2017) had studied the quality of hot springs in Ranong Province to be health and wellness tourism destination. The studied show that quality of Raksawarin Hot

Spring, and Pron Rang Hot Spring in water quality is meet the standard. However, quality of hot spring water bath, toilet, shower, safety, and environmental management still not meet the standard.

2.2 Spa's literatures

Pailin (2006) has studied marketing factor which impact to spa service selection in Amphur Muang Saraburi. The result shown that the most influence factors were product, promotion, and process accordingly.

Sittichai (2011) studied spa business management in Amphoe Muang Chonburi province. The study showed that most of the entrepreneur plan to have a day service and use both personal money and loan from a bank to improve their business. Skill of staffs are the most important factor in spa operation. The most popular service is face spa. Average fee for spa usage is 301 – 500 baht and average time is 30 – 60 minutes.

Nattha (2011) studied marketing factors affecting the selection of spa services of consumers in Bang Na district, Bangkok. It was found that the importance of marketing factors by spa users was, overall, at a very high level. The most important factor was people, place, and promotion accordingly. In addition, when testing the hypothesis, it was discovered that different occupations gave different levels of marketing factors in terms of products and processes with a statistical significance of $p<=0.05$. Meanwhile, samples from different educational levels put a greater emphasis on overall mix factors affecting the selection of spa services at a statistical significance of 0.05. The behavior exhibited in spa service choice being that of traditional Thai massage revealed that most would use the service alone. The average cost per visit would be 501-1,000 baht. The most common time of service was between 5:00 PM – 8:00 PM with the massage lasting 2 hours. Frequency was at 1 visit per month.

Watsamon (2014), in the study 'Demand for Spa Services in Bangkok Metropolis', discovered that most spa users are female between the ages of 31-40 years old. These were made up of mainly private company employees with moderate income. They would most likely visit during the weekend between 1:00 PM and 6:00 PM and generally pay no more than 1,000 baht per visit. Most of them would choose to get a Thai massage in order to relieve tension. In a test of the factors influencing the demand for spa users it was found that the sex of the consumer has a direct correlation with the time and frequency of spa service, age is related to the type of spa service as well as extra services, and education is related to the marketing mix. Service personnel, atmosphere of the location, marketing promotion, and news channels had a correlation with the frequency of service as well as the type of service. The salary of the consumer was related to the type of additional spa services. The cost of the various services was related to the service frequency. Lowering the cost of a service was related to the type of service. Finally, the preferences of the consumers were related to supplementary services available in spa facilities.

Amnart (2014) discovered in 'A Study of Marketing Mix Factors and Relationship between Personal Characteristics and Behaviors in Using Spa Services to Improve Health among Consumers in Bangkok' that the majority of spa users in Bangkok were women age between 41-45 years old, with a master's degree, and a salary of 20,001-30,000 baht per month. It was also found that the overall marketing factor was at a 'fairly important' level while the 3 most important marketing factors were people, physical, and process.

In 'Marketing Factors Influencing the Customers Behavior in the Service of Beauty Spa in Bangkok Area', Orwan (2014) found that most spa users were women between the ages of 20-29 years old, single, had a bachelor's degree, and worked as a private company employee with a salary of 20,001-40,000 baht per month. Research revealed that the importance of overall marketing was at the highest level. Factors that affected consumers the most were: process, people, product and promotion in order from most to least important.

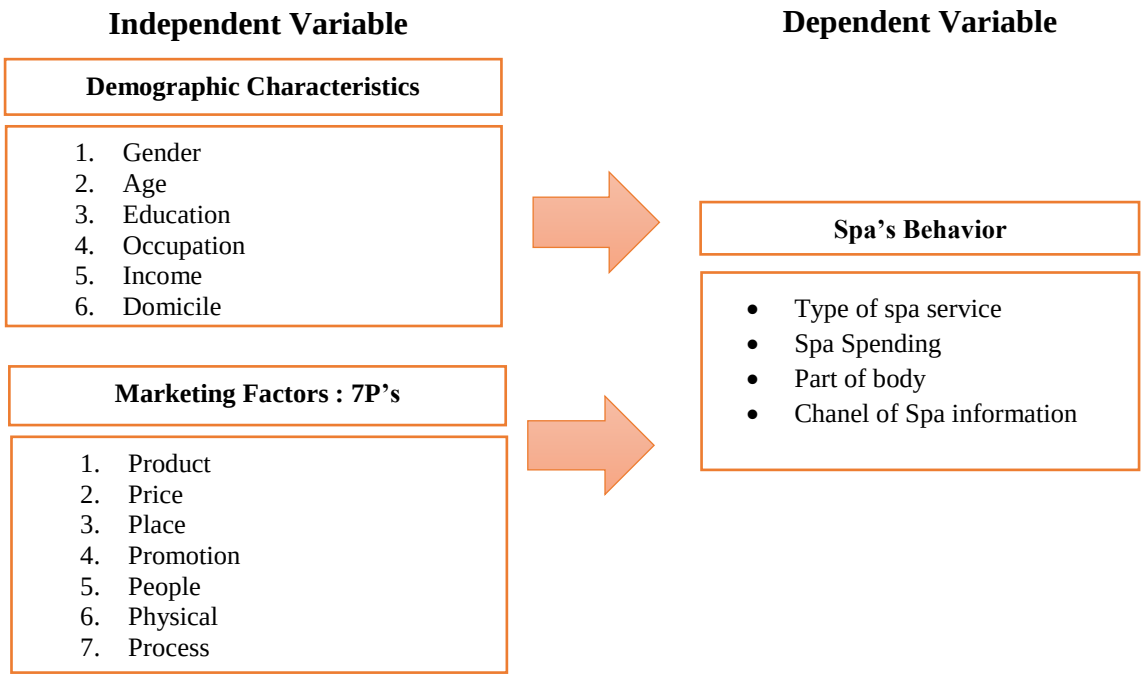
Shatchaya and Narisa (2015) studied consumer's expectations for the health and beauty spa. The study shown that the most important factor to choose spa is the standard of each shop, spa users normally chose their own service, the most popular service is Thai spa, average fee is 500 – 1,000 baht per usage, package set is the most popular.

Laongsrai (2015) conducted a study entitled 'Factors Positively Affecting Customer Satisfaction of Spa Services in Klongsan District, Bangkok'. The results of the research showed that customer satisfaction could be measured according to a regression equation with centrality in lifestyle at (β = 0.477), atmospheric cues at (β = 0.172), and perceived relative price at (β = 0.168). The equation could be used to explain the influences on customer satisfaction at spas at 68.7 with a statistical significance of 0.01

Orathai, Sunee and Nantawan (2016) studied spa customers' behavior towards spa service selection in Surat Thani province. Oil massage spa for stress relieve was the most popular service among tourist. Standalone spa shop were the most popular, average usage time is 2 hours, 500 – 1,000 baht. In addition, it was found that the overall marketing factor is at a low level. Distribution channel factors was the most important factors where staff factor was the least important factor.

According to hot spring and spa literatures reviews, the research can be divided into two groups. The first group aim to study quality of hot spring in physical and mineral in the water such as Wanarat , Nuanphan and Sunan (2011), Veerada (2011) and Narumon and Saisanit (2017). The other larger group studied the behavior of spa users and spa management such as Orathai, Sunee, Nantawan (2016) Nattha (2011) Sittichai(2011) Pailin (2006) Watsamon (2014) Amnart (2014) and Orawan (2014). Shatchaya and Narisa (2015) was shown about the behavior and expectations of using the spa. Laongsrai(2015) studied the satisfaction with the factors that affect the use of the service. However, there is no research study both hot spring and spa altogether. This new study can lead to better understand how to create wellness center according to customer behavior and expectation.

2.3 Conceptual Frame Work



3. Research Methodology

Target population was the hot spring users in Ranong Province. The purposive sampling is used to identify the place, namely Raksawarin Hot Spring, Pu Lum Pee Hot Spring and Pornrang Hot Spring. The data are collected by the questionnaire, between 25 – 27 August 2017, from 111 people who used 3 hot spring spots.

The questionnaire used in this study, can be divided into four parts. The first part is personal information, the second part is hot spring behavior questions, the third part is the spa behavior questions and the last part is 7P's of marketing factors affecting the behavior of spa services. This study focuses on seven aspects, known as 7P's : Product, Price, Place, Promotion, People, Physical, and Process. The participants were asked to rate the degree of their agreement to the statement provided in each section. The agreement scales are rated by Likert (1932) as follows: 5 = very important, 4 = fairly important, 3 = important, 2 = slightly important and 1 = not at all important.

The data obtained from the questionnaire were analyzed in terms of the 7P's of the marketing mix which influence the purchasing behaviors of spa user.

The data obtained from the analysis of the importance of marketing factors are presented in percentage, average and standard deviation. The level of importance is divided into 5 levels as follows

Average 4.21-5.00 means very important
Average 3.41-4.20 means fairly important
Average 2.61-3.40 means important
Average 1.81-2.60 means slightly important
Average 1.00-1.80 means not at all important

Descriptive statistics are used to analyze the data. Hypothesis testing, difference in mean of each group, were done using t-test (Independent Sample) and F-test (One-way ANOVA).

Nevertheless, the limitation of this study is mainly in the narrow study in the spa behavior where only a few topics such as the experience in spa service and channel for spa usage decision were studied.

This questionnaires was tested the content validity by 3 experts using Index of Concordance (IOC). The validity result shown that every item of questionnaire has IOC more than 0.5. Moreover, the reliability testing was tried out by 30 people with has similar characteristic as the target population, Cronbach's Alpha by Alpha Coefficient = 0.921.

4. Findings

4.1 Demographic information of respondent

There are total of 111 respondents from hot spring users in Raksawarin Hot Spring, Pu Lum Pee Hot Spring and Pornrang Hot Spring. The detail of the respondent are shown in Table 1. From these 111 respondents, there were 57 people, 51.35%, have experience with spa. Most of this group were female with 63.16%, age group of 26-35 are the most with 52.63%, single status 63.16%, Bachelor degree 52.63%, white collar 31.58%, income range between 20,001 – 30,000 baht 64.86%, and reside outside Ranong Province 78.95%. Personal characteristics of respondents from spa-hot spring group are similar to only-hot spring group. This can be imply that hot spring users can be persuaded to use spa later.

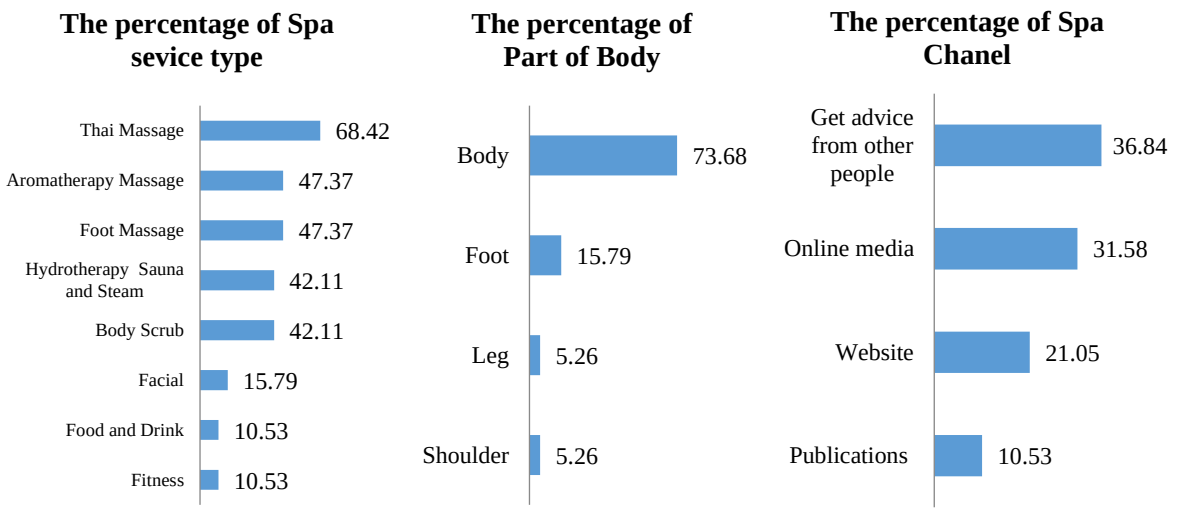
Table 1 : Description of Sample

Respondent's Demographic		Have experienced in Spa service		Total of Hot Spring User
		Yes	No	
Number of respondents		**57**	**54**	**111**
Gender	Male	36.84%	27.78%	32.43%
	Female	63.16%	72.22%	67.57%
Age	lower 26	5.26%	22.22%	13.51%
	26-35	52.63%	38.89%	45.95%
	35 up	42.11%	38.89%	40.54%
Marital Status	Single	63.16%	72.22%	67.57%
	Marriage	31.58%	27.78%	29.73%
	Others	5.26%	0.00%	2.70%
Education Level	Lower or equal M.6 / High School	15.79%	27.78%	21.62%
	Diploma / Vocation / Technical Collage	15.79%	16.67%	16.22%
	Bachelor's Degree	52.63%	33.33%	43.24%
	Master's Degree or higher	15.79%	22.22%	18.92%
Occupation	Student	0.00%	5.56%	2.70%
	Official or state enterprise employee	10.53%	16.67%	13.51%
	White Collar	31.58%	33.33%	32.43%
	Private Business	28.07%	5.56%	17.12%
Occupation	House Keeper	0.00%	5.56%	2.70%
	Blue Collar	10.53%	22.22%	16.22%
	Freelance	5.26%	11.11%	8.11%
	Others	14.04%	0.00%	7.21%
Income per month	Less than or equal 10,000	11.76%	11.76%	11.76%
	10, 001 – 20,000	5.88%	29.41%	17.65%
	20, 001 – 30,000	58.82%	35.29%	47.06%
	30, 001 – 40,000	23.53%	23.53%	23.53%
Domicile	Ranong Province	21.05%	44.44%	32.43%
	Others ; Bangkok, Phuket etc.	78.95%	55.56%	67.57%
Total		**100.00%**	**100.00%**	**100.00%**

4.2 Spa User Behavior

Hot spring users answer that most of them 51.35% have ever used spa and around 48.65% have never used. From the hot spring respondent who used spa (57 people), Thai massage is the most popular with 68.42%, followed by Foot Massage and Aromatherapy Massage (same at 47.37%). In average, the total of 725 baht are spend per usage time, minimum is 50 baht, maximum is 3,500 baht with 635.27 standard deviation. Moreover, the body part that user want to relive by using spa or hot spring was body (73.68%), foot (15.79%), shoulder and leg (same at 5.26%) accordingly.

The most influence channel for spa usage decision is an advice from friends (36.84%), social media such as Facebook, LINE and Instagram (31.58%), and website (21.05%) accordingly. Detail of the answer are shown in Figure 1.



Multiple respondent 57 people

Figure 1 : The percentages of Spa Behavior

4.3 7P's of Marketing factors affecting the behavior of spa services

In overall factor, those who visit spas rated the value on marketing factors at the 'fairly important' level. This has an average value of 4.19 out of 5.00. Upon examination, the most important factor for spa users is people (average level of 4.56), followed by physical (average level of 4.42), and then price (average level of 4.32). These 3 factors are all at the 'very important' level. The factor with the least importance was promotion (average level of 3.84) and was at the 'fairly important' level.

Table 2 : Percentage, mean and standards deviation of the important of marketing factors in choosing spa services

Marketing factors	Levels of Importance					Mean	SD	Meaning
	Very important	Fairly important	Important	Slightly important	Not at all important			
1. Product								
1.1 Spa image and reputation	24.32%	62.16%	10.81%	2.70%	0.00%	4.08	0.68	Fairly Important
1.2 Variety of services	18.92%	64.86%	13.51%	2.70%	0.00%	4.00	0.66	Fairly Important
1.3 There are modern standard services.	27.03%	54.05%	16.22%	2.70%	0.00%	4.05	0.74	Fairly Important
1.4 Product quality and treatment results	54.29%	34.29%	8.57%	2.86%	0.00%	4.40	0.77	Very Important
Average product	***31.14%***	***53.84%***	***12.28%***	***2.74%***	***0.00%***	***4.13***		***Fairly Important***
2. Price								
2.1 Prices of products and services are appropriate.	54.29%	22.86%	20.00%	2.86%	0.00%	4.29	0.88	Very Important
2.2 If there is a discount, will use more services.	58.33%	19.44%	19.44%	2.78%	0.00%	4.33	0.89	Very Important
2.3 Service rates affect the selection of spa services.	52.78%	30.56%	13.89%	2.78%	0.00%	4.33	0.82	Very Important
Average Price	***55.13%***	***24.29%***	***17.78%***	***2.80%***	***0.00%***	***4.32***		***Very Important***
3. Place								
3.1 Travel convenience	57.14%	40.00%	2.86%	0.00%	0.00%	4.54	0.56	Very Important
3.2 in the department store	5.88%	38.24%	38.24%	11.76%	5.88%	3.26	0.95	Important
3.3 Stay in a quiet, private place.	55.88%	35.29%	8.82%	0.00%	0.00%	4.47	0.66	Very Important
3.4 in the resort hotel	23.53%	35.29%	32.35%	8.82%	0.00%	3.74	0.92	Fairly Important
Average Place	***35.61%***	***37.21%***	***20.57%***	***5.15%***	***1.47%***	***4.00***		***Fairly Important***

Marketing factors	Levels of Importance					Mean	SD	Meaning
	Very important	Fairly important	Important	Slightly important	Not at all important			
4. Promotion								
4.1 There are ads through the media.	33.33%	38.89%	27.78%	0.00%	0.00%	4.06	0.78	Fairly Important
4.2 There is a famous person who is the presenter	13.89%	30.56%	44.44%	8.33%	2.78%	3.44	0.93	Fairly Important
4.3 There is a discount promotion.	50.00%	25.00%	22.22%	2.78%	0.00%	4.22	0.89	Very Important
4.4 can pay for the service fee	25.71%	37.14%	22.86%	5.71%	8.57%	3.66	1.18	Fairly Important
Average Promotion	***30.73%***	***32.90%***	***29.33%***	***4.21%***	***2.84%***	***3.84***		***Fairly Important***
5. People								
5.1 Reliability and expertise of employees	63.89%	30.56%	5.56%	0.00%	0.00%	4.58	0.60	Very Important
5.2 Polite, courteous, cheerful.	75.00%	16.67%	8.33%	0.00%	0.00%	4.67	0.63	Very Important
5.3 Caring for advice	75.00%	11.11%	13.89%	0.00%	0.00%	4.61	0.72	Very Important
5.4 Knowledge and experience in spa massage services	69.44%	19.44%	11.11%	0.00%	0.00%	4.58	0.69	Very Important
5.5 There should always be training for massage services.	66.67%	25.00%	8.33%	0.00%	0.00%	4.58	0.64	Very Important
5.6 should have a certificate through training on spa services	55.56%	27.78%	11.11%	5.56%	0.00%	4.33	0.89	Very Important
Average People	***67.59%***	***21.76%***	***9.72%***	***0.93%***	***0.00%***	***4.56***		***Very Important***
6. Physical								
6.1 Cleanliness of premises and tools	77.78%	19.44%	2.78%	0.00%	0.00%	4.75	0.50	Very Important
6.2 Lighting is appropriate.	44.44%	36.11%	19.44%	0.00%	0.00%	4.25	0.76	Very Important
6.3 The air in the spa has a good aroma.	66.67%	22.22%	11.11%	0.00%	0.00%	4.56	0.69	Very Important
6.4 Attractive decoration	52.78%	25.00%	19.44%	2.78%	0.00%	4.28	0.87	Very Important
6.5 Free Wi-Fi / drug / beverage service	41.67%	44.44%	11.11%	2.78%	0.00%	4.25	0.76	Very Important
6.6 There are enough seats.	61.11%	22.22%	16.67%	0.00%	0.00%	4.44	0.77	Very Important
Average Physical	***57.41%***	***28.24%***	***13.43%***	***0.93%***	***0.00%***	***4.42***		***Very Important***
7. Process								
7.1 The process of receiving customers or booking queues	55.88%	35.29%	8.82%	0.00%	0.00%	4.47	0.66	Very Important
7.2 Service process	23.53%	33.33%	34.31%	8.82%	0.00%	3.72	0.93	Fairly Important
7.3 Performance in following up after using the service	31.48%	37.04%	30.56%	0.93%	0.00%	3.99	0.81	Fairly Important
Average Process	***36.96%***	***35.22%***	***24.56%***	***3.25%***	***0.00%***	***4.06***		***Fairly Important***
Average in Total	**44.94%**	**33.35%**	**18.24%**	**2.86%**	**0.62%**	**4.19**		**Fairly Important**

4.4 Hypothesis test

4.4.1 The results of hypothesis testing between demographic and spa expense are shown as follows.

The user who have different age were significantly different in spa expense at the $p<0.05$ level. To further analyze multiple comparison of spa expense of each age group using LSD statistics. We found that age group 26-35 years old and group greater than 35 years old were significantly different at the $p<0.05$ level.

Moreover, the result is the same when analyze the income of each group and spa expense. To further analyze multiple comparison of spa expense mean of each income group by using LSD statistics. We found that income group 20,001-30,000 baht and group 30,001-

40,000 baht were significantly different at the p<0.05 level. Apart from that, income group of 20,001 – 30,000 baht has higher spa expense than other groups

Table 3 : The result of hypothesis testing between personal factors and spa expense using independent t-test and F-test ANOVA

Personal Factors		Mean	Statistical Value	p-value	LSD
Gender	Male	825.00	t = 0.815	$(0.419)^{ns}$	
	Female	675.06			
Age	Lower 26	666.67	F = 4.274	$(0.019)^{*}$	$(26\text{-}35,35up)^{*}$
	26-35	933.40			
	35 up	435.71			
Status	Single	787.56	F = 0.693	$(0.505)^{ns}$	
	Marriage	560.00			
	Others	800.00			
Education	Lower or equal M.6 / High School	266.67	F = 2.743	$(0.053)^{ns}$	
	Diploma / Vocation / Technical Collage	983.56			
	Bachelor's Degree	711.11			
	Master's Degree or higher	966.67			
Occupation	Official or state enterprise employee	800.00	F = 1.457	$(0.230)^{ns}$	
	White Collar	916.67			
	Private Business	421.88			
	Blue Collar	725.33			
	Others: Student, Freelance etc.	831.82			
Income	Less than or equal 10,000	408.33	F = 2.904	$(0.045)^{*}$	$(20{,}001\text{-}30{,}000\ ,\ 30{,}001\text{-}40{,}000)^{*}$
	10,001 – 20,000	500.00			
	20,001 – 30,000	963.40			
	30,001 – 40,000	383.33			
Domicile	Ranong Province	538.89	t = -1.563	$(0.130)^{ns}$	
	Others ; Bangkok, Phuket etc.	762.27			

4.4.2 Hypothesis testing to find the relationship between personal factors and marketing factors affecting the decision to use spa services shown as follows.

The user who have different sexes have significantly different of important level in overall, price and promotion aspects. When considering the average level of importance, it was shown that women will focus more on such aspects than men.

The user who have different age groups have significantly different of important level in overall, product, price, people, and physical aspects. When considering the average level of importance, it was found that consumers between the ages of 26-35 years old gave more importance to these factors than those of other ages.

The user who have different education levels have significantly different of important level in overall, product, price, place, and physical aspects at the p<0.05 level. Examining the average of important level, it was seen that consumers who have a level of education of grade 12 or lower placed a higher emphasis on overall and place than those with other education levels. Meanwhile, those with a master's degree or higher placed more importance on product, price, and physical than those at other education levels.

The user who have different occupations levels have significantly different of important level in overall, promotion, and physical aspects at the p<0.05 level. When considering the average level of importance, it is seen that those who work at private businesses place a higher importance on overall than those in other groups, while consumers who work as office or state enterprise employees places more importance on promotion and physical than other groups.

The user who have different incomes levels have significantly different of important level in overall, product, price, people, and physical aspects. When looking at the average level it is found that consumers with an income of 10,001-20,000 baht per month would place more importance on overall and physical than other groups whereas those earning 20,001-30,000

baht per month would place a higher importance on product, price, and people than those in other groups.

The user who have different domiciles put marketing significant importance on overall, place, promotion, people, and process at the $p<0.05$ level. When considering the average level of importance, it is found that consumers who do not have a domicile in Ranong province would put more importance on overall, product, place, people, and process than other groups while those with domiciles in Ranong emphasize promotion more than others.

Table 4 : The result of hypothesis testing between personal factors and 7P's Marketing factors by using independent t-test and F-test ANOVA

Personal Factor	Marketing Factors : 7P							
	Product	**Price**	**Place**	**Promotion**	**People**	**Physical**	**Process**	**Overall**
Gender	t = -0.162 (0.873)^{ns}	t = -3.620 (0.001)**	t = -1.514 (0.136)^{ns}	t = -3.909 (0.000)**	t = -0.910 (0.367)^{ns}	t = -0.567 (0.573)^{ns}	t = -2.331 (0.024)*	t = -3.144 (0.003)*
Age	F = 5.782 (0.005)*	F = 3.498 (0.037)*	F = 2.646 (0.081)^{ns}	F = 1.070 (0.350)^{ns}	F = 8.804 (0.000)**	F = 8.424 (0.001)**	F = 1.090 (0.344)^{ns}	F = 4.923 (0.011)*
Status	F = 0.630 (0.537)^{ns}	F = 3.788 (0.029)*	F = 2.158 (0.127)^{ns}	F = 1.434 (0.248)^{ns}	F = 1.706 (0.191)^{ns}	F = 2.269 (0.113)^{ns}	F = 1.706 (0.192)^{ns}	F = 0.859 (0.430)^{ns}
Education	F = 3.826 (0.015)*	F = 10.288 (0.000)**	F = 7.255 (0.000)**	F = 1.236 (0.306)^{ns}	F = 2.207 (0.098)^{ns}	F = 6.471 (0.001)**	F = 4.680 (0.006)*	F = 13.831 (0.000)**
Occupation	F = 2.166 (0.087)^{ns}	F = 5.081 (0.002)*	F = 2.210 (0.083)^{ns}	F = 3.103 (0.024)*	F = 0.659 (0.623)^{ns}	F = 3.983 (0.007)*	F = 1.501 (0.217)^{ns}	F = 5.482 (0.001)**
Income	F = 13.214 (0.000)**	F = 4.492 (0.007)*	F = 2.241 (0.098)^{ns}	F = 1.788 (0.163)^{ns}	F = 8.693 (0.000)**	F = 7.832 (0.000)**	F = 0.688 (0.565)^{ns}	F = 4.663 (0.007)**
Domicile	t = -3.287 (0.002)*	t = -1.742 (0.087)^{ns}	t = -4.180 (0.000)**	t = 2.748 (0.008)*	t = -2.864 (0.006)*	t = -1.605 (0.114)^{ns}	t = -3.518 (0.001)**	t = -1.981 (0.053)*

Remarks :

***** means significant level 0.05.

** means significant level 0.01.

ns means not significant.

5. Discussions

This study shown that most of the spa users are female which confirm the result of all the earlier studies by Orathai, Sunee, Nantawan (2016) Nattha (2011) Sittichai(2011) Pailin (2006) Shatchaya and Nurisa (2015) Laongsrai(2015) Watsamon (2014) Amnart (2014) Orawan (2014). Most of spa user earn bachelor degree which coincide with Orathai, Sunee, Sittichai(2011) Shatchaya and Nurisa (2015) Laongsrai(2015) Orawan (2014), occupant are white collar as shown in the study of Orathai, Sunee, Sittichai(2011) Laongsrai(2015) Watsamon (2014) Orawan (2014), income range between 20,001 – 30,000 baht as same as Orawan (2014) where the study of Orathai, Sunee, Sittichai(2011) shown that the spa user income is more than 30,000 Baht. From this result, most of spa users are females own bachelor degrees work as white color and earn at least 20,000 per month. The women have enough income to spend on her beauty and relaxation.

This section discussed behavior of spa user, who was hot spring users and have experienced with spa service. Around half of hot spring users have experienced in Spa especially Thai massage with coincide with the result from Thai Spa Association (2014, p. B10) Orathai, Sunee, Nantawan (2016) Nattha (2011) Shatchaya and Nurisa (2015). It is confirmed that Thai massage is the most popular service in spa. This is because Thai massage can effectively relief body ache and does not require to take off clothes which suitable for Thai culture that do not like to remove clothes in public place. Moreover, this study found that the average cost for spa service per usage is 725 baht which similar to the result of Nattha (2011) Shatchaya and Narisa (2015) and Orathai, Sunee and Nantawan. (2016) (500-1,000 Baht). Finally, the 91% of spa user want to use spa service if they are available at hot spring place. This imply that spa or wellness center at hot spring might bring a good opportunity to local hot

spring. This will eventually alleviate local tourist destination to become a major tourist attraction.

Spa users rated the overall marketing factor as fairly important coinciding with the research of Nattha (2011) Sittichai(2011) Amnart (2014). The most influence factor was people with confirm the result of Amnart (2014) where the work of Sittichai(2011) and Pailin (2006) mentioned product as the most influence factor. However, spa users in every researches always mention people and product as the top 3 most influence factors. Therefore, spa must give a priority in own people such as being professional service and modest. Services in spa must maintain a high standard service level.

6. Recommendations

6.1 The study shown that most of spa users are female, bachelor degree background, age more than 26. Therefore, the most relevant target group for spa is white collar working women. The most effective marketing channel for this group is online and advice from friend.

6.2 Spa users rate the people aspect as the most important factors especially in polite, courteous, and caring for advice. Therefore, spa owner or manager should carefully select talent staffs who has high service mind.

6.3 Spa owner should support and encourage spa staff for retraining. Staff quality evaluation should be done regularly to ensure a high standard.

6.4 According to result, Ranong administrative should develop spa center or wellness center at hot spring spot. It will increase the interesting of user and can add more value to hot spring. Spa Business should be developed to be a wellness center especially should add some service related to hot spring.

6.5 A national spa standard should be set up to be a guideline for all spa. Government agency should visit and evaluate spa to ensure the quality of service.

6.6 This research was a standard behavior survey of hot springs and spa users. More intense study in spa behavior should be conducted and the sample size should be increased so other related factors analyzed can be done.

6.7 It should have a comparative study of hot spring all over Thailand to gain better understanding and increase competitiveness of each local tourist destination.

6.8 Foreign spa or hot spring users might have a different opinion in wellness service. More study should be conducted to compare between Thai and foreign customers about their opinion and experience.

7. References

Amnart Srisomsuk.(2014). A Study of Marketing Mix Factors and Relationship between Personal Characteristics and Behaviors in Using Spa Services to Improve Health among Consumers in Bangkok. (Unpublished master's thesis). Bangkok University, Thailand.

Aracha Sakunsing, Sarunya Lerdputtaruk and Yingyote Chokechaiworarat. (2011). A Study of Management Factor of Tourist Sites Impacting The Decisoin of Thai Tourists to Use Service at Raksawarin Hot Spring, Raksawarin Public Park. Muang District, Ranong Province. Journal of Graduate School of Commerce-Burapha Review, 6(1), 69-82.

Global Wellness Institute (2017) Retrieved from https://globalwellnessinstitute.org/global-wellness-institute-blog/2018/10/06/wellness-now-a-4-2-trillion-global-industry/

Laongsrai Komonman (2015). The Study of Factors Positively Affecting Customer Satisfaction of Spa Services in Klongsan District, Bangkok. (Unpublished master's thesis). Bangkok University, Thailand.

Monruadee Keeratipranon and Warun Kongsom. (2018). Behavior of Hot Spring and Spa

Users in Ranong Province, Thailand. Paper presented at the 1st International Conference in Tourism, Business and Social Sciences, Thailand.
Narumon Preuksa and Saisanit Phongsuwam. (2017). Quality of Hot Springs in Ranong Province to be Health and Wellness Tourism Destination. Retrieved from http://j-com-dev-and-life-qua.oop.cmu.ac.th/uploads/file_backup1/dikoqrsw1349.pdf.
Nattha Sukapak (2011). Marketing Mix Factors affecting the selection of spa services of consumers in Bang Na district Bangkok. Retrieved from http://mis.krirk.ac.th/librarytext/MBA/2554/Nattha_Sukapak.pdf
Orathai Jantaro, Sunee Longprasert and Nantawan Changkid. (2016). Spa Guests' Behavior towards Spa Service Selection in Surat Thani Province. Suratthani Rajabhat Journal.3(1), 185-206.
Orwan Srathongma. (2014) Marketing Factors Influencing the Customers Behavior in the Service of Beauty Spa in Bangkok Area. (Unpublished master's thesis). Stamford International University, Thailand
Pailin Somsri. (2006). Market factors that influence the decision to use the services in the spa.Mueang District, Saraburi Province. (Unpublished master's thesis). Thepsaitri Rajabhat University, Thailand.
Shatchaya Duangchant and Narisa Kamkaen. (2015). Consumer's Expectations for the Health and Beauty Spa. Retrieved from https://research.dusit.ac.th/new/upload/file/bf2204a50ec7061b68342cae30752941.pdf
Sittichai Thammasane. (2011). Spa Business Management in Amphoe Muang, Chonburi Province. Retrieved from http://www.ssruir.ssru.ac.th/bitstream/ssruir/463/1/037-54.pdf
Sunisa Pensup and Pawanrat Saengsiriroj.(2012). Behavior and Satisfaction of Thai Tourist towards Tourism, Raksawarin Hot Spring, Ranong province, Thailand. Suan Sunandha Rajaphat University, Thailand.
Thai Spa Association. (2014). Spa Industry Study 2014. Retrieved from https://www.thaispaassociation.com/uploads/userfiles/file/2014_Spa_Study_Final.pdf
Uemthip Srithong.(2016). Hot Spring (Onsen): An Innovation of tourism Management for Health Participation, and Therapy by Community's. Journal of MCU Social Science Review, 5(2), 179-192.
Veerada Somphoch. (2011) Sustainable health and wellness tourism development of Ban Phon Rang hot spring in Ranong province, Thailand . Bangkok University Research Conference. 660-671.
Wanarat Kornitsaranukoon, Nuanphan Toyjalearn and Sunan Omkatum. (2011). Community Participatory Development of Natural Hot Springs for Health Tourism: A Case Study of Praruang Hot Spring, Kamphangphet Province. Academic Conference of Khonkaen University in 2011. 32-138.
Watsamon Boonrung . (2014). Demand for Spa Services in Bangkok Metropolis. The Journal of Department Administration Research, 4(2), 15-23.

Homeopathic approach to cancer
treating and palliating the cancer cases homeopathic way

DR.P.T.VENKATESAN THIRUSAILAM.M.D.
india.drbellwinhomoeofoundation@gmail.com

Introduction:

Homoeopathy is a holistic medical system founded by Dr,Hahnemann from Germany. Hahnemann choose Similia way to treating disease. Hahnemann followed Hippocrates and paracelsus way to treat disease , strongly believe disease is a morbid state of mind ,body and soul. and Hahnemann strongly believed deranged vital force or vital energy can cause all the disease, when you look a person as a whole than the parts of the body.Either common cold or cancer same way Hahnemann treat the disease as a whole. Hahnemann found 8 cardinal principle of homeopathy 1.Law of similia 2.Law of simplex 3.Law of minimum dose 4.Doctrine of drug proving 5.Thoery of chronic disease 6.Theory of vital force 7. Doctrine of drug dynamisation 8.Doctrine of individualisation

Cancer, as with all chronic diseases, if untreated, will lead to death. The imbalance that leads to cancer occurs first on the general level. As the disease brought about by the imbalance of the Vital Force progresses, the cancer tumour manifests at the local level. A person's inherent susceptibility predisposes them to developing cancer. If the imbalance isn't addressed, the local manifestation of the disease will take form in a particular part or system that is weak or sensitive.
As Homeopathic treatment directly addresses the energetic imbalance of the Vital Force, it is a useful tool in both the treatment and the prevention of cancer. Samuel Hahnemann states: "When a person falls ill, it is initially only this spirit-like, autonomic life force (life principle), everywhere present in the organism, that is mistuned through the dynamic influence of a morbific agent inimical to life. Only the life principle, mistuned to such abnormality, can impart to the organism the adverse sensations and induce in the organism the irregular functions that we call disease."

Since the Vital Force is weakened by the overgrown pathology, cancer may initially be treated as a one-sided disease. Hahnemann states: **"Diseases that appear to have only a few symptoms are termed one-sided because only one or two main symptoms stand out, almost obscuring the rest of the befallments. Because of this, these diseases, which belong chiefly to the class of chronic diseases, are more difficult to cure."** Indeed, cancer is challenging to the Homeopathic Practitioner as the patient presents with a paucity of symptoms and the enormous burden of the pathology seems to have taken them over. If the Homeopath reads further into the Organon, he will find that **"if one selects an internal medicine, directed at the whole, which is fittingly homeopathic, it will cause the most salutary alteration, the recovery of the whole human being, along with the disappearance of the external malady, without the assistance of an external means."** Furthermore, "By means of this medicine, taken only internally, the general disease state of the body is lifted simultaneously with the local malady...proving that the local suffering depended simply and solely on a disease of the rest of the body and was only to be regarded as an inseparable part of the whole." This is the beauty and the strength of Homeopathy; it's ability to address both the underlying energetic imbalance of the Vital Force and the outwardly manifested localisation of the individual's diseased state.

In history Dr Compton Burnett who was the first homoeopath, treat successfully many cancers and tumours.and he published book curability of tumours with lot of evidence, he is the father of homeopathic oncology

Dr A.H.Grimmer [1874-1967] did wide range of cancer research and introduced many unused remedies for cancer treatment ,Dr.Blackwood and Dr .Bernoville introduced specific therapeutics for each type of cancers .

Now homeopathy having more than 1000 drugs to treat specific cancer according to parts which involved, still constitutional therapy ahead than specific treatment

cancer -a view according to homoeopathy

In modern medicine believes cancer is caused by accumulated damage to genes,such changes may be due to change or exposure to a cancer causing substance…occupational risks,,,Chemicals,Smoking,Viruses, Obesity,Hormones,Chronic inflammation and lack of exercise etc….They consider this is only cause of cancer..But homeopathy believe grief,Depression,Anxiety, Apathy ..This causes more cancer than smoking or any other reasons..Mind is prior to the man..A man suffered cancer stomach after two years of his son death, A businessman suffered prostate cancer immediately after huge business loss, a children suffered brain cancer after vaccination much more cases…..

till the medical world believe cancer is a local origin,in homeopathic philosophy Dr Hahnemann very clearly define what is disease? disease is nothing but decreased vital force… what is vital force? vital force is the invisible force that ruled and animates our body, Hahnemann clearly explain any damage or any derangement in vital force is called disease

vital force is normal means person is active physically and mentally according to the situation. if the vital force is deranged means change in the mental equilibrium later physical symptoms appears,if no vital force the person is dead.

Hahnemann believes disease arises through miasms[genetic], as well vital force derangement the major two causes of disease

How to treat cancer in homeopathy

1. Classical way
2. According to specific parts or organs involved

1. Classical way

Classical way gives more wonderful results , It cures the cancer most of the time
classical way, we need to listen the patients complete history , family situation, desire and aversion,thermal relationship and mental makeup of the patient all, we individualised treatment according to their data, and select the drug according to their personality and miasmatic expressions.this is called as constitutional remedy.but constitutional therapy is not so effective in terminal stage of cancer.

due to severe pain and fear of death dominating in cancer cases even they never say very clear picture about them such a case constitution therapy is not give much result

2**. Specific treatment:**

Prescribing against the specific type of cancer or specific parts involved. for example prostate cancer -Conium is the specific remedy. cancer stomach- ornithogalum is the specific remedy, in this methodology gives better relief but mostly palliating the case . as well prolong the death and lesser suffering.

Why homoeopathy is best treating cancer?
Homoeopathy is very effective in cancer cases, Homoeopathy medicine reduce the suffering not only physical level mental level too,

Homoeopathy cost effective, Its not very costly like chemotherapy and radiation

Homeopathy is not having any side effects- like chemotherapy homoeopathy is not having any side effects like hair falling, vomiting, weight loss etc.homeopathy boost the health make the cancer patients live very well.no nauseating drugs ,

Homoeopathy so superior than any system of medicine treating cancer , because homeopathic drugs is a dynamic drugs , it has not having any chemical or minerals or plant substances ,but it contain their energies , that energies stimulate weekend immune system without damage any further cells

latest research on homeopathic oncology

In an animal model study, the inhibitory effects of potentised preparations of ***Hydrastis***, ***Lycopodium, Ruta*** and ***Thuja*** against sarcomas that were induced by 3-Methylcholanthrene in mice as well as hepatocellular carcinoma induced by N'-nitrosodiethylamine in rats was studied. Biochemical, morphological and histopathological evaluation revealed that the reduction of elevated marker enzymes and tumour size. Among the four used medicines, ***Ruta*** **200c** was most effective in reducing tumour size and incidence of sarcomas. A homoeopathic medicine, ***Chelidonium*** in ultra-low doses showed anti-tumour and anti-genotoxic potential against hepatocarcinoma that was induced by azo-dye mice. **Condurango** ethanolic extract and tincture showed antiproliferative action in lung cancer through apoptosis. In another animal study. Anti tumor and anti metastatic effects of various homeopathic medicines were studied in mice against transplanted tumors. ***Hydrastis*** and ***Ruta*** significantly increased the lifetime of Dalton's Lymphoma Ascites and Ehrlich Ascites Carcinoma induced tumour -bearing mice. Moreover, these medicines showed marked reduction of solid tumour volume on the 31st day after tumour inoculation. Most of the ***Hydrastis*** **1M**-treated animals were completely tumour free. ***Hydrastis*** **1M,** ***Lycopodium*** **1M** and ***Thuja*** **1M** exhibited antimetastatic effect in B16F-10 melanoma-bearing animals. These medicines showed inhibition of lung tumour nodule formation and decreased levels of γ-GT in serum.Undifferentiated lung cancer, a woman with leiomyosarcoma and a child with an astrocytoma, were treated with a new homoeopathic approach of carcinogen-induced apoptosis. A homoeopathic medicine, ***Sulphur,*** showed anti-apoptotic effect in non-small cell lung carcinoma cells.***Sabal serrulata*** mother tincture showed the reduction of prostate tumour xenograft size significantly in an*in vivo* trial. Moreover, ***Sabal serrulata*** decreased PC-3 cell proliferation and DU-145 cell proliferation. Permixon, a lipidosterolic extract of ***Sabal serrulata,*** is being used to treat symptoms of benign prostate hyperplasia (BPH). It treats BPH by activating the permeability of transition pore of mitochondria, NF-KB apoptotic pathway and inhibition of 5-α reductase inflammatory-related gene. Insufficient research hinders to prove that ***Sabal serrulata*** is the right medicine for prostate cancer. ***Thuja*** along with ***Conium*** and ***Sabal serrulata*** in combination can assure more effective treatment against BPH. In another research study, 220 patients of metastatic pancreatic cancer were administered by ***Viscum album*** sub-cutaneous 3 times weekly. Those who took this therapy needed no more anti-cancerous therapy. In those patients, brain metastasis was not observed. The patient receiving ***Viscum album*** as anticancerous remedy showed increase in the survival rate by 4.8 month and patients who took no treatment the survival rate was 2.7 month. P-dimethylaminoazobenzene-induced hepatocarcinogenesis mice model which induce cytological changes such as chromosomal aberration mitotic activity and also chemical changes and reduced aspartate transaminase, lipid peroxidation, reduced glutathione carcinogenic changes was used to determine the anticarcinogenicity of ***Natrum sulph*****.** These changes were reduced by *Natrum*

***sulphuricum*. *Natrum sulph* 200** showed effective potential to reduce cancer as compared to ***Natrum sulph* 30.*Lycopodium clavatum* 5C a**nd 15C administration have any anticancer effects on human cervical cancer cell line HeLa cells by causing cell death through apoptosis in cancer cells. It induced DNA fragmentation, the increases in the expressions

Anecdotal evidence showed the effectiveness of following medicines in different types of carcinomas.

- ***Calcarea flour*** for breast cancer with hard and stony lumps
- ***Lapis albus*** for scirrhus and uterus malignancies with burning where oozing of fluid is black and putrid
- ***Silicea*** can be used as adjuvant to reduce cancer pain and also sarcoma with yellow and offensive discharge
- ***Hecla lava*** is a bone cancerous remedy
- ***Baryta carb*** for scattered lipomas
- ***Baryta iodium*** can cure ovarian cancer and mammae cancer with tuberculosis tinge
- ***Plumbum iodium*** in mastitis and induration of breast
- ***Bromine*** is a remedy for mammae cancer
- ***Phosphorus*** is used for cancer with bleeding tendency
- ***Iodium*** can be used for uterus cancers
- ***Cicuta virosa*** for epithelial cancer
- ***Kali sulph*** for facial epithelial cancer
- ***Cedron*** can be used to reduce the lancinating pains of cancer.

Adjacent therapy

Homeopathic medicines used as a adjacent therapy after and during chemotherapy, there is no contra indication occurs when use along with any therapies,

R**eferences**

Burnett, J.C. (2000). *Curability of Tumours by Medicines*. B Jain Publishers.

Currim, A.N. (1996). *The Collected Works of Arthur hill Grimmer M.D*. Hahnemann International Institute for Homeopathic Documentation.

Hahnemann, S. (1993). *Organon of Medicine* (6th ed.). B Jain Publishers.

Hahnemann, S. (1995). *Chronic Diseases*. B Jain Publishers.

Value-added Development: A model for Creating Joint Activities between Local Food Tourism and Health Tourism

Puri Chunkajorn

Culinary for Health Program, College of Integrative Medicine, Dhurakij Pundit University, Bangkok, Thailand. Email: chefmungon@gmail.com

Abstract

This academic article is an analysis of value-added development through defining a model for the creation of joint activities between local food tourism and health tourism. The first step in the analysis will be that of the customer segment in conjunction with the analysis of the properties and values of products or services (value proposition). This analysis will help reveal the difference in demand between food tourism and health tourism. Furthermore, the article will go on to analyze the design process. This will be done by examining various data related to the activities of both food tourism and health tourism. This process will be able to effectively determine the forms of joint activities between the two types of tourism.

Keywords: Value-added development, local food tourism, health tourism

Introduction

Currently, tourism in Thailand continues to grow. This is apparent from the number of tourists who visited the country within the first 7 months (January – July) of 2018. In this time, Thailand received 22,657,730 foreign tourists. This is an 11 percent increase from the same period the previous year. In total, these tourists generated a revenue of 1.8 trillion baht. There was a significant increase in revenue from tourists coming from China, Russia, India, and Malaysia. The number of local Thai tourists also increased during this same period in 2018 with 74.96 million tourists accounting for an increase of 4.68 percent and a total revenue of 519 billion. This means that collectively, Thailand has an income from the tourism sector of 1.701 trillion baht, a 122.87 percent expansion rate. This growth rate has resulted in intense competition in the tourism sector and has brought about new trends in tourism including the introduction of new tourism technologies. This has also forced related operators to adjust their strategies to cope with the challenges of this new competition (Kasikorn Research Center, 2018)

However, this current competition has inevitably resulted in various trends directly and indirectly involved in business, in particular, tourism business. These new trends can be seen in the behavior of tourists as well as the different forms of demand from the sector. Data from

PhocusWire (2017) indicated that 36 percent of tourists are willing to pay more to enjoy a better personal experience. This information may imply that some tourists have the desire to receive services or have interest in products that are suitable to their personal needs. This behavior may be an important factor that has contributed to the increase in tourism trends towards offering more options in order to add more value (Kasikorn Research Center, 2018)

The word value is a mental price evaluated from the comparison between what is received and the cost of what has been lost in order to obtain it. The value of each thing may be uncertain. One thing may have a different value depending on the situation, the environment, its characteristics, and individual feelings toward it. There are many different ways to create value added products or services such as developing new features, improving the image, branding, offering additional services, in addition to many others. Choosing a method to add value in line with customer needs requires a systematic thinking process. Various concepts must be screened before any are actually used to create added value in order to ensure that such methods are able to attract customers to buy products or use services in such a way that they create real success for the business (Department of Business Development, 2016)

Creating added value for the tourism business can be accomplished in a variety of ways. This is particularly true of food tourism as it is seen that Thai food is currently garnering a lot of popularity. The number of Thai food restaurants are growing a lot in foreign countries resulting in the expansion of the Thai food industry. In addition, now that Thai food is more well known to tourists, visitors to Thailand now have the knowledge to choose from more local dishes. This encourages tourism to better experience life and culture in each region and local community of Thailand. It is also an important tool in driving the tourism industry towards a higher potential for sustainable tourism development. In addition, the value of the food obtained through food tourism is a necessity for the health of the consumer. This way of thinking about food requires taking various factors into account, specifically, nutrient factors. Nutritional value effects the body. Therefore, it can be said that food tourism is an interdisciplinary tourism concept that can connect various sciences together to reflect cultural knowledge through food consumption without strict rules (World Tourism Organization, 2012, Benjamaporn Chamnancha, 2018; Santich, 1996; Kesimoglu, 2015)

Thai food is considered a cultural heritage that represents what it is to be Thai since ancient times. It has become widely popular throughout the world because it is well known for its flavor, nutritional value, its adherence to the food groups, and its use of many herbs and spices beneficial to physical health. Due to the increase in health tourism, food tourism has, as a result, become more important as well. Health tourists traveling to Thailand are often looking to experience other types

of tourism as well. Therefore, both types of tourism which are the focus of this article can be offered together which will add value to the tourism industry in Thailand.

Concept of value creation

Guidelines for creating value added products or services can be done using 2 conceptual frameworks for development (Department of Business Development, 2016). Namely:

1. Value Proposition Canvas

This conceptual framework was developed by Alexander Osterwalder, owner of Business Model Canvas, a business modeling tool that is widely used in professional circles. This tool is used to create added value for businesses by assisting in the development of products or services that can meet the needs and preferences of customers. The tool consists of 2 main parts: 1 , customer segment which is the study of the customer or users of the business, and 2, value proposition, which is an analysis of the properties and values of the products or services of the business. These 2 things must consistently support one another.

Once a detailed analysis of the customers' needs has been conducted, it can be determined how much the products or services match the needs of the customers. In addition, it also indicates what should be done or fixed in order to encourage customers to choose the product or service. This method is considered as a guideline for creating added value for businesses. Customer data analysis can be done using customer segment. The canvas can be used to find the actual needs of the target customers consisting of:

Part 1 , studying the basic needs of customers, specifying the basic needs of customers so that the product or service can fill both emotional and physical requirement. Take emotion, for example. If a customer wants to exercise, one of the features that must be met is most likely comfortable, ergonomic athletic footwear.

Part 2 , problems, concerns and difficulties customers have in using the product or service. This could also be an issue or poor experience after having used the product or service from a business or one of its competitors. This is a negativity that now exists in the mind of the customer. For example, athletic footwear that falls apart when it gets wet.

Part 3, Other special expectations more important than basic requirements and other options. Customer expectations are specified in addition to fulfilling their basic needs, and what products and services they want on the market. Things that impress customers on an experience level such as the quality of service or after sales service. For example, athletic footwear that can be customized to the customer's liking.

In addition, value proposition canvas is used to design models for the additional choices of products and services. This is in order to determine the value that will be delivered to the customers through these products and services. Customers are happy when they receive what they want, have

a good experience, or when they are able to solve a problem with which they were faced. Using this canvas will help businesses fulfill the needs of their customers, offer solutions to problems, or build customer satisfaction. The canvas consists of:

Part 1, the value that the product or service has for the customer. Identifying what value will be added to meet Customer Jobs requirements. Considering the characteristics and benefits that customers want and conclude which products and services should be offered by the business and what features they should have.

Part 2 , Pain Reliver. Preventing, solving, or alleviating customer problems. Identifying things to solve these issues and help the customer. It's important to address the customer's pains. For example, how can customers be facilitated? How can customer concerns be relieved?

Part 3 , Creating an impression with Gain Creator. Identifying things that will impress customers. It is important to attempt to satisfy all requirements. It is also a good way to present additional things in addition to the basic benefits of the products and services. This can show the customer that the business can do more to help them and add value to the business. For example, Fast Track service.

2. Design Thinking Process

This is another concept of value-added development that is no less interesting than the value proposition canvas. The Design Thinking Process was developed by Hasso Plattner at the Institute of Design (d. School) at Stanford University. It starts with understanding the problems and needs of the customers and then brainstorms ideas to create value or to solve various problems. This is accomplished through group testing and experiments based on samples reflecting the target customers. From there, the products and services are developed in order to meet the identified requirements. There are 5 important steps:

Step 1 , Understanding customers. This requires an in depth understanding of customer causality, action, needs, ideas, and values.

Step 2 , Determining customer needs. Identifying the things that affect customer buying behavior. The issues examined in step 1 must be used in order to see the relevance and to group ideas systematically.

Step 3 , Brainstorming. This process requires many people working as a team to develop products and services that meet customer needs and feelings. It's important to identify fixes for products and services that are still unable to meet the requirements.

Step 4, Creating a prototype or simulation product. This is where the idea becomes tangible. This is to better see the overall picture and examine the results of the new products and services more clearly.

Step 5 , Market testing. This is where the prototype or simulation product is used to gauge customer opinion. By allowing customers to try it, valuable feedback and data is acquired that can then be used to improve the actual product or service.

It can be seen that both concepts are related as the value proposition canvas can be a conceptual framework that can be used in the design thinking process of defining customer needs (Ideate)

Food Tourism Concept

Food tourism is part of the UNESCO's creative cities network. Therefore, food and tourism issues are ones of great interest to scholars. Study on those topics has revealed that food is a major part of creative tourism activities that has artistic, cultural, and social value. This is easily seen in society, in particular, within regional delicacies that can serve as incentive for tourists from different cultures to come for the opportunity to enjoy new types of food. (Scarpato, 2 0 0 2 ; UNESCO, 2008). That is, food can serve to enhance the tourism experience. Food is a medium that encourages tourists to consider new travel destinations (Cohen & Avieli, 2 0 1 0). Often, regional foods are used to create a travel brand. Food may even serve as a tool in the development of strategies to attract tourists both locally and nationally (Hall & Mitchell, 2 0 0 0 ; Hall & Sharples, 2003)

Food tourism has become a subject of much interest today and has become one of the fastest forms of tourist attractions in recent years. It can be seen that tourism businesses in many countries have become aware of the importance tourists place upon their satisfaction with food. It's not just that food is consumed to satiate hunger, but that it can bring about new experiences. Food even serves to encourage learning about new cultures, and different ways of life (Yanapa Boonprakob and Faculty, 2017).

The importance of food tourism can be summarized as follows (Hall, 2003):

1) Makes tourists aware of the importance of local food culture.
2) Is an element of promotion for tourism marketing.
3) Is responsible for the development of agriculture and the local economy.
4) Is an important part of the market competition
5) It is an indicator of prosperity, both globally and domestically.
6) It is an essential product or service.

Tourism for the sake of learning about food is not a new thing in the tourism industry. However, various scholars and travel experts have brought food back as a topic of education as they have seen the surge in importance of food tourism. Food tourism ties in with learning about culture, society, environment and economy. It has received much attention due to its popularity in the following areas:

1) The global society is interested in the foods of different cultures.
2) There is a growing number of new and exotic places to eat.
3) Promotion of food-based marketing is a new way of attracting tourists.
4) Going out for food is creating more experiences than eating at home. It is a form of cultural exchange.
5) Food makes tourists feel and experience a travel destination on a different level, specifically, a sense of place (Hall, 2003). It is something unique to each location. While, with globalization, food is now influenced by a number of outside factors and places making it difficult to distinguish the characteristics of food according to geography, weather, or history, it is still considered a cultural exchange that is constantly changing.

The motivations of tourists who choose food tourism are (Special Area Development Organization for Sustainable Tourism, PSU):

1) Pleasurable Experience, the need to fulfill both happiness and experience.
2) Grounded, the need to indulge in the raw ingredients in the countryside to study methods of food production.
3) Curiosity, the need to find knowledge and discover new things.
4) Self-expression, the need to express differences and identity.
5) Anxiety, the need to relax by eating and drinking while traveling. Indulging in local food or familiar food is an escape from everyday life provided they aren't things that are eaten regularly.

Therefore, any tourist attraction often has food as a means to help promote it. Food tourism is a very effective marketing strategy for competition in the tourist industry. It serves to attract more tourists while creating satisfaction for them. It generates income and results in a better quality of life for the local people. It even helps to preserve the local culture and customs (Ritchie & Crouch, 2003)

Health Tourism Concept

The Tourism Authority of Thailand (2008) provided the meaning of health tourism: it is a form of travel to visit beautiful destinations for both culture and nature as well as to learn about lifestyle and recreation. However, part of the travel time is also dedicated to doing health promotion activities and health rehabilitation activities.

Gee et al (1989, quoted in Douglas, 2001) gave a different definition for health tourism: it is a trip to a destination in a country or natural area to escape from the monotony and to calm the minds of businessmen.

Wanna Wongwanich (2003), gave yet another definition for health tourism: it is traveling to relax in the midst of nature, learning to use natural energy to treat and strengthen health, and refresh the mind. This is coupled with tourism to see local cultures and to take what has been improved back home to add to the quality of life.

In summary, the definition of health tourism is that it is a form of tourism that aims to promote health and/or offer treatment and rehabilitation. It is type of travel that combines healing and restoration both physically and mentally in conjunction with a consciousness for conservation of tourism resources and the environment in both natural and cultural attractions.

Health tourism in its main form is a leisure activity coupled with health care for tourists. Health tourism can be divided according to 3 different levels of health characteristics, namely:

1. Tourism to maintain the health of tourists who are already in good health. This form of tourism is becoming highly popular around the world because many people have begun to focus on maintaining their health in this current degraded environment through taking care of themselves in both body and mind in the form of meditation, yoga, tai chi, mineral baths or spas, traditional massage, eating herbs, eating healthy, and getting plenty of rest in the fresh air. Thailand offers plenty of health tourist attractions for health care such as the traditional massage at Wat Pho, or meditating at Buddhist temples.

2. Restorative health tourism. Tourists need fresh air in a natural environment, healthy foods, and gentle exercise to restore health. Tourist attractions that offer this form of service include beach resorts.

3. Tourism to treat disease or illness. This type of health tourism is quite popular. Medical expenses in Thailand are far cheaper than in many foreign countries. In addition, Thailand offers very experienced, professional doctors in a variety of fields such as dental practice, hip replacement, knee replacement, and cosmetic surgery for starters.

In addition, health tourism may also be divided according to purpose as follows:

1. Health promotion tourism is a form of travel for leisure. By visiting beautiful sights in natural attractions, tourists are able to enjoy new cultures and learn about a different, more comfortable way of life. Dividing time between tourism and activities to promote health both within and outside of their respective accommodations, tourists can enjoy a number of treatments in accordance with medical science such as hot spring bathing, Thai massage, herbal steam, aroma therapy and water therapy. The main purpose of health tourism is the promotion and maintenance of physical and mental health. Medical treatment, health restoration and the opportunity to exchange experiences and be a part of social gatherings for better health are all things that can bring about behavioral changes. They also benefit tourists by introducing new attitudes and values to promote and maintain self-health. This sort of promotion can be expressed in the form of exercise and sports,

controlling body weight, healthy food choices, herbal drinks full of health benefits, calming the mind by practicing meditation, and using medicinal herbs with fewer side effects.

2. Health healing tourism, or medical tourism, is a form of travel for leisure. Time is divided between tourism and therapeutic or rehabilitative activities. These are varied according to medical science and at a very high standard. Some forms of care include: physical examination, dental practice, dental care, hip replacement surgery, knee replacement surgery, cosmetic surgery, sex conversion etc. These are conducted in quality hospitals and clinics.

In summary, health tourism consists of tourism activities in natural environments, cultural health tourism, eating properly to strengthen the body, relaxing the mind to eliminate stress, as well as treating the body through spa services, massages, mineral baths, hot springs, mediation practice, reducing fat, reducing stress, exercise, healthy eating practices etc. Health business operators that offer some of these services include: health resorts, hot springs, mineral pools, health centers, and hospitals or other healthcare facilities.

Analysis for value added development for local food tourism and health tourism

When analyzing value added development for local food tourism and health tourism, its important to adhere to guidelines for creating products or services for businesses. Data can be analyzed as follows (Department of Business Development, 2016)

Conceptual framework 1, value proposition canvas

This conceptual framework is a two-part data analysis consisting of customer data (customer segment) and the properties and value of products or services (value proposition). Such data analysis can be applied to that of food tourism and health tourism as follows:

Based Tourism	Local Food Tourism	Health Tourism
Customer Segment	- The need to enjoy both the feeling and the experience of food. - The need to indulge in the raw ingredients from the countryside in order to study food production. - The need to attain knowledge and discover new food related things. - The need to show difference, specialty, and identity. - The need to relax by eating and drinking while traveling as well as escaping from everyday life through	- The need to maintain good health through exercise, mediation, yoga, tai chi, mineral bath, spa, traditional massage, eating herbs, eating healthy, and resting in fresh air in nature. - The need to recover - The need for fresh air in a natural environment, eating healthy, gentle exercise to restore health. -The need to treat illness or disease.

	the consumption of local delicacies and familiar foods that aren't eaten regularly.	
Value Proposition	- Food in tourist attractions isn't just for consumption, it's also about creating new experiences and offers an opportunity for an exchange of culture, society and a local way of life. - Food makes tourists feel and experience a travel destination on a different level. They get a real sense of place.	- There are activities in accordance with medical science of a very high standard. - Travelers have the opportunity to exchange experience in social gatherings in order to promote good health. - There are changes in behavior, attitudes, and values about promoting and maintaining complete self-health.

Conceptual Framework 2, Design Thinking Process

The conceptual framework in this section is data analysis which will done as follows:

Step 1, Understanding customers. This requires a deep understanding of customer causality, needs, ideas and values. Business and tour operators in food tourism and health tourism must study target tourist groups in order to identify the types of needs and wants they should address and how they should go about doing that.

Step 2, Determining customer needs. This step requires an identification of the things that affect customer buying behavior. This is linked to a variety of issues from the first step so it's important to see the relevance and by able to group the ideas systematically. Business operators in the food tourism and health tourism industry must present a type of tourist activity that is different from the basic requirements of step 1. The activity should be useful and able to bridge the gap between food tourism and health tourism.

Step 3, Brainstorming. This step requires ideas from a group to create or develop products and services to meet the needs or wants of the customers. It's important to find a way to fix or fill whatever the current products and services on offer are unable to fully address. Business operators in the food tourism and health tourism industry must cooperate with one another in presenting ideas for activity design for the target customers. This can be done by organizing regular meetings both before and after service in order to develop and improve service efficiency and create greater satisfaction for the tourists.

Step 4 , Creating a prototype or simulation product. In this step, the idea chosen in the brainstorming step (ideate) is developed into a tangible form that customers can understand and experience. This is so that a better overall picture is gained and it becomes more apparent how the products and services should be modified. Business operators in the food tourism and health tourism industry must jointly formulate activities that help both local tourisms, and promote health.

Step 5, Market testing. This is the step where the prototype or simulation product created in step 4 is used to test customer opinion by letting them try it out for themselves. Feedback from this process will help to improve the product or service even more. Business operators in the food tourism and health tourism industry must look at target groups of tourists as well as evaluate the tourism activities in order to assess the product or service. These results can then be used in another meeting to work together and develop local food tourism and health tourism activities more effectively.

Model for creating joint activities between local food tourism and health food tourism.

This article will present a number of examples for joint activities between food tourism and health tourism in order to show that these two forms of tourism can go hand in hand to add value to the overall tourism model.

Day 1

- Knowledgeable staff welcome and provide advice.
- Lunch is provided. It consists of local food made with a variety of vegetables. The benefits of each vegetable are explained.
- Health examination.
- Lectures and demonstrations on preparing healthy food
- Relaxing activity such as mediation, yoga, tai chi, mineral bath, spa, or traditional massage.
- Dinner. The menu should evoke Thai identity by serving dishes like local curries and soups made with various herbal ingredients.

Day 2

- Morning exercise activities
- Breakfast consisting of boiled rice and various grains.
- Relaxing activity such as mediation, yoga, tai chi, mineral bath, spa, or traditional massage.
- Lecture on healthy eating
- Lunch is provided. It consists of local food made with a variety of vegetables. The benefits of each vegetable are explained.
- Healthy cooking class using herbs.

- Dinner is made up of the food prepared during the cooking class.

Day 3

- Sun bathing and detoxification with natural herbs.

- Breakfast consisting of boiled rice and various grains.

- Leisure activity such as playing games in the pool for improved circulation, listening to sounds for sleep, cycling in natural areas, or yoga for physical relaxation and mental balance.

- Lunch consists of local delicacies and various vegetables. The benefits of the vegetables are explained.

- End of the program.

Such activities can create added value for tourists because they address tourist needs and wants as much as possible. This means they will be able to receive more overall value from their experience especially if there is a limited amount of time. Therefore, it can be seen that joint activities between food tourism and health tourism can benefit many different businesses at once and create far more added value for the tourism business as a whole.

Reference

Center, K. R. (2018). *SME Tourism Trend*. Retrieved from https://kasikornbank.com/th/business/sme/KSMEKnowledge/article/KSMEAnalysis/Documents/Tourism-trend_SME-Opportunity.pdf.

Chamnancha, B. (2018). Gastronomy Tourism: Thailand's Competitiveness. *Apheit*, 103-116.

Cohen, E. &. (2010). Food tourism : Attraction and impediment. *Annals of Tourism Research*, 31(4), 755-778.

Development, D. o. (2016).*Value Creation Handbook. http://www.dbd.go.th/dowload/article/article_20161103115457.pdf.*

Douglas, P. (2001). Tourist Development. . *London: Pitman.*

Hall, C. &. (2000). We are what we eat: Food, tourism and globalization. *Tourism Culture and Communication*, 2, 29-37.

Hall, M. (2003). Food Tourism Around the World management and markets. . *Oxford: Butterworth-Heinemann*.

Kesimoglu, A. (2015). A Reconceptualization of Gastronomy as Relational and Reflexive. *Hospitality and Society*, 5(1), 71-91.

Organization, D. A. (n.d.). *Food Tourism*. Retrieved from www.dasta.or.th/th/.../840_da12f12c9915698bd10e50c811eba772.

Organization, W. T. (2012). Global report on food tourism. *AM report volume four. Madrid, Spain: Author.*

Santich, B. (1996). Looking for flavour. *Kent Town: Wakefield Press*.

Scarpato, R. (2002). Gastronomy as a tourist product: The perspective of gastronomy studies, in A.M. Hjalager and G. Richards (eds.), Tourism and gastronomy. *London: Routledge*.

Thailand, T. A. (2008). *www.elfhs.ssru.ac.th/phanitthat_pu/mod/resource/view.php.*

United Nation Educational, S. a. (2008). The 2008 Santa Fe UNESCO International Conference on Creative Tourism in Santa Fe. *Santa Fe . New Mexico. n.p.*

Wongvarnish, W. (2003). Geography of Tourism. *Department of geography The company's Board ofSocial science, srinakharinwirot University.*

Yanapa Booparkob, J. W. (2018). Local Food Wisdom of Lao Khrang Ethnic Group. *Dusit Thani College*, 93-108.

Functional Banana Flower Ingredients: Opportunities and Challenges for Innovative Food Entrepreneurs in the Thailand 4.0 Era.

Piyavit Thipbharos[a]

[a]College of Innovative Business and Accountancy

Dhurakij Pundit University

[a]Corresponding author, E-mail: piyavit.thi@dpu.ac.th

Abstract

This article presents the opportunities and challenges for food entrepreneurs in the Thailand 4.0 era, such as start-up enterprises, small and medium enterprises, or large–scale companies. In order to create more value for the business in a highly competitive era, the functional ingredients and properties of banana flower can be processed into innovative food products that are useful and valuable to both domestic and international consumers who are interested in maintaining good health. Banana flower is a vegetable that is cheap and in good supply in all regions of Thailand. The functional ingredients in almost every type of banana flower include essential fatty acids, amino acids, protein, dietary fiber, vitamin E, potassium, and phytochemicals. Such functional ingredients, in addition to providing nutritional value to the body, also have antioxidant properties. They can help to reduce the likelihood of tumors, prevent obesity and diabetes, and reduce tissue inflammation. They also have a gastro-protective effect, are anti-hyperglycemic, and prevent oxidative stress. They also have the ability to resist pathogenic microorganisms and resist the formation of rancid odors in food products as well.

Keywords: Functional ingredient, Banana flower, Opportunity and challenges, Innovative food entrepreneur, Thailand 4.0 era.

Introduction

People are becoming increasingly aware of the importance of good health that results from the consumption of beneficial food. Therefore there are opportunities and challenges for food manufacturers in the Thailand 4.0 era because this issue has received a lot of attention in the ASEAN region. The International Monetary Fund reported that the gross domestic product (GDP) of ASEAN is around 2.7 trillion USD, and the economy is expected to grow by 4.1 trillion USD over the next 5 years. The ASEAN market has a population of about 630 million people, which makes it the third largest market in the world. Thus, the trend of healthy food consumption will play an increasing role because consumers select only good products and require food that has been minimally processed. In addition, there is also global demand for food with medicinal properties, which plays a part in product selection prior to consumption as most consumers study the information on the functional ingredients on food packaging as to whether the product is beneficial to the body or has properties for the treatment and / or prevention of disease. Furthermore, the trend of meat consumption is decreasing as well, especially in European and American food markets. The number of vegetarians is also increasing, and new

protein food innovations are emerging. Consumers increasingly demand non-meat protein food sources both for the health benefits and to avoid the contaminants or chemical residues in meats (Small and Medium Enterprise Club of Thailand, 2018).

Thailand aims to be the "food kitchen of the world" but the export of traditional food products is difficult in such competitive markets. Thai entrepreneurs need to transform agricultural products to create new products by applying knowledge, science, technology and innovation to produce healthy, ready-to-eat food products. Although Thailand is the world's largest market for exporting hermetically sealed food, the market is saturated and the growth rate of the market in terms of both value and volume has decreased. However, it appears that ready-to-eat food products have the greatest sales potential both in the domestic market and the world market as mentioned above. Such products can be made by using functional ingredients and modern production processes and technology. This includes packaging to preserve food for a long time, and products that are convenient and easy to consume (Small and Medium Enterprise Club of Thailand, 2018; Management Association of Thailand, 2018). Another alternative for the research and development of ready-to-eat food with value and creativity is in the use of banana flower, which is a by-product of banana production in all regions of Thailand. According to research, the banana flower contains functional ingredients such as essential fatty acids, amino acids, proteins, vitamins, minerals, dietary fiber and phytochemicals.

In addition, these functional banana flower ingredients not only provide nutritional value to the body, but they also have bioactive properties in the nutraceatucals, which will be discussed below.

Business opportunities for entrepreneurs using banana flower in innovative food products

In addition, consumers want to have good physical and mental health, such as millennial consumers of school and working age who want to control weight and love to exercise or consumers who want to prevent diseases such as obesity, diabetes, stomach ulcers, heart disease, etc. Therefore, the business opportunities for Thai entrepreneurs include start-up enterprises. Small and medium enterprises and large operators can increase the choice of innovative food products by employing banana flower (**Figure 1**) in the research and development of products by applying knowledge, science, technology and production innovation to respond to consumer demand. It is an opportunity for Thai entrepreneurs to grow and compete in both domestic and international markets. There is empirical research to support such business (shown in **Tables 1 and 2**). Firstly, banana flower is a cheap vegetable that is widely available in every region of Thailand. Secondly, it can be consumed as a fresh vegetable (Fingolo et al., 2012) or as an ingredient in healthy food products. The primary material can be used as an ingredient. The variety of products according to the type of of food producer, i.e. dried powder (Wickramarachchi & Ranamukhaarachchi, 2005; Bhaskar et al., 2011), dried - finely chopped (Fingolo et al., 2012) , without dried-finely chopped (Sheng et al., 2010; 2011) , and liquid extract (Nyunt Swe, 2012; Sumathy et al., 2011) is shown in **Tables 1 and 2**.

figure 1: banana flower
sources: https://magentafitness.com/banana-flower/

Thirdly, banana flower has many benefits for health, including nutritional value, and consists of (1) essential fatty acids (Sheng et al., 2010; 2011) (2) amino acids and proteins (Florenta et al., 2017) (3) vitamin E (Schmidt et al., 2016) (4) potassium minerals (Zehla et al., 2018) (5) healthy dietary fiber, including lignin, cellulose, and hemicellulose (Krishnan & Sinija, 2016; Florenta et al., 2017) Flavonoids (Nyunt Swe, 2012; Marikkar et al., 2016) which are shown in Tables 1 and 2. Fourthly, Functional banana flower ingredients are phytochemicals, and it has antioxidant properties. There are the following bioactive nutritional properties: (1) It can reduce blood sugar levels (Marikkar et al. 2016); (2) It can prevent the occurrence of ulcers in the stomach (gastroprotective effect) (Khamboonruang et al., 2016); (3) It can prevent obesity and diabetes (Florenta et al., 2017); (4) It is able to resist tissue degradation (anti-inflammatory) and prevent diabetes (anti-obese effect) (Divya et al., 2016); (5) It can prevent the proliferation of cancer cells (anti-cancer) (Timsina & Nadumane, 2014); (6) anti-oxidation is a condition in which the free radicals in the body are so large that the body's antioxidants are insufficient, resulting in DNA, protein, fat and molecules of various sizes. People can suffer from various diseases (China et al., 2011) as detailed in **Table 1**. Fifthly, in the form of liquid extracts, it can be used as an ingredient in bio-polymer film for food packaging, which will effectively prevent growth in the number of pathogens in humans (Jahan et al., 2010; Tin et al., 2015), as detailed in **Table 2.** Finally, functional banana flower ingredients such as vitamin E, in addition to other health benefits, also have the ability to prevent the occurrence of rancid odor or unusual odor in foods that contain fat such as pork burgers (Schmidt et al., 2016) chocolates (Sharmila & Puraikalan, 2013) , and biscuits (Elaveniya & Jayamuthunagai, 2014) etc., which are detailed in Table 2, and do not need to use antioxidants in the form of synthetic chemicals sold commercially such as butylated hydroxyl anisole (BHA), butylated hydroxyl toluene (BHT) or propyl gallate (PG).

Challenges in creating innovative food products that contain banana flowers

Based on the literature review, it was found that some products that use banana flowers include biscuits (Elaveniya & Jayamuthunagai, 2014), chocolate (Sharmila & Puraikalan, 2013), pork burgers (Schmidt et al. 2016) patties stuffed with coconut cream (USDA & NIFA, 2018) Indian local food "Laddu" (Zehla et al., 2018) and food wrap film (Jahan et al., 2010) as shown in **Table 2**. These products use banana flower as an ingredient in the form of dry powder, liquid extract and chopped into fine pieces (both through drying and not drying), which can be seen as an example of product innovation. If the entrepreneur conducts research and development to create products for sale in Thailand, the products will be differentiated from both domestic and foreign competitors and entrepreneurs should give details of their product innovation and explain to customers what is currently being done. New concepts or technologies can be used to create new products as a result of research and develop activities. Thai entrepreneurs need to adapt to create business opportunities and face challenges in today's business world. Firstly, it is necessary to determine the target market. Entrepreneurs need to think about the problems by determining the needs or problems of real customers. For example, various data collection methods can be employed in the sensory testing of products to determine customers needs before production. When done, must not give up and not let go because the production of innovative food products is not as easy as it would mean, the research and development of innovative food products for customers, 10 products when able to produce 1 product until accepted both in quality and safety. If a product is successful, it must be continued, to build business opportunities and add more value. Secondly, the challenge is that Thai entrepreneurs must determine the strengths of the business in order to be able to stay competitive, such as the business of entrepreneurs, research and development associated with rancid flavors in powder or liquid extract from banana flowers to replace the import of rancid substances in synthetic chemicals and can make the entrepreneur's business to many other products, including various dried food products that contain fat as components such as snack products, dried food products from fruits and vegetables meat/poultry, dried food products, dried food products from the sea, etc., thus creating new business opportunities. Finally, entrepreneurs need to be aware of food product standards in terms of quality and safety from the upstream (raw materials), the water (production/storage during product distribution) until downstream (product distribution to customers/consumers) in order to create differentiation and value added for the products.

Table 1: Functional banana flower ingredients and properties

Raw Materials	Varieties /countries	Functional ingredients /properties	Authors
liquid extracts	*Musa* sp. (ABB) "Kluai Nam Wa" / Thailand	polyphenols / gastroprotective effect	Khamboonruang et al. (2016)
	Musa paradisiaca / India	polyphenols / anti-inflammatory ,and anti-obese effects	Divya et al. (2016)
	Musa paradisiaca / india	essential amino acids, proteins, vitamin E, polyphenols (polyphenols, and flavonoids) / anti – cancer, and antioxidative effects	Timsina & Nadumane (2014)
	Musa paradisiaca cv. Phee kyan and *Musa chiliocarpa* cv. Thee hmwe / Myanmar	potassium, polyphenols (alkaloids, glycocide, steroid, saponin, tannin, flavonolid, and terpenoid) / antioxidative effect	Nyunt Swe (2012)
	Musa paradicicus / India	antioxidants (polyphenols, and flavonoids) / oxidative stress	China et al. (2011)
	Musa acuminate / Malaysia	polyphenols (glycocides, tannin, saponin, phenolic acids, steroid, and flavonoids) /antimicrobial effect	Sumathy et al. (2011)

Table 1: (Continued)

raw material	varieties/country	functional ingredients/properties	authors
liquid extracts	*Musa balbisiana* / Malaysia	polyphenols (flavonoid, and phenolics) / antioxidative, and anti-hyperglycemic effects	Marikkar et al. (2016)
dried powder	*Musa acuminata* cv. Colla / Thailand	amino acid, proteins, and dietary fibers (lignin, cellulose, and hemi-cellulose) / non studied	Wickramarachchi & Ranamukhaarachchi (2005)
	Musa sp. cv. Elakki bale / India	dietary fibers (lignin, cellulose, and hemi-cellulose) and polyphenols / antioxidative effect	Bhaskar et al., (2011)
	Musa acuminata and *Musa balbisiana* / Cameroon	amino acid, proteins, potassium, dietary fibers / anti-obesity, and anti-diabete effects	Florenta et al. (2017)
	Musa sp. cv. Poovan and Monthan / India	dietary fibers, vitamin E, phenolic acid, and flavonoids / antioxidative effect	Krishnan & Sinija (2016)
chopped into finely pieces (dried)	*Musa acuminata* cv. Ouro / Brazil	potassium , and dietary fibers (lignin, cellulose, and hemicellulose)/ non studied	Fingolo et al., (2012)
chopped into finely pieces (non-dried)	*Musa baxijiao* and *Musa paradisiaca* / China	potassium, vitamin E, amino acids, proteins, essential fatty acids, crude fibers, and polyphenols (saponin, penolic acids, and flavonoids) / antioxidative effect	Sheng et al. (2010; 2011)

Table 2: Using banana flower as an ingredient and their properties

raw material	product (varieties/country)	functional ingredients/properties	authors
liquid extracts	biopolymer film (*Musa sapientum* / India)	polyphenols/antimicrobials (pathogenic bacteria)	Jahan et al., (2010)
	Biopolymer film (*Musa balbisiana* cv. Saba /Malaysia)	polyphenols/antimicrobials (pathogenic bacteria)	Tin et al., (2015)
	pork burger (*Musa cavendishii* / Brazil)	-polyphenols/antioxidative effect -vitamin E / reduce rancid flavor	Schmidt et al., (2016)
dried powder	chocolate non-specified varieties / India	-dietary fibers -potassium -vitamin E/antioxidative effect -flavonoids / antioxidative effect	Sharmila & Puraikalan (2013)
	biscuits (*Musa paradisiaca* / India)	-dietary fibers -potassium -polyphenols/antioxidative effect	Elaveniya & Jayamuthunagai (2014)
	Laddu (local food in India)	-proteins -essential fatty acids -dietary fibers -potassium	Zehla et al. 2018)
finely chopped, pieces	patties with coconut cream (coconut cream patties) / USA	-proteins -essential fatty acids -dietary fibers -potassium	USDA & NIFA (Land grant)

Past research frameworks and research gaps in the future

According to the findings of the above research on the study of functional banana flower ingredients and it to be applied in products (food and non-food) can explain the past research framework as shown in figure 2.

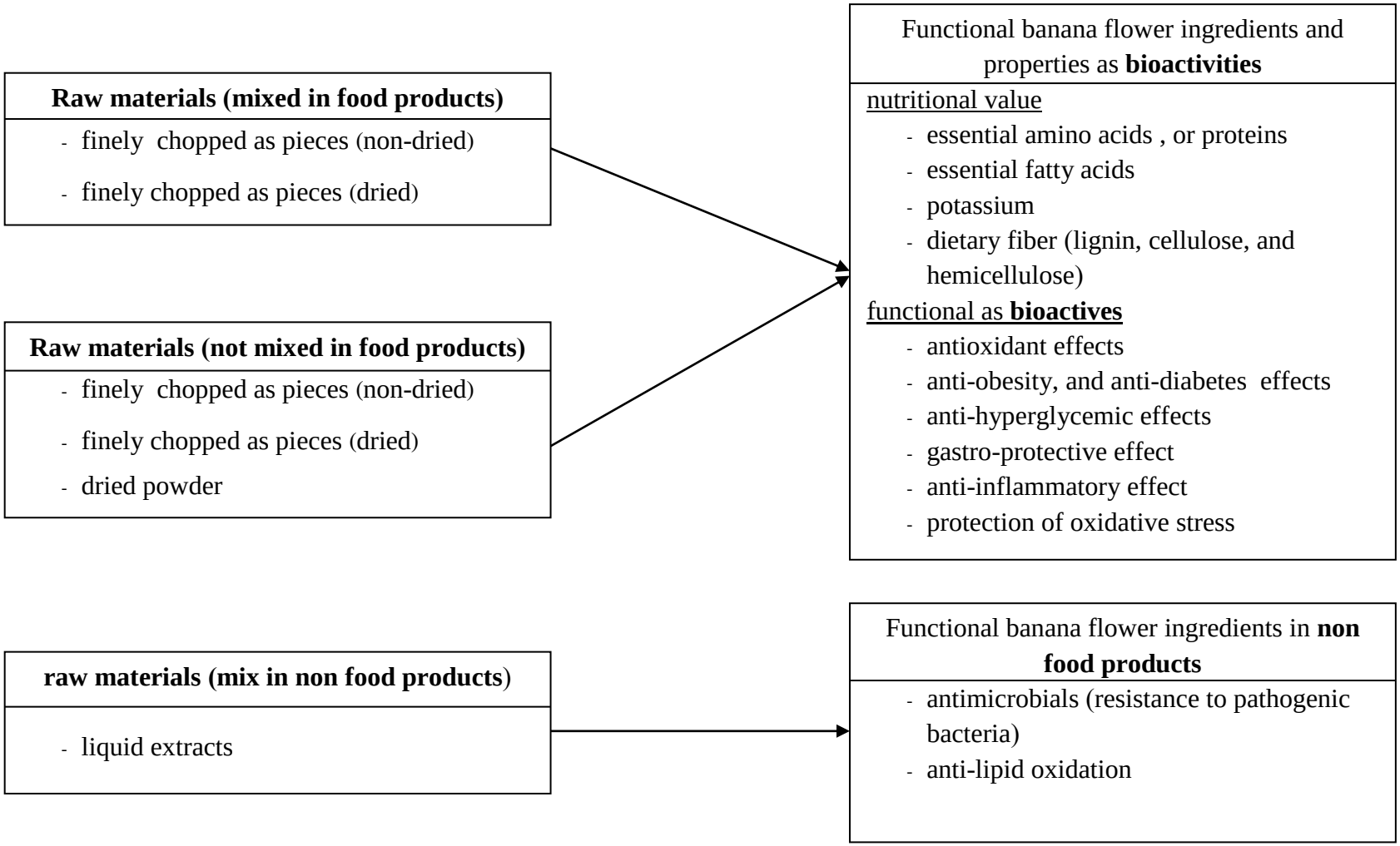


Figure 2 Past research framework

From the above past research framework, it is evident that most of the work was conducted in hot and humid continents such as in Asia, North America (South America) and Africa. However, Thailand has not been studied. Therefore, there are opportunities and challenges for Thai entrepreneurs to conduct research and development on the use of banana flower in each region to create innovative products that are beneficial in both domestic and foreign markets as follows: firstly, ready-to-use raw materials, chilled, frozen should be studied and the stability of substances that provide benefits in chilled and frozen products; secondly, Thai ready-to-eat food is popular internationally (savory and sweet foods); thirdly, healthy beverage products; fourthly, in-depth analysis of the types of essential amino acids that are needed for the body and finally, to analyze the influence of thermal processing on the loss of functional ingredients.

Conclusions and Recommendations

Many people recognize the importance of having good physical and mental health by consuming food that is beneficial to health in addition to regular exercise. In order to increase the choice and value for consumers and/or customers both domestically and abroad, Thai entrepreneurs can create innovative products by conducting research and development by applying knowledge, science, technology and innovation to respond to demand. Therefore, it is an opportunity and challenge for food entrepreneurs in Thailand 4.0 era. Banana flower is a vegetable that is cheap and available in all regions of Thailand. In regard to functional banana flower ingredients, almost all varieties of banana contain essential fatty acids, amino acids, fiber proteins, vitamin E, potassium, and phytochemicals (phenolic, flavonoid Curcumin). Banana flower also has antioxidant properties and nutritional properties such as anti-tumor proliferation; it prevents obesity,diabetes, and inflammation of the tissues and ulcers in the stomach and reduces blood sugar ,and prevents oxidative stress in the body. In addition, it can resist pathogenic microorganisms and resist the formation of rancid odor in food products.

Therefore, to use banana flower to maximize the benefits, entrepreneurs should employ open innovation techniques and educational institutions should conduct research and advise production operators .The government can also support inductries with law and help to develop markets. The fact that Thailand is going to be a giant in the food industry is not difficult, just all parties face each other and must not forget that research work is not used once and finished because the products that are made out soon will have people follow. Thus, wanting to see strong Thai entrepreneurs and focus on research and innovation Thailand will be able to walk, not to compete with price, but to use innovative research as a guide (SME Club of Thailand, 2018).

References

Small and Medium Enterprise Club of Thailand. (2018). *"Innovation-Reseach" Powerful tools to increase food business value*. Retrived on February, 2019 from http://www.smethailandclub.com/entrepreneur-2985-id.html

Management Association of Thailand. (2561). *Raise the Thai food industry with eco-system by open* innovation. Retrived on February 6, 2019 from http://thailandcompetitiveness.org/topic_detail.php?lang=Th&ps=102

Bhaskar, J. J., Mahadevamma, S., Chikunda, N. D., & Salimath, P. V. (2011). Banana (Musa sp. Var. elakki bale) flower and pseudostem: dietary fiber and associated antioxidant capacity.*Journal of Agricultural and Food Chemistry*, *60*, 427-432.

Divya, R. S., Venkatalakshmi, P., Vadivel, V., & Brindha, P. (2016). In vitro studies on the biological activities of flowers of banana (*Musa paradisiaca* L.). *Der Pharmacia Lettre*, *8*(10), 238-246.

Elaveniya, E. & Jayamuthunagai. (2014). Functional, physicochemical and anti-oxidant properties of dehydrated banana blossom powder and its incorporation in biscuits. *International Journal of ChemTech Research*, *6*(9), 4446-4454.

Fingolo, C. E., Braga, J. M. A., Vieira, A. C. M., Moura, M. R. L., & Kaplan, M. A. C. (2012). The natural impact of banana influorescences (Musa acuminate) on human nutrition. *Annals of the Brazillian Academy of Sciences, 84*(4), 891-898.

Florenta, A. W., Bih Loha, A. M., & Thomas, H. E. (2015). Nutritive value of three varieties of banana and plantain blossoms from Cameroon. *Greener Journal of Agriculture Sciences*, *5*(2), 53-61.

Jahan, M., Warsi, M. K., & Khatoon F. (2010). Concentration influence on anitimicrobial of banana blossom extract-incorporated chitosan-polyehylene glycol (CS-PEG) blended film. *Journal of chemical and Pharmaceutical Research*, *2*(5), 373-378.

Khamboonruang, P., Anuntasethakul, T., Navephap, S., & LeGrand S. M. (2016). The gastroprotecitve effects of the ethanolic extraction from Musa (ABB group) "Kluai Nam Wa" Flower in wistar rats. *KKU Sciences Journal*, *44*(2), 282-293.

Krishnan, A.,& Sinija, V. R. (2016). Proximate composition and antioxidant activity of banana blossom of two cultivars in india. *International Journal of Agriculture and Food Science Technology*, *7*(1), 13-22.

Marikkar, J. M. N., Tan, S. J., Salleh, A., Azrina, A.,& Shudri, M. A. M. (2016). Evaluation of banana (Musa sp.) flowers of selected varieties for their antioxidative and anti-hyperglycemic potentials. *International Food Research Journal*, *23*(5), 1988-1995.

Nyunt Swe, K. N. (2012). Study on phytochemicals and nutritional composition of banana flowers of two cultivars (Phee kyan and Tree hmwe). *Universities Research Journal*, *5*(1), 1-5.

Sheng, Z., Ma, W., Gao, J., Bi, Y., Zhang, W., Dou, H., & Jin, Z. (2011). Antioxidant properties of banana flower of two cultivars in China using 2,2–diphenyl-1-picrylhydrazyl (DPPH) reducing power, 2,2 –azoinobis-(3-ethylbenzthizoline-6-sulphonate (ABTS) and inhibition of lipid peroxidation assays. *African Journal of Biotechnology*, *10*(21), 4470-4477.

Sheng, Z., Ma, W., Jin, Z., Bi, Y., Sun, Z., Dou, H., Gao, J., Li, J., & Han, L. (2010). Investigation of dietary fiber, protein, vitamin E and other nutritional compounds of banana flower of two cultivars grown in China. *African Journal of Biotechnology*, *9*(25), 4888-3895.

Smathy, V., Jothy Lachumy, S., Zakaria, Z.,& Sasidharan, S. (2011). In vitro bioactivity and phytochemical screening of Musa acuminate flower. *Pharmacologyonline*, 2, 118-127.

Timsina, B., & Nadumane, V. K. (2014). Anti-cancer potential of banana flower: An in vitro study. Journal of the Bangladesh Phamacological Society, 9, 628-635.

Tin, H. S., Padam, B. S., Vairappan, C. S., Abdullah, M. I., & Chye, F. Y. (2015). Effect of preparation and extraction parameters of banana (*Musa balbisians* cv. Saba) inflorescence on their antibacterial activities. *Sains Malaysiana, 44*(9), 1301-1307.

Schmidt, M. M., Kubota, E. H., Prestes, R. C., Mello, R. O., Rosa, C. S., Scapin G., & Ferreira, S. (2016). Deveopment and evaluation of pork burger with added natural antioxidant based on extract of banana inflorescence (*Musa cavendishii*). *Journal of Food, 14*(2), 280-288.

Wickramarachchi, K. S., & Ranamukhaarachchi, S. L. (2005). Preservation of fiber-rich banana blossom as a dehydrated vegetable. *Science Asia Journal, 31*, 265-271.

Zehla, P. F., Vijayalakshmi, D., Suvarna, V. C., & Yatnatti, S. (2018). Processing of banana blossom and its application in food product. *International Journal of Current Microbiology and Applied Sciences, 7*(8), 1243-1250.

MedWellNet 1.2.2 Concept and Dimension of Wellness: A systematic scoping review

Naparat Srilapan[a], John Beaty[b] , Dr.Banchob Junhasawasdikul [c], Ramaimas ChankaoPhd.[a] and Sohnatda Panchee [b]

[a]Wellness Knowledge Institute (WKI), College of Integrative Medicine (CIM), Dhurakij Pundit University (DPU), Thailand. nprsrilapan@yahoo.com
[b]Burton and South Derbyshire College, Burton on Trent, Staffordshire, UK, john.beaty@bsdc.ac.uk
[c]College of Integrative Medicine (CIM), Dhurakij Pundit University (DPU),Thailand. dr.banchob@outlook.com
[a]Wellness Knowledge Institute (WKI), College of Integrative Medicine (CIM), Dhurakij Pundit University (DPU), Thailand. ramaimas.cha@dpu.ac.th
[c]College of Integrative Medicine (CIM), Dhurakij Pundit University (DPU),Thailand. sohnatda@lannaspaacademy.com

Abstract

The term of wellness has been applied in many ways. Although there might be different views on what wellness encompasses, this paper analyzes a concept of wellness and a compartment of wellness in difference regions of the world as well as in Thailand. --Along with the help of leaders in health and wellness--shared many interpretations and models of wellness. The purpose of this article is to find the meaning of wellness, dimension of wellness, addressing all dimensions of wellness in our lives builds a holistic sense of wellness and fulfillment. This is important for every party doing in this industry. We should know the back ground, the present situation in the world and the position of Thailand at this moment, the trend in this near future, also in the highly competitive situation in the world.

Keywords: wellness, dimension of wellness, wellness assessment tool, wellness concept, wellness type, Thai wellness, Thailand wellness dimension, compartment of wellness

Introduction:

Wellness is a modern word with ancient roots. Wellness has gained currency since the 1950s, 1960s, 1970s and 1977-1978s, when the writings and leadership of an informal network of physicians and thinkers in the United States,; (Physician Halbert L. Dunn/ Dr. John Travis/ Don Ardell / Dr. Bill Hettler) largely shaped the way we conceptualize and talk about wellness today.

The origins of wellness, however, are far older – even ancient. Aspects of the wellness concept are firmly rooted in several intellectual, religious, and medical movements in the United States and Europe in the 19th century. The tenets of wellness can also be traced to the ancient civilizations of Greece, Rome and Asia, whose historical traditions have indelibly influenced the modern wellness movement.

The History and Evolution of Wellness [1]

The Global Wellness Institute is a nonprofit organization with a mission to empower wellness worldwide by educating public and private sectors about preventative health and wellness describes an evolution of wellness as show in the below picture;

"Ancient Wellness

3,000-1,500 BC: **Ayurveda** – originated as an oral tradition, later recorded in the Vedas, four sacred Hindu texts. A holistic system that strives to create harmony between body, mind and spirit, Ayurvedic regimens are tailored to each person's unique constitution (their nutritional, exercise, social interaction and hygiene needs) – with the goal of maintaining a balance that prevents illness. Yoga and meditation are critical to the tradition, and are, of course, increasingly practiced worldwide.

3,000 – 2,000 BC: **Traditional Chinese Medicine** (TCM), one of the world's oldest systems of medicine, develops. Influenced by Taoism and Buddhism, TCM applies a holistic perspective to achieving health and wellbeing, by cultivating harmony in one's life. Approaches that evolved out of TCM, such as acupuncture, herbal medicine, qi gong and tai chi, have become core, modern wellness – and even Western medical – approaches.

500 BC: Ancient Greek physician **Hippocrates** – is possibly the first physician to focus on preventing sickness instead of simply treating disease, and also argued that disease is a product of diet, lifestyle and environmental factors.

50 BC: Ancient Roman medicine emphasized disease prevention, adopting the Greek belief that illness was a product of diet and lifestyle. Ancient Rome's highly developed public health system (with its extensive system of aqueducts, sewers and public baths) helped prevent the spreading of germs and maintained a healthier population.

19th Century Intellectual & Medical Movements

In the 19th century new intellectual movements, spiritual philosophies and medical practices proliferated in the United States and Europe. A number of alternative healthcare methods that focus on self-healing, holistic approaches, and preventive care – including homeopathy, osteopathy, chiropractic, and naturopathy – were founded during this era and gained widespread popularity in both Europe and the United States. Other new philosophies were more spiritually oriented (such as the "mind-cure movements," including New Thought and Christian Science) and were instrumental in propagating the modern idea that a primary source of physical health is one's mental and spiritual state of being.

While some of the beliefs espoused by the thinkers behind these movements have been discredited, or seem "wacky" today, these movements did popularize ideas about regaining or maintaining one's health through diet, exercise and other lifestyle measures. The philosophies embodied in these 19th century systems – that a healthy body is a product of a healthy mind and spirit – are now considered precursors to the current, thriving wellness and self-help movements. In addition, although these approaches fell out of favor with the rise of modern, evidence-based medicine in the mid-20th century, several of them are now regaining favor within the mainstream medical community and the general public.

1650s: The use of the word "wellness" in the English language – meaning the opposite of "illness" or the "state of being well or in good health" – dates to the 1650s, according to the Oxford English Dictionary. The earliest published reference is from the 1654 diary entry of Sir Archibald Johnston: "I … blessed God … for my daughter's wealnesse." The first citation with modern spelling is from a 1655 letter from Dorothy Osborne to her husband, Sir William Temple: "You … never send me any of the new phrases of the town… Pray what is meant by wellness and unwellness?"

1790s: German physician Christian Hahneman develops Homeopathy, a system that uses natural substances to promote the body's self-healing response.
1860s: German priest Sebastian Kneipp promotes his "Kneipp Cure", combining hydrotherapy with herbalism, exercise and nutrition. The New Thought movement also emerges, around Phineas Quimby's theories of mentally-aided healing.
1870s: Mary Baker Eddy founds spiritual-healing-based Christian Science. Andrew Taylor Still develops Osteopathy, a holistic approach grounded in manipulating muscles and joints.
1880s: Swiss physician Maximilian Bircher-Benner pioneers nutritional research, advocating a balanced diet of fruits and vegetables. The YMCA launches as one of the world's first wellness organizations, with its principle of developing mind, body and spirit.
1890s: Daniel David Palmer develops Chiropractic, focused on the body's structure and functioning.
1900s: John Harvey Kellogg (director of the Battle Creek, Michigan Sanitorium) espouses a healthy diet, exercise, fresh air, hydotherapy and "learning to stay well." Naturopathy, focused on the body's ability to heal itself through dietary and lifestyle change, herbs, massage and joint manipulation, also spreads to the U.S. from Europe. Austrian philosopher Rudolf Steiner develops the spiritual movement of anthrosophy and the holistic system of anthrosophical medicine. Another Austrian, F.X. Mayr, develops "Mayr Therapy", a detoxification and dietary modification program.
1910: The Carnegie Foundation's Flexner Report, a critique of North America's medical education system for lack of standards and scientific rigor, questions the validity of all forms of medicine other than biomedicine, resulting in most alternative systems (homeopathy, naturopathy, etc.) being dropped from mainstream medical education, and setting the stage for our modern disease-oriented, evidence-based medicine.

20th Century: Wellness Spreads and Get Serious

Our modern use of the word "wellness" dates to the 1950s and a seminal – but little known – work by physician Halbert L. Dunn, called *High-Level Wellness* (published1961). Although Dunn's work received little attention initially, his ideas were later embraced in the 1970s by an informal network of individuals in the U.S., including Dr. John Travis, Don Ardell, Dr. Bill Hettler, and others. These "fathers of the wellness movement" created their own comprehensive models of wellness, developed new wellness assessment tools, and wrote and spoke actively on the concept. Travis, Ardell, Hettler and their associates were responsible for creating the world's first wellness center, developing the first university campus wellness center, and establishing the National Wellness Institute and National Wellness Conference in the U.S.

From **1980-2000**, the wellness movement begins to gain momentum, and get taken more seriously by the medical, academic and corporate worlds. For instance, Hettler's National Wellness Institute caught the attention of Tom Dickey and Rodney Friedman, who then established the monthly *Berkeley Wellness Letter* (1984), designed to compete with the *Harvard Medical School Health Letter*, pointedly using "wellness" in the title as contrast. This influential academic publication presented evidence-based articles on wellness approaches, while also debunking numerous health fads. More medical establishment validation: in 1991 the U.S. National Center for Complementary and Alternative Medicine (NCCAM) was established, as part of the government-funded National Institutes of Health.

More government-sponsored programs to promote healthier lifestyles launched in U.S. cities/states. The modern concept of wellness also spread to Europe, where the German Wellness Association

(*Deutscher Wellness Verband*, DWV) and the European Wellness Union (*Europäischen Wellness Union*, EWU) were founded in 1990.

At the latter end of the 20th century, many corporations began developing workplace wellness programs. The fitness and spa industries globally experienced rapid growth. And an ever-growing line-up of celebrities and self-help experts started bringing wellness concepts to a mainstream audience. However, despite all these disparate developments, this momentum had not yet coalesced under the formal banner of a "wellness industry."

Several Key Moments:

1950s: J.I. Rodale, one the first advocates for organic farming in the U.S., launches *Prevention* magazine, a pioneering publication in promoting alternative/preventative health.

1950s-1960s: Physician Halbert L. Dunn presents his idea of "high level wellness" in 29 lectures, and then publishes these ideas in his influential book by the same title.

1970s: Dr. John Travis, influenced by Dunn, opens the world's first wellness center in California, and publishes a 12-dimension wellness assessment tool, *The Wellness Inventory* (1975) and *The Wellness Workbook* (1977) – the latter both in use today. Don Ardell publishes *High Level Wellness: An Alternative to Doctors, Drugs and Disease* (1977, referencing Dunn's work). The University of Wisconsin-Stevens Point (UWSP), drawing on Travis' materials, establishes the first university campus wellness center, with campus wellness centers spreading throughout the U.S. in the 80s. In '77-'78, Dr. Bill Hettler of USWP organizes the National Wellness Institute and first National Wellness Conference.

1980s-2000s: Workplace wellness programs, the fitness and spa industries, and celebrity wellness and self-help experts take off – bringing wellness into the mainstream.

21st Century: The Tipping Point

A 2010 *New York Times* article on the word/concept of wellness noted that when Dan Rather did a *60 Minutes* segment on the topic in 1979, he intoned, "*Wellness*, there's a word you don't hear every day." But "…more than three decades later," the NYT noted, "*wellness* is, in fact, a word that Americans might hear every day…" And it's more than Americans paying attention to wellness. In the 21st century, the global wellness movement and market reached a dramatic tipping point: fitness, diet, healthy living and wellbeing concepts and offerings have proliferated wildly—and a concept of wellness is transforming every industry from food and beverage to travel.

By 2014, more than half of global employers were using health promotion strategies, while a third have invested in full-blown wellness programs (Bucks Consultants report). Medical and self-help experts who promote wellness (such as Drs. Mehmet Oz, Deepak Chopra and Andrew Weil) became household names. "Wellness," essentially, entered the collective world psyche and vocabulary and is firmly entrenched with the media and an increasing number of medical institutions and governments.

Healthcare Costs Drive the Shift to Wellness

With a chronic disease and obesity crisis raging worldwide in this century, leading to unsustainable healthcare costs, the traditional medical establishment and more governments are shifting the focus to prevention and wellness. For instance, if, in the 1990s, most academic medical centers had an

adversarial stance toward complementary medicine, now many of the most elite institutions in the world feature Integrative Medicine departments.

"For example, in 1999, in the US, eight medical institutions (including Harvard and Stanford) convened at a historic conference, The Consortium of Academic Health Centers for Integrative Medicine. Today, membership spans 60 esteemed institutions such as Yale, Harvard and the Mayo Clinic. In Europe, respected, large institutions, such as Charité University Medical Center (Berlin), the Karolinska Institute (Stockholm), and the Royal London Hospital, have large Integrative Medicine centers. And again, in the US, fast-growing federal and foundation research funds (close to $250 million annually just from NCCAM and the National Cancer Institute) are dedicated to research on complementary medicine, wellness and prevention. The American Board of Physician Specialties, which awards board certification to medical doctors, announced that, in 2014, it would begin accrediting doctors in Integrative Medicine." (1)

Wellness Milestones: (1)

2008: Bhutan embraced democracy and includes Gross National Happiness within their constitution, saying, "The State shall strive to promote those conditions that will enable the pursuit of Gross National Happiness." His Majesty Jigme Singye Wangchuck, the Fourth King of Bhutan, who questioned the premise that Gross Domestic Product (GDP) alone could deliver happiness and wellbeing to society, conceived the term in the 1970s. In 2011, The UN General Assembly passed "Resolution Happiness: towards a holistic approach to development," urging member nations to follow the example of Bhutan and measure happiness and wellbeing and calling happiness a "fundamental human goal."

2011-2018: With obesity and diabetes skyrocketing, from 2011–2018, there was a flurry of new laws taxing soda/sugary drinks in nations across the world. A few examples with dates of legislation: Finland 2011, Hungary 2011, France 2012, Mexico 2014, Chile 2014, UK 2016–2018, UAE 2017, Portugal 2017, Saudi Arabia 2017, Sri Lanka 2017, Ireland 2018, and South Africa 2018. Norway bumped up sugar taxes in 2018, and US cities, such as Berkeley, CA; Oakland, CA; Boulder, CO; Philadelphia, PA; and Seattle, WA, all passed new soda tax laws.

2012: On April 1, 2012, the first *World Happiness Report* was released, now an annual publication of the United Nations Sustainable Development Solutions Network. The groundbreaking report used data from the Gallup World Poll and measured the state of happiness in 155 nations, the key causes of happiness and misery, and policy implications for countries worldwide.

2014: The Global Wellness Institute (GWI) launched and released research finding that the global wellness industry was a $3.4 trillion market or 3.4 times larger than the worldwide pharmaceutical industry. The GWI research also benchmarked the 10 sectors comprising the global wellness market: Beauty & Anti-Aging ($1.03 trillion), Healthy Eating/Nutrition/Weight Loss ($574 billion), Fitness & Mind-Body ($446 billion), Wellness Tourism ($494 billion), Preventative/Personalized Health ($433 billion), Complementary/Alternative Medicine ($187 billion), Wellness Lifestyle Real Estate ($100 billion), Spa Industry ($94 billion), Thermal/Mineral Springs ($50 billion), and Workplace Wellness ($41 billion).

2017: In October, the GWI, along with Dr. Richard H. Carmona, 17th Surgeon General of the United States, announced *The Wellness Moonshot: A World Free of Preventable Disease*; a call to action to eradicate chronic, avoidable disease worldwide by uniting the health and wellness industries.
2018: In January, the Global Wellness Institute released *Build Well to Live Well*, the first in-depth research to analyze the $134 billion global wellness real estate and communities sector. The report found that real estate and communities that intentionally put people's health at the center of design, creation and redevelopment are the next frontiers in real estate.

In Thailand:

1995s: The former vacation home of the family of "Rojanasatien", the modification is a health resort and Wellness and Spa-side operation starts in the name of "Chivasom International Health Resort". Chiva-Som in timeframe start only drop-off friends and group members that founded in a narrow band, and become popular among foreigners, coming to rest in the present, the main customer group, awareness of mouth. This is a Considered to be the first in Thailand that inspire people, recognizes health centers/ wellness center, then there is a small health centers happening.

2013s: CMMU.,Mahidol University is a University with renowned Health Care of country-Thailand. Honorably with the vision of the University is aimed at executives, seeing that there are opportunities in the health business to high growth, opened "Master of Management in Healthcare and Wellness Management"
"The changes of health business? When the AEC certainly health needs, it will be more. Whether it is the Government's policy in matters of Medical Tourism will make this type of business has increased, and also provide a medical hub Thailand Festival (Medical Hub), Thailand, countries need to accelerate production of talent in these business management." Dr. Prattana Chairman of course. Ph.D. (Industrial Engineering)(Industrial Engineering). E-mail: prattana.pun@mahidol.ac.th. Research Interest:

2016s: Bangkok Dusit Medical Services Plc Group (BDMS) the country's largest private hospital operator push Thailand up to "Medical Hub" invest 10,800 million baht purchase of Park Nailert projects sprang fully-integrated health center, the first of its kind in Asia.

2017s: Dr.Banchob Junhasawasdikul, establishes The first wellness knowledge institute in Thailand. The wellness knowledge institute (WKI) College of Integrative Medicine (CIM) under the umbrella of The Dhurakij Pundit University (DPU), Thailand. and publishes a 4-dimension wellness assessment tool,

In the June 7th, **2019**, College of Integrative Medicine (CIM) of DPU organizes the first International Wellness Conference (ICIM-2019).

Top 10 Spas and Wellness in Thailand: (4)
Chiva-Som International Health Resort www.chivasom.com
The Sanctuary Thailand www.thesanctuarythailand.com
Kamalaya Koh Samui www.kamalaya.com
Atsumi Healing Center-Phuket www.atsumihealing.com
The Dhara Dhevi Chiang Mai www.dharadhevi.com
The Spa Koh Chang Resort www.thespakohchang.com
The Spa Resort Chiang Mai www.thesparesortchiangmai.com
Samahita Retreat Koh Samui www.samahitaretreat.com
Thai Beach Retreat Krabi www.thaibeachretreat.com
Absolute Sanctuary www.absolutesanctuary.com

Meaning of Wellness:

1. The state of being healthy ,Cambridge English dictionary
   https://dictionary.cambridge.org/dictionary/english/wellness

2. The state of being in good physical and mental health , Collin English dictionary
   https://www.collinsdictionary.com/dictionary/english/wellness

3. The state of being in good physical and mental health
   American Heritage® Dictionary of the English Language, Fifth Edition. Copyright © 2016 by Houghton Mifflin Harcourt Publishing Company. Published by Houghton Mifflin Harcourt Publishing Company.

4. a) The quality or state of being healthy, esp. as the result of deliberate effort; health.
   b) An approach to health care that emphasizes preventing illness and prolonging life, as opposed to emphasizing treating diseases.
   Collins English Dictionary – Complete and Unabridged, 12th Edition 2014 © HarperCollins Publishers 1991, 1994, 1998, 2000, 2003, 2006, 2007, 2009, 2011, 2014

5. Wellness is the opposite of illness. When you're healthy and not suffering from any diseases, you're enjoying a state of *wellness*.
   It might seem like the phrase "health and wellness" is a little repetitive, but the two terms have increasingly distinct meanings. Since the middle of the 20th century, *wellness* has become the popular term, especially in alternative medicine, to describe health that includes a balance of body, mind, and spirit.
   https://www.vocabulary.com/dictionary/wellness

6. The state of being in good health, especially as an actively pursued goal.
   'measures of a patient's progress toward wellness'
   'a healthcare system focused on wellness, not sickness'
   as modifier 'company health and wellness programmes'

Oxford dictionary
https://en.oxforddictionaries.com/definition/wellness

7.Our Physical, Social, Emotional, Work, Spiritual Values, Intellectual lives along with our Cultural values, Environment and Finances all impact upon each other and our overall balance – our Wellness. A wellness lifestyle is the commitment and approach adopted by an individual aiming to reach their highest potential *NWIA – www.wellnessaustralia.org* National Wellness Institute of Australia Inc.

Research method

Definition of Wellness vary across geographic location

- Table 1 : Definitions of Wellness in the World

Definitions of Wellness	**Country**	**Year**	**Reference**
"High Level Wellness" A condition of change in which the individual moves forward, climbing toward a higher potential of functioning	USA	1950	Halbert L.Dunn
• Wellness is a conscious, self-directed and evolving process of achieving full potential • Wellness is multidimensional and holistic, encompassing lifestyle, mental and spiritual well-being, and the environment • Wellness is positive and affirming The definition of wellness long used by the National Wellness Institute is consistent with these tenets: *Wellness is an active process through which people become aware of, and make choices toward, a more successful existence.*	USA	1976	Dr. Bill Hettler, co-founder of the National Wellness Institute (NWI)
Wellness is being in good physical and mental health. Because mental health and physical health are linked, problems in one area can impact the other. At the same time, improving your physical health can also benefit your mental health, and vice versa. It is important to make healthy choices for both your physical and mental well-being. Remember that wellness is not the absence of illness or stress. You can still strive for	USA	2006	The Substance Abuse and Mental Health Services Administration (SAMHSA)

wellness even if you are experiencing these challenges in your life.			
Our Physical, Social, Emotional, Work, Spiritual Values, Intellectual lives along with our Cultural values, Environment and Finances all impact upon each other and our overall balance – our Wellness. A wellness lifestyle is the commitment and approach adopted by an individual aiming to reach their highest potential	Australia	2010	National Wellness Institute of Australia Inc. *NWIA – www.wellnessaustralia.org* Alima Goss, PhD Dissertation
Personal responsibility for health and life quality, environmental sustainability and other life enhancement elements at the top reaches of Maslow's hierarchy.	Germany		Lutz Hertel, Chairman of the German Wellness Association The German Wellness Association(GWA)
Achievement of an overall well-being through balanced influence on human physical, emotional and spiritual health	Bulgaria	2010	UTMS Journal of Economics, Vol. 1, No. 2, pp. 37-44, 2010 G. Georgiev, M. Trifonova Vasileva: South West University "Neofit Rilski", Blagoevgrad, Bulgaria1
Wellness is a continuum process of the good quality on body, mind, social and wisdom. A Combination of Physical, Beauty&Aethetics, -Detox, Massage and manipulation, Body and Mind connectedness, Education	Thai	2019	Dr.Banchob Junhasavasdikul, College of Integrative Medicine, Dhurakij Phundit University, TH

- Table 2 : Dimension of Wellness in the world

Model	**Descriptions**	**Reference**
Six Dimension of Wellness	Focusing on wellness in our lives builds resilience and enables us to thrive amidst life's challenges are: 1. Emotional 2. Occupational 3. Physical 4. Social 5. Intellectual 6. Spiritual	Developed by Dr. Bill Hettler,MD, co-founder of the National Wellness Institute (NWI) *This interdependent model describes a whole person approach to wellness.* The National Wellness Institute (NWI) is the leader in providing professional development and engagement opportunities that support individuals from a variety of disciplines in promoting whole–person wellness.
Seven Dimensions of Wellness	1. Physical 2. Emotional 3. Intellectual 4. Social	GRCC Grand rapids community college

	5. Spiritual 6. Environmental 7. Occupational	
Eight Dimensions of Wellness	1. Emotional 2. Environment 3. Financial 4. Intellectual 5. Occupational 6. Physical 7. Social 8. Spiritual	The Substance Abuse and Mental Health Services Administration (SAMHSA) is the agency within the U.S. Department of Health and Human Services that leads public health efforts to advance the behavioral health of the nation. SAMHSA's mission is to reduce the impact of substance abuse and mental illness on America's communities.
Nine Dimensions of Wellness	1. Emotional 2. Environment 3. Financial 4. Intellectual 5. Occupational 6. Physical 7. Social 8. Spiritual 9. Cultural	National Wellness Institute of Australia Inc. *NWIA – www.wellnessaustralia.org* Alima Goss, PhD
Twelve Dimensions of Wellness[2]	1. Self-Responsibility & Love 2. Breathing 3. Sensing 4. Eating 5. Moving 6. Feeling 7. Thinking 8. Playing & Working 9. Communicating 10. Intimacy 11. Finding Meaning 12. Transcending	Twelve dimensions form the basis of the Wellness Inventory, the original wellness assessment, developed by wellness pioneer John W. Travis, MD, MPH in the 1970s. This dynamic whole person model, formally referred to as the Wellness Energy System, is comprised of the 12 fundamental life processes that interact with one another to shape our life experience and our state of personal wellbeing.

Differences between Wellness and Illness [3]

"Wellness vs. Illness

Posted on **September 18, 2013**

Wellness is defined as the state or condition of being in good physical and mental health;

Illness is a disease or period of sickness affecting the body or mind.

Looking at the spelling of these two words, the letters in common are the ones at the end. Yet what differentiates these two words from one another are the beginning letters – **WE**versus **I**. WEllness is often achieved by building a community of individuals (the "we") who can support our health,

growth and strength. Yet when we become individually focused or isolative and do not involve others around us (the "I"), we may be prone to Illness in that our internal focus may lead us astray in terms of our goals. We could become exhausted if we do not have those around us to guide, nurture, uplift and empower us to reach greater heights. To be well, take a careful look around you to see who can be part of your team – who can support you – who may be able to help you reach your greatest potential. Involve them in your life so that you can achieve WEllness.

This entry was posted in **Empowerment**, **Mental Health** by **Dr Ackard**. Bookmark the **permalink**."

Finding interpretation

Table 3: Conceptual model on Wellness industries in Thailand

Model	Descriptions	Six Compartments of practice	Reference
Four Dimensions of Wellness	Body Mind Social Wisdom	1. Physical improvement 2. Beauty & Aesthetic 3. Nutrition & Detoxification 4. Massage & Manipulation 5. Body & Mind Connectedness 6. Education	**Developed by** College of Integrative Medicine, Dhurakij Phundit University, TH 2019s.

Conclusions and recommendations

Summary

Although the word **"Wellness"** has been part of the English language for more than 350 years, but it's not popular like today. It's become well-known in 1950s by an international movement through the conceptual work of the American physician Dr. med. **Halbert L. Dunn**; he is known as the "father" of the wellness movement. He distinguished between good health—not being ill—and what he termed high-level wellness, which he defined as "a condition of change in which the individual moves forward, climbing toward a higher potential of functioning". He introduced the concept in a series of twenty-nine lectures at the Unitarian Church in Arlington County, Virginia in the late 1950s, which provided the basis for his book, *High Level Wellness*, published in 1961. The book was reissued in a number of editions but did not have a great deal of immediate impact. It did, however, come into the hands of a number of the future leaders of wellness and holistic health movement that bloomed more than a decade later, such as **John Travis, Don B. Ardell**, and **Elizabeth Neilson**.

Four events in the mid-1970s broadened the impact of Dunn's ideas. First, **John Travis** opened the first US wellness center (Mill Valley, CA, 1975). This center and other organizations were then described in **Don Ardell's** 1976 book, using Dunn's title (giving Dunn due credit for his origination of the title and concept). Then **Elizabeth Neilson** founded the journal *Health Values: Achieving High Level Wellness* (renamed the *American Journal of Health Promotion* in 1996), which was dedicated to Dunn and reprinted one of his papers in its first edition. Lastly, the publisher of *Health Values*, Charles B. Slack, Inc., published a reprint edition of Dunn's *High Level Wellness* that achieved a wider distribution and impact.

We recommend that.; Wellness is not illness and The Wellness concept is the stage of being in good physical and mental health which is a compartment optimum level practice of physical improvement, Beauty & Aesthetics, Nutrition & Detoxification, Massage & Manipulation, Body & Mind Connectedness and Education" In 2019 by Wellness Knowledge Institute (WKI), College of Integrative Medicine (CIM), Dhurakij Pundit University (DPU), Thailand analyze a *Wellness is a continuum process of the good quality on body, mind, social and wisdom*; Have Four Dimensions and Six Compartments practice accordingly.

By Naparat Srilapan, John Beaty, Dr.Banchob Junhasawasdikul , Ramaimas Chankao and Sohnatda Panchee

References

1. Sources [1]

https://globalwellnessinstitute.org/industry-research/history-of-wellness/

2. Sources [2]

• Ardell, D. B. (1976). High Level Wellness: An Alternative to Doctors, Drugs and Disease. Emmaus, PA: Rodale.

•Ardell, D. B. (Dec. 29, 2000). A (very) brief history of the wellness concept. Wellness in the Headlines (Don's Report to the World). [1]

• Dunn, H.L. (1961). High-Level Wellness. Arlington, VA: Beatty Press.

• Dunn, H.L. (1977). High Level Wellness. Thorofare, NJ: Charles, B. Slack.

• Dunn, H.L. (1977). What High Level Wellness Means. Health Values, 1(1), 9-16.

• Neilson, E. A. (1988). Health Values: Achieving high level wellness—Origin, philosophy, purpose. Health Values, 12(3):3-5.

•Travis, J. W., and Ryan, R. S. (1981, 1988, 2004) Wellness Workbook, Ten Speed Press/Celestial Arts

3. Eight Dimensions of Wellness, (UMD) University of Maryland's Your Guide to Living Well. [Last accessed June 27, 2017]. Available from: https://umwellness.wordpress.com/8-dimensions-of-wellness/
4. https://dictionary.cambridge.org/dictionary/english/wellness
5. https://www.collinsdictionary.com/dictionary/english/wellness
6. https://www.vocabulary.com/dictionary/wellness
7. https://en.oxforddictionaries.com/definition/wellness
8. https://www.nationalwellness.org/page/Six_Dimensions
9. https://www.grcc.edu/humanresources/wellness/sevendimensionsofwellness
10. https://cpr.bu.edu/living-well/eight-dimensions-of-wellness/ tp://www.samhsa.gov/wellness-initiative/eight-dimensions-wellness
11. ^ Jump up to:[a] [b] *Daniela Blei (January 4, 2017). "The False Promises of Wellness Culture". JSTOR Daily. JSTOR.*
12. Sources [3]
    - http://www.diannackard.com/2013/wellness-vs-illness/
13. Sources [4]

http://thai.luxurysocietyasia.com

Dietary Exposure to Benzoic Acid and Sorbic Acid from Frozen Food in Convenience store

Thitirat Wangratanaparkdee
Department of Anti-Aging and Regenerative Medicine,
College of Integrative Medicine, Dhurakij Pundit University,
Thailand, Thitirat.may@gmail.com

Abstract

The objective of this study is to examine the amount of Benzoic Acid and Sorbic Acid used as preservatives in frozen food sold in convenient stores. This study is an experimental research in which 8 types of frozen food were sampled; Chicken Sausage Fried Rice, Macaroni Tomato Sauce with Chicken, Spaghetti Tomato Sauce with Chicken, Omelet Mixed with Rice, Stir-fried Clams with Chili Paste Fried Rice, Spaghetti Carbonara, Spaghetti with Chili Pork Basil Leaf, and Stir-fried Pork with Basil Leaf and Rice. Risk was characterized by comparing the exposure with the Acceptable Daily Intake (ADI) of Benzoic Acid and Sorbic Acid. ADI is a safe level for human exposure to the chemical over a lifetime. The study found that the types of food that were found with Benzoic Acid and risk of dietary exposure to Benzoic Acid are Stir-fried Clams with Chili Paste Fried Rice (1.11-2.95% of ADI), Spaghetti with Chili Pork Basil Leaf (1.22 -3.25% of ADI), and Stir-fried Pork with Basil Leaf and Rice (1.1-2.93% of ADI). Whereas, types of food that were found with Sorbic Acid and risk of dietary exposure to Sorbic Acid; Spaghetti Carbonara (0.21-0.56% of ADI) and Stir-fried Pork with Basil Leaf and Rice (0.22 - 0.59% of ADI). In conclusion, the exposure of frozen food in convenient stores to Benzoic Acid and Sorbic Acid were lower than ADI; thus, it is safe to consume. However, it should be consumed in moderation.

Keywords: Preservatives, Benzoic Acid, Sorbic Acid, Frozen food, Risk Assessment

Introduction

In today's society more people are having a rushed lifestyle, so they consume more instant frozen food sold in the market. This frozen food can contain preservatives, chemical substances to preserve it. These substances inhibit or eliminate the microbes that are the cause of

food decay, prevent the microbes' regeneration and eventually kill them (Phuttharin Wannissorn, 2017). In the case of having an excess amount of preservatives in the body, for example, having a high amount of Benzoic Acid might cause diarrhea, dizziness, and headaches (Wiraya, Kanphanit, 2018). Meanwhile, taking a high amount of Sorbic Acid might result in soft tissue and skin irritation especially in those who are sensitive to this substance (Sofos J.N.,1995).

Purpose of the Study

To determine Benzoic Acid and Sorbic Acid and evaluate the risk of dietary benzoic acid and sorbic acid exposure in frozen food with the ADI values specified by the Joint FAO/WHO Expert Committee on Food Additive (JECFA).

Literature Review

Suvannee Thiraphapthammakul et al. (2016) have studied the risk of Benzoic Acid and Sorbic Acid for Thais. This study was being conducted in 2011-2012 by sampling food and examining consuming data by using Duplicate Portion method from 400 households in 4 regions for 4 days. There were 1,600 samples of food examined for Benzoic Acid and Sorbic Acid using High Performance Liquid Chromatography (HPLC). The results revealed that Benzoic Acid was found in 89.8% of the food with the average amount of 36.8 mg/kg, while Sorbic Acid was found in 12.0% of the food with the average amount 2.1 mg/kg. By calculating in comparison with the average food consumption of Thai people, which was 1,506 g/person/day, it was found that Thais were exposed to Benzoic Acid and Sorbic Acid from their daily diet at 55.4 and 3.2 mg/person/day or 20.5% and 0.2% of the ADI respectively. These findings expressed that for an overall risk of Thai consumers, they were still safe from the over exposure of Benzoic Acid and Sorbic Acid as the amount of the additives they were exposed to were lower than that specified ADI by JECFA.

Patnapa Wongsaprom et al. (2000) has studied the risk assessment of Benzoic Acid and Sorbic Acid Exposures from Red Curry Paste Consumption in Bangkok and Suphanburi. There were 33 samples collected from different market in Bangkok and Suphanburi and analyzed by HPLC. The food frequency questionnaire (FFQ) was used to survey individual food consumption. The estimated exposure of benzoic acid from red curry paste indicated exposed to benzoic acid at average intake levels of 1.56% and 0.51% of ADI. The exposure levels of

benzoic acid and sorbic acid were still very lower than the ADI. Consequently, the consumption of red curry paste did not provide a high risk of health effects from benzoic acid and sorbic acid exposures.

Wenika Benjapong et al. (2012) has studied the risk of Benzoic Acid consumption of Thai people in comparison with the Codex's Acceptable Daily Intake (ADI). The estimation of the exposure was calculated from the highest amount of Benzoic Acid found in the food and the individual food intake information from a Thailand food consumption survey in 2004. It was an estimation of the ADI of Benzoic Acid, safe levels of the preservative, through a human's lifetime. It was found that the exposure of Thai people to Benzoic Acid was an excessive amount, higher than the ADI at 125% of it. The age groups of 3-5.9 and 6-18.9 years old were found to be at 224% and 150% of the ADI respectively. The highest acceptable amount found in the types of food found giving Benzoic Acid to children and teenager groups should be lowered, especially carbonated drinks, baked goods, and processed fruit and vegetables.

Research Hypothesis

Frozen food sold in convenience stores have higher Benzoic Acid and Sorbic Acid levels than the Acceptable Daily Intake (ADI) values specified by the Joint FAO/WHO Expert Committee on Food Additive (JECFA).

Methods

1. Submit the sampled 8 types of food to the laboratory of the Department of Medical Sciences, Ministry of Public Health to analyze Benzoic Acid and Sorbic Acid.
2. One month after the first lot of food is submitted, the second lot of the same 8 types is sent to test in order to find the average result.
3. Determine the exposure data and conduct the risk assessment to compare with ADI values.

Data analysis used in the study

1. In this study the sampling was done twice (n=2) and the mean was calculated ($\bar{x}$).

2. Calculate food additives exposure specified by FAO/WHO (JECFA, 1996) as shown in the following equation;

$$\text{Exposure} = \frac{(\text{Food consumption x Concentration of food additives})}{\text{Body Weight}}$$

Exposure = the amount of food additive exposure from the consumption of frozen food in one day (mg/kg bw/day)

Food Consumption = the amount of frozen food consumed in a day

Concentration = the amount of food additive found in a box of frozen food (mg/box)

3. The risk characterization is conducted by comparing the dietary exposure of benzoic acid and sorbic acid in food with the ADI values (JECFA, 1996) as shown in the following equation;

$$\text{Risk (\% of ADI)} = \frac{\text{Exposure (mg/kg bw/day)} \times 100}{\text{ADI (mg/kg bw/day)}}$$

If the Risk is higher than 100% of ADI, it means there will be higher risk of negative health effect in the consumers – which is an unacceptable risk.

Results

Benzoic Acid

Out of the 8 types of Frozen food being tested, 3 types is found Benzoic Acid level which are Stir-fried Clams with Chili Paste Fried Rice (23.30 mg/kg), Spaghetti with Chili Pork Basil Leaf (27.05 mg/kg on average) and Stir-fried Pork with Basil Leaf and Rice (<20.0 mg/kg) (Table 1). The risk assessment of Benzoic Acid is compared its ADI (5 mg./kg. bw/day) and categorized based on average male weight of 68.83 kg. Assuming they would consume 1 box in a day, it was found that the ADI-based exposure risk of Benzoic Acid was 1.29 % in Stir-fried Clams with Chili Paste Fried Rice, 1.42% in Spaghetti with Chili Pork Basil Leaf, and 1.28% in Stir-fried Pork with Basil Leaf and Rice (Table 2).

Sorbic Acid

Out of the 8 types of Frozen food being tested, 2 types is found Sorbic Acid level which are Spaghetti Carbonara (<20.0 mg/kg) and Stir-fried Pork with Basil Leaf and Rice (<20.0 mg/kg) (Table 1). The risk assessment of Sorbic Acid is compared its ADI (25 mg./kg. bw/day)

and categorized based on average male weight of 68.83 kg. Assuming they would consume 1 box in a day, the average exposure it was found that the ADI-based exposure risk of Sorbic Acid was 0.24 % in Spaghetti Carbonara and 0.26% in Stir-fried Pork with Basil Leaf and Rice (Table 2).

Table 1 The analysis result of Benzoic Acid and Sorbic Acid found in 8 types of Frozen Food

Unit: (mg/1 kg of food weight)

Sample	Benzoic Acid			Sorbic Acid		
	1st test	2nd test	Average	1st test	2nd test	Average
Stir-fried Clams with Chili Paste Fried Rice	23.30	23.30	23.30	0.00	0.00	0.00
Spaghetti Carbonara	0.00	0.00	0.00	<20.0	<20.0	<20.0
Spaghetti Tomato Sauce with Chicken	0.00	0.00	0.00	0.00	0.00	0.00
Macaroni Tomato Sauce with Chicken	0.00	0.00	0.00	0.00	0.00	0.00
Omelet Mixed with Rice	0.00	0.00	0.00	0.00	0.00	0.00
Chicken Sausage Fried Rice,	0.00	0.00	0.00	0.00	0.00	0.00
Spaghetti with Chili Pork Basil Leaf	25.60	28.50	27.05	0.00	0.00	0.00
Stir-fried Pork with Basil Leaf and Rice.	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0

Unit: (mg/1 kg of food weight)

Table 2 Dietary exposure and Risk assessment to Benzoic Acid and Sorbic Acid from 8 types of Frozen Food

Sample	Benzoic Acid		Sorbic Acid	
	Dietary Exposure (mg/kg bw/day)	Risk (%ADI)	Dietary Exposure (mg/kg bw/day)	Risk (%ADI)
Stir-fried Clams with Chili Paste Fried Rice	0.064	1.29%	0	-
Spaghetti Carbonara	0.00	-	< 20	0.24%
Spaghetti Tomato Sauce with Chicken	0.00	-	0	-
Macaroni Tomato Sauce with Chicken	0.00	-	0	-
Omelet Mixed with Rice	0.00	-	0	
Chicken Sausage Fried Rice,	0.00	-	0	-
Spaghetti with Chili Pork Basil Leaf	0.071	1.42%	0	-
Stir-fried Pork with Basil Leaf and Rice.	0.064	1.28%	< 20	0.26%

Assumption: consume frozen food 1 box/day

ADI of Benzoic Acid = 5 mg./kg bw/day and Sorbic Acid = 25 mg./kg bw/day

*Average Male weight = 68.83 kg. (Source: SizeThailand, 2551) http://www.sizethailand.org/region_all.html

Discussion

The results of the analysis of Benzoic Acid and Sorbic Acid in 8 types of frozen food revealed that Benzoic Acid was found in 3 types of food; Stir-fried Clams with Chili Paste Fried Rice, Omelet Mixed with Rice, and Spaghetti with Chili Pork Basil Leaf. Whereas, Sorbic Acid was found in 2 types of food; Spaghetti Carbonara and Stir-fried Pork with Basil Leaf and Rice. It can be concluded that both benzoic acid and sorbic acid are not intentionally added into the frozen food to preserve the food; otherwise, all food would have found these two preservatives when tested. There is a possibility that the preservatives that were found in the food are from the ingredients in that particular food. Examples of ingredients that could potentially contain preservatives are chili paste, oyster sauce, variety of sauces and butter/cheese. Stir-fried Clams with Chili Paste Fried Rice contains chili paste as an ingredient and chili pastes were usually found containing preservatives to extend it shelf life. Both benzoic acid and sorbic acid have the properties of slowing or inhibiting the bacterial growth in food. A study by Thasanee Nanudorn (2008) which explored the amounts of additives found in several types of chili paste. It was found that Grilled Fish Chili Paste Mae Mukda manufactured by Mae Mukda Chi Paste Company contained 1,123.11 mg/kg of Benzoic Acid and 56.74 mg/kg of Sorbic Acid. Whereas, Narok Chili Paste (fish) of a manufacturer called Rung Napha (Big C Saphan Kwai) was found containing 1,851.55 mg/kg although without Sorbic Acid. According to the Announcement of the Ministry of Public Health No. 281 Topic: Food Additives (Ministry of Public Health, 2004), Benzoic Acid and Sorbic Acid are allowed to be used as food additives in some types of food for no higher than 1,000 mg/1 kg of food weight. As for Spaghetti with Chili Pork Basil Leaf and Stir-fried Pork with Basil Leaf and Rice, they usually contain oyster sauce and fish sauce. The risk assessment of oyster sauce found that it usually contained topica starch which is commonly found with pathogenic bacteria like Bacillus cereus, Aspergillus sp., Penicillium sp., Alternaria sp., and Cladosporium sp - microbes that can cause serious danger (Chanida Chuenkamol. 2007).

Similarly for the frozen food that found Sorbic Acid, the preservative was not added to the food to preserve it but it was remnant of the preservative used in raw ingredient of each type of food. On the label of Spaghetti Carbonara, it shows 44% of Carbonara Sauce as an ingredient. Carbonara sauce is made from butter and cheese and the study of Sonwanee Maneerat and Chalermphon Thongphun (2017) revealed that Sorbic Acid was added into butter products to inhibit growth and eliminate microbes. It was possible that Sorbic Acid was found in Spaghetti Carbonara came from the Carbonara sauce.

At the average body weight of Thai males of 68.83 kg and females of 57.40 kg **(**sizethailand, 2008), it was found that the exposure of Benzoic Acid when consuming Spaghetti with Chili Pork Basil Leaf was 0.071 ml/kg bw/day in males and 0.085 ml/kg bw/day in females. Stir-fried Clams with Chili Paste Fried Rice and Stir-fried Pork with Basil Leaf and Rice shared the same number of 0.064 ml/kg bw/day in males and 0.077 ml/kg bw/day in females. When the numbers are compared with the ADI value of Benzoic Acid which is 0-5 mg/kg bw/day according to the Joint FAO/WHO Expert Committee on Food Additive (JECFA), it was found that the consumption of one box of Spaghetti with Chili Pork Basil Leaf in one day, males and females would be at risk of exposing to benzoic acid at 1.42% and 1.70% of ADI respectively. One the hand, the consumption of Stir-fried Clams with Chili Paste Fried Rice or Stir-fried Pork with Basil Leaf and Rice for one box in one day, males and females would be at risk of exposing to benzoic acid at 1.28% and 1.54% of ADI respectively.

As for the exposure of Sorbic Acid from the consumption of Spaghetti Carbonara was 0.061 ml/kg bw/day in males and 0.073 ml/kg bw/day in females. Whereas, Stir-fried Pork with Basil Leaf and Rice's number was 0.064 ml/kg bw/day in males and 0.077 ml/kg bw/day in females. When the value is compared with the ADI of Sorbic Acid as specified by the Joint FAO/WHO Expert Committee on Food Additive (JECFA), it was found that by consuming 1 box of Spaghetti Carbonara in one day, males and females would be at risk of exposing to sorbic acid at 0.24% and 0.29% of ADI respectively. By consuming 1 box of Stir-fried Pork with Basil Leaf and Rice, males and female would be at risk of exposing to sorbic acid at 0.6% and 9.31% of ADI respectively.

This indicates that consuming frozen food sold at convenience store is still safe from benzoic acid and sorbic acid exposure. Dietary exposure of benzoic acid and sorbic acid were

lower than ADI value specified by JECFA. From the result, Frozen food contains benzoic acid at a level higher than sorbic acid which follows the study of Suwanne Thiraphapthammakul et al. (2017) which explored on the exposure risk of Benzoic Acid and Sorbic Acid in Thai people. It was found that Benzoic Acid was found in daily food at 20.5% which was higher than Sorbic Acid which was found at 0.2%. Although the risk of exposure might be very low, some people who are allergic to the preservatives might show an allergic reaction even from consuming them at a low concentration. Additionally, a long term and continuous consumption of benzoic acid might cause irritation in gastrointestinal system, nausea. vomiting, diarrhea, dizziness, and headache (Wiraya Kanphanit, 2018). Sorbic Acid might cause soft tissue or skin irritation (Sofos J.N., 1995). Additionally, even the risk level might be low, but if the consumers consume several boxes in a day or consume it regularly for a long time, the accumulation of food additives might occur and will pose dangerous effects to body, behavior, and development of the children who consume the food containing additives (Agricultural Research Development Agency, 2014).

Although the consumption of these 8 types food of frozen might not pose risk from the exceeding amount of the two preservatives according to the values specified by the Joint FAO/WHO Expert Committee on Food Additive (JECFA); however, for safety and complete nutritional reasons, consumers should have a diverse range of food. One type of food should not be consumed repeatedly or at a large amount as it might cause an unnecessary exposure to one of the additives. Moreover, if consumers can choose to have freshly made meals, they will provide more nutrition than frozen food without the risk of exceeding amount of preservatives.

Suggestions

1. Frozen food sold in convenience stores are safe for consumers in general as they were found with safe levels of Benzoic Acid and Sorbic Acid. However, for those who are allergic to preservatives or people who consume frozen food regularly for a long time, it might pose negative effects to their health.
2. Children and adolescence should not consume frozen food as their exposure risk as comparing with ADI would be higher than that of an adult.
3. If consumers cannot avoid frozen food, they could at least avoid those that contain chili paste and sauces as these ingredients could potentially contain preservatives.

References

Chanida Cheunkamol (2007). *Generic model of HACCP system in small scale production of oyster sauce.* Bangkok: King Mongkut's Institute of Technology Ladkrabang.

Charoen Charoenchai (2017). Frozen Food Method. In *Food Processing Engineering* (p. 1-19) Pathum Thani: Rajamangala University of Technology Thanyaburi.

Tassanee Nanudorn (2008). Eating Preservative-Free Chili Paste. *Buy Wisely*, 14(87), 31-34. The Announcement of the Ministry of Public Health No. 281 B.E. 2547 Topic: Food Additives.

Phuttharin Wannisorn. (2013). *Too Much Preservatives Used can be Dangerous.* [Pamphlet].Pathum Thani: Thailand Institute of Scientific and Technological Reacerch.

Wiraya Kanphanit (2018). *Benzoic Acid A Popular Food Preservative*. Retrieved on 25th August 2018, from http://www.thaitox.org/media/upload/file/Benzoic-Acid.pdf

Wenika Benjapong, Anadi Nitithamyong, Weeraya Karnpanit, Nipa Rojroongwasinkul, Piyanuch Visetchart, Narissara Moungsrichan, Jirarat Thasasilp (2012). Dietary exposure assessment of benzoic acid in Thai people estimated from the Codex General Standard for Food Additives. Journal of Health Systems Research, 6(3), 416-428.

Sonwanee Maneerat and Chalermphon Thongphun. (2017). Determination of Salicylic Acid, Benzoic Acid and Sorbic Acid in Fruit Juices by High Performance Liquid Chromatography *in the 17th* Graduate *Studies of Northern Rajabhat University Network Conference, University of Northern Rajaphatcha.* (p. 2715-2726). Phitsanulok: Pibulsongkram Rajabhat University.

Sirinthip Inchai and Somchai Sitthiophakul (2008). Benzoic acid and Sorbic Acid in noodles in Nakhon Ratchasima Municipality. *Journal of Health Science*, 17(5), 744-750.National Food Commission (2017). *Food and Nutrient Knowledge for All Ages.* Bangkok: Author.

Food Department Office of Food and Drug Administration. (2013). *A Guideline for the Use of Food Additives and Related Laws*. (2nd ed). Nonthaburi: Author.

Agricultural Research Development Agency. (2014). *Eat Safely Away from Preservations.* Bangkok: Author.

Suvannee Teerapapthamkul, Laddawan Rojanapantip, Panawan Kluengklangdon, Saeksan Tongpo, Patcharida Pichai, Kanokwan Thepluean, Nontarat Pornsapmanee. (2016). Risk Assessment of Benzoic Acid and Sorbic Acid in Foods for Thais. *Journal of Health Science*, 25(1), 49-59.

Saowapa Chumanee. (2009). Method development for determination of Benzoic Acid, Sorbic Acid, Methylparaben, and Propylparaben in food and cosmetics using ultra-performance liquid chromatography. Bangkok : National Research Council of Thailand.

Joint FAO/WHO Expert Committee on Food Additives. (1996). Evaluation of certain food additives and contaminants, *Forty-sixth report of the Joint FAO/WHO Expert Committee on Food Additives. WHO Technical Report Series No. 868*. Geneva: World Health Organization.

Maria M. S. & Fernando C. L. (2016). Food preservatives – An overview on applications and side effects. *Emirates Journal of Food and Agriculture*, 28(6), 366-373.

Sizethailand (2008). National Size Survey Results. Retrieved from http://www.sizethailand.org/region_all.html

Sofos JN. Antimicrobial agent. In: Maga JA, Tu AT, (Eds.). (1995). *Food additive toxicology*. New York: Marcel Dekker.

Biodistribution Study of ^{68}Ga-DOTAVAP-P1 in BALB/cMlac-nu Models

Sarinya Wongsanit[1, a *], Thunyatorn Yimsoo[2, b], Werayut Yingmema[2, c] and Pattra Lertsarawut[1, d]

[1] Research and Development Division, Thailand Institute of Nuclear Technology (Public Organization), Nakorn-Nayok, Thailand

[2]Laboratory Animal Center, Advanced Science and Technology, Thammasat University, Thailand

[*a]sarinyaw@tint.or.th, [b]Tyimsoo@tu.ac.th, [c]Werayut@tu.ac.th, [d]pattra.lert@hotmail.com

Abstract

Vascular adhesion protein 1 (Vap-1) is practically absent in normal endothelium and is induced upon inflammation. It is promising labeling compound to diagnose sterile inflammation. DOTA-PEG is the most suitable ligand conjugate structure when label with Vap-1 and the radioisotope gallium-68. The study on an optimum conditions for labeling DOTAVAP-P1 with gallium-68 was performed by adjusted pH and radiolytic stabilizer. The radiochemical purity of radiolabeling ^{68}Ga-DOTAVAP-P1 was accepted when used sodium acetate or ammonium acetate as the buffer solution, at pH 4.4-5.0. The radiochemical purity in this experiment was increased by adding radiolytic stabilizer during the labeling. A set of various concentrations ranged from 0 to 30 milligram w/w or 10% w/v of gentisic acid and ascorbic acid were added during the labeling in order to decrease impurities which caused by radiolytic oxidation by-products of ^{68}Ga- DOTAVAP-P1 that were observed in the chromatogram of the analytical radio-HPLC. The addition of those radiolytic stabilizer to the reaction mixture showed significant improvement on the radiochemical purity of ^{68}Ga- DOTAVAP-P1 and they were achieved in avoided the radiolysis and significantly increased the stability. The biodistribution of 68Ga-DOTAVAP-P1 was study in animal implanted liver cancer models. The results showed that ^{68}Ga-DOTAVAP-P1 is specific to the inflammation that occurs in liver cancer; the value of Ratio of the percent injected dose per gram of organ (%ID/g) was 3 times more than the normal muscle.

Keywords: ^{68}Ga-DOTAVAP-P1, Radiolytic stabilizer, Biodistribution, Animal model, Theranostic

Background

In vivo imaging of inflammation is a demanding task, and novel molecular imaging targets are called for. The preparation of this imaging agent is both time consuming and potentially hazardous for the technical personnel. Positron emission tomography (PET) is a powerful, non-invasive method that is particularly suitable for drug development because of its high sensitivity and ability to provide quantitative and kinetic information. PET imaging with a specific imaging agent makes it possible to investigate the presence or absence of a target molecule *in vivo*. Also immuno-PET, a combination of PET with monoclonal antibodies, may provide useful quantitative information about pharmacokinetics, accumulation in targeted and non-targeted tissues, and saturation of the target antigen in patients. Both, peptides and antibodies, can be labeled in a straight forward manner with several PET isotopes, such as Gallium-68 (^{68}Ga), Copper-64 (^{64}Cu), Fluorine-18 (^{18}F), Iodine-124 (^{124}I) and Zirkonium-89 (^{89}Zr). From those lists of PET isotopes, Gallium-68 is one of the most interesting because Gallium-68 is a positron-emitting radioisotope that is produced from a ^{68}Ge/^{68}Ga generator. As such it is conveniently used, decoupling radiopharmacies from the need for a cyclotron on site. Gallium-68-labeled peptides have been recognized as a new class of radiopharmaceuticals showing fast target localization and blood clearance.

Peptide-based imaging agents offer an interesting approach for the molecular imaging of inflammation. They are molecules that possess favorable properties, such as rapid diffusion in a target

tissue, rapid clearance from the blood circulation and non-target tissues, an easy and low-cost synthesis, and low toxicity and immunogenicity. Vascular adhesion protein-1 (VAP-1) is an inflammation-inducible endothelial adhesion protein involved in the leucocyte trafficking from the blood stream into the tissues. VAP-1 is stored in intracellular granules within endothelial cells and plays a key role in recruiting leucocytes into sites of inflammation [1]. VAP-1 is both an optimal candidate for anti-inflammatory therapy and a potential target for in vivo imaging of inflammation. This approach may open new opportunities for diagnosing, therapy planning and monitoring of the treatment efficacy, as well as for the drug discovery and development processes

Literature

When the body encounters tissue damage, it reacts to this change with inflammatory stimuli. the causes of tissue damage to exogenous and endogenous factors. Exogenous factors can be further divided into microbial, such as bacteria, viruses and parasites and non-microbial, such as allergens, foreign bodies and chemical and physical irritants. Endogenous signals, such as tissue stress and malfunction are more delicate and do not cause extreme symptoms, such as tissue damage. These changes are referred to as para-inflammation, at one end near the basal state and at the extreme end this phenomenon might play a role in many inflammatory diseases, such as obesity, type 2 diabetes, atherosclerosis, asthma and neurodegenerative diseases, which all are characterized by a chronic low-grade inflammation [2]. Imaging agents visualizing a specific progress during the development of inflammation would be valuable. Leukocyte migration from the blood into the non-lymphoid tissues is a hallmark of inflammation. Several molecules on the endothelial cell surface and their counter-receptors on vascular endothelium mediate a multistep adhesion cascade featuring tethering, rolling, activation, adhesion, crawling and transmigration phases. Non-invasive imaging of inflammation would be a highly valuable. Nuclear imaging modalities, single photon emission computed tomography (SPECT) and positron emission tomography (PET), offer functional and molecular information with high sensitivity.

Vascular adhesion protein 1 **(**vap-p1**)** is a novel adhesion molecule for inflammatory disease; its membrane bound homodimer with the molecular weight of app. 90 kDa/each monomer. The active site is large enough to accommodate an amino acid side chain and might interact with a larger molecule, such as a peptide or protein ligand. vap-p1 contains several sites for glycosylation. The glycosylation is needed for vap-p1 to function properly during leukocyte adhesion [2, 3]. Vap-p1 is also found in other tissues in addition to the inflamed synovial. It is practically absent in normal endothelium and is induced upon inflammation. The early translocation of vap-p1 onto the endothelial cell surface within an hour after the stimulus suggests that the function may be connected to the early recruitment of polymorphonuclear leukocytes [4, 5].

Even though vap-p1 seems to play an important role in the early events of inflammation, its expression on the cell surfaces stays constant for a longer time period, suggesting that its can still be targeted after the first phase of inflammation, and making it a promising target for anti-adhesive therapy. DOTA is the most suitable ligand conjugate structure of the conjugated vap-p1 targeting peptides when label with the radioisotope gallium-68 [6], The structures were show in Fig 1. The aims of this study were to find the optimum condition of labeling ^{68}Ga- DOTAVAP-P1 and to study the biodistribution of ^{68}Ga-DOTAVAP-P1 in BALB/cMlac-nu Models of inflammation and cancer.

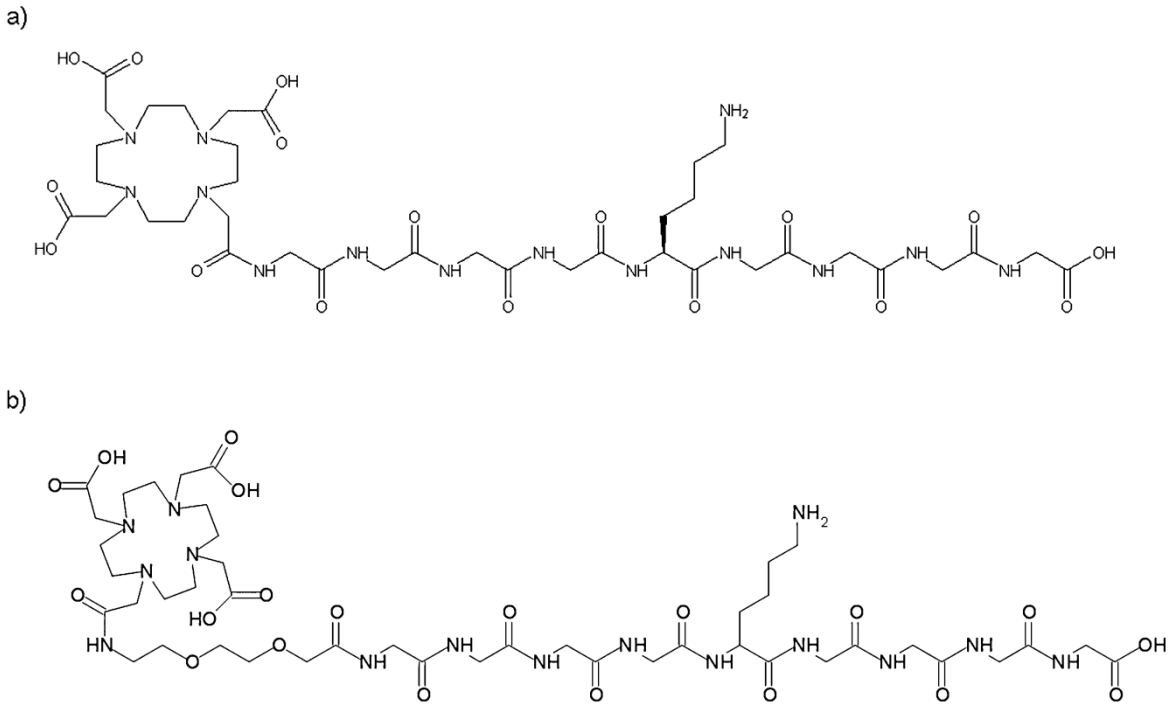


Fig. 1 Structures of VAP-1 binding peptides. a) DOTAVAP-P1 with the amino acid sequence: GGGGKGGGG and a molecular weight of 989.011 g/mol, b) DOTAVAP-PEG-P1 with the amino acid sequence: GGGGKGGGG and a PEG spacer (8-amino-3,6-diooxaoctanoyl). The molecular weight of the peptide is 1133.5 g/mol [6].

Methods

Labelling Method

Vap-p1 was labeled with **^{68}**Ga and DOTA ligand. Labeling conditions were optimized by adjusted the amount of peptide, pH and buffer.^{68}Ga was obtained from a ^{68}Ge/^{68}Ga by elution with 0.1 M HCl. [^{68}Ga]Cl_3, DOTAVAP-P1 was added, eluate was mixed with pH buffer to give a pH of approximately 4.4–5.0, radiolytic stabilizer was added to the mixture and incubated at 95°C for 20 min.

The study of optimum pH buffer and radilitic stabilizer

Sodium acetate and Ammonium acetate were used as pH buffers by adjusting the amount of solution that add to the labelling mixture in order to obtain pH ranged from 4.4-5.0. For the study of radiolytic stabilizer, the set of various concentrations of radiolytic stabilizer, ascorbic acid and gentisic acid, ranged from 0 to 30 milligram w/w or 10% w/v were added during the labeling. No further purification was needed. The labelling compound stability at room temperature was systematically categorized applying chromatography techniques. The radiochemical purity of [^{68}Ga]-DOTAVAP-P1 was determined by reversed-phase HPLC (C18 column, 7.8×300 mm2, 125 Å, 10 μm). The HPLC conditions were as follows: flow=4 ml/min; λ=215 nm; A=2.5 mM trifluoroacetic acid; B= 50 mM phosphoric acid. For A/B gradient: 0–8.5 min 100/0 and 8.5-16 min 0/100. The optimized condition of ^{68}Ga- DOTAVAP-P1 labeling were prepared and used for biodistribution study on BALB/cMlac-nu models.

The biodistribution study on BALB/cMlac-nu models.

All animal experiments were approved by the Laboratory Animal Center, Advanced Science and Technology, Thammasat University, Thailand. and carried out in compliance with the Thailand laws relating to the conduct of animal experimentation. The nude mice (BALB/cMlac-nu) were

obtained from Nomura Siam international co. ltd, Thailand, at the age of 6 weeks. Human liver cancer cell line, HepG2 cells (ATCC, USA) were injected subcutaneously into the flank region of nude mice and allowed to develop to the size of 1–2 cm in diameter. The biodistribution study was performed on three groups of experiment as followed;

Group I : Injected ^{68}Ga- DOTAVAP-P1 and count after 1 h of injection
Group II : Injected ^{68}Ga- DOTAVAP-P1 and count after 3 h of injection
Group III : Control, Injected with normal saline

The radiochemical purity of ^{68}Ga- DOTAVAP-P1 was more than 95%, the specific activity was in the range of 1.5-2.4 mCi/nmole peptide The nude mice were injected via tail vain with the total volumn not exceed 100 ul. The nude mice were euthanized with isoflurane and carbondioxide gas before dissection. In this study, the heart, liver, spleen, lungs, and kidneys were excised and analyzed by gamma counter. The calculation of Ratio of the percent injected dose per gram of organ (% Id/g) is show in Eq. 1.

$$\%\ ID / organ = \frac{Organ\ count \times 100}{Total\ counts\ injected\ dose}$$

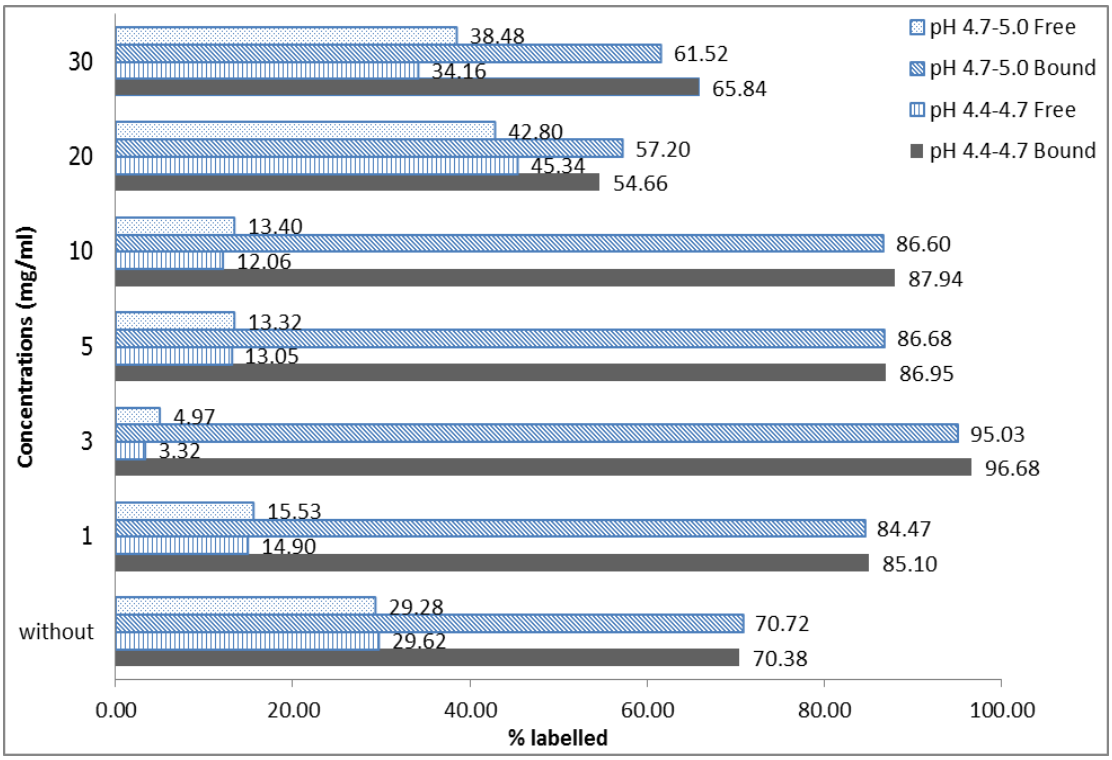
$$\%\ ID / g = \frac{\%\ ID / organ}{Organ\ weight\ (g)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Findings

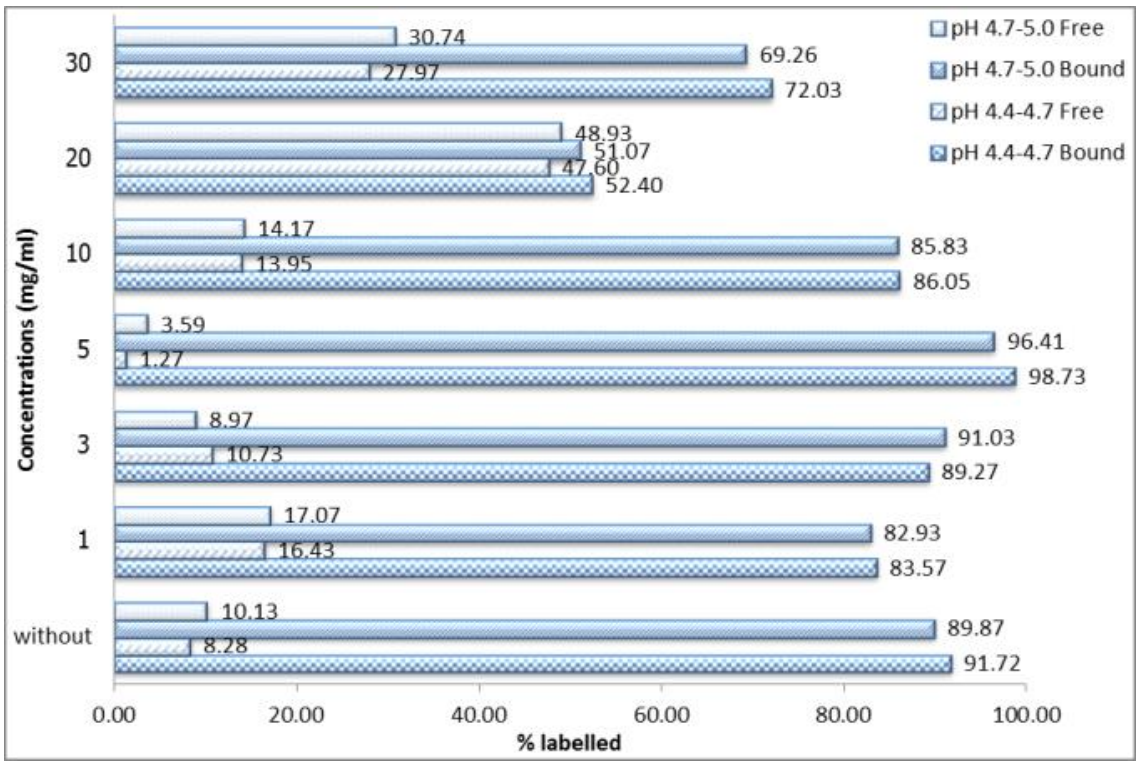
The study of optimum pH buffer and radilitic stabilizer

The results as show in Fig. 2 have been shown that 3 mg/ml and 5 mg/ml of gentisic acid increased the radiochemical purity of radiolabeled compound ^{68}Ga- DOTAVAP-P1 in sodium acetate and ammonium acetate pH adjustment solution, respectively. At pH 4.4 - 4.7, the 3 mg/ml and 5 mg/ml of gentisic acid increased the radiochemical purity of radiolabeled compound to 96.68±0.48 % in sodium acetate and to 98.73±0.49 % in ammonium acetate, respectively.

For ascorbic acid as show in Fig. 3, 10 mg/ml and 15 mg/ml of ascorbic acid increased the radiochemical purity of radiolabeled compound ^{68}Ga- DOTAVAP-P1 in sodium acetate and ammonium acetate pH adjustment solution, respectively. At pH 4.4 - 4.7, The 10 mg/ml of ascorbic acid increased the radiochemical purity of radiolabeled compound to 98.42±0.7% in sodium acetate and to 94.25±0.4% in ammonium acetate. Moreover, At pH 4.7 – 5.0, with 15 mg/ml of ascorbic acid can also increase the radiochemical purity of radiolabeled compound to 92.17±0.4%, but the shoulder peak still can be observed.

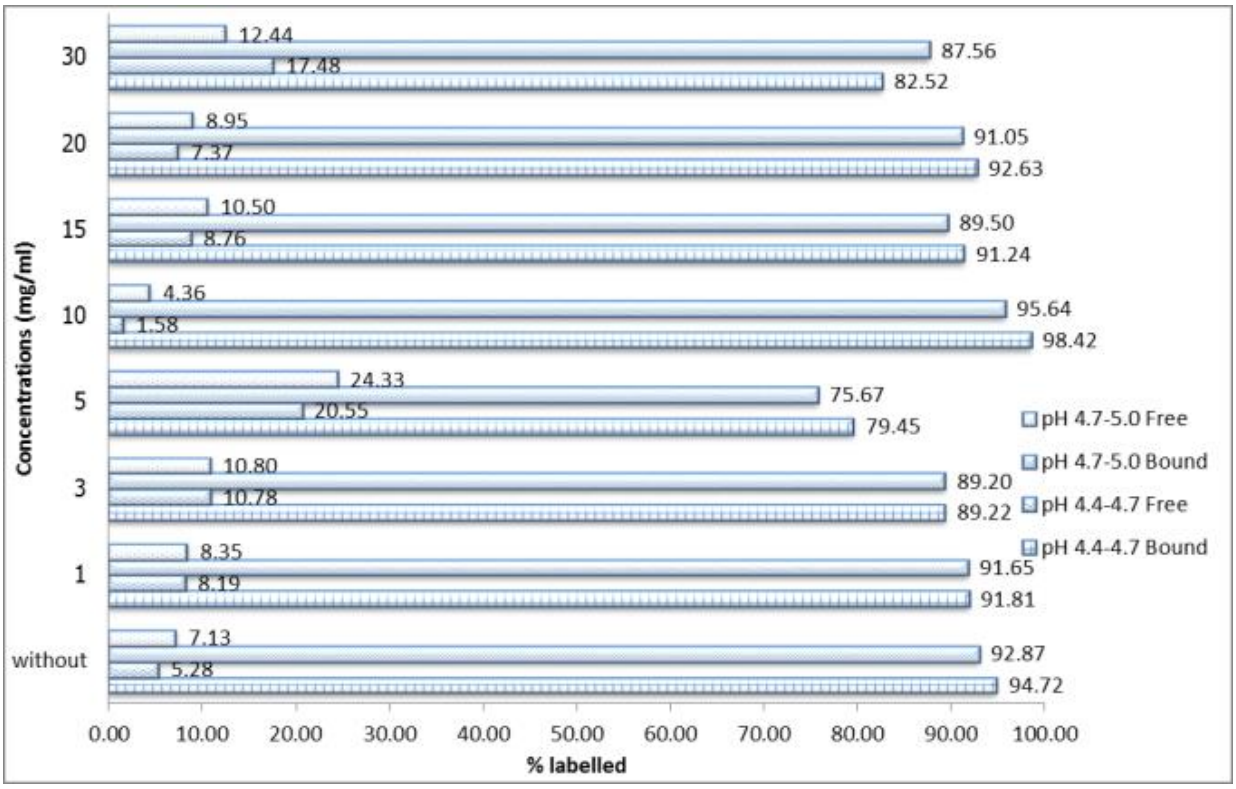


(a)

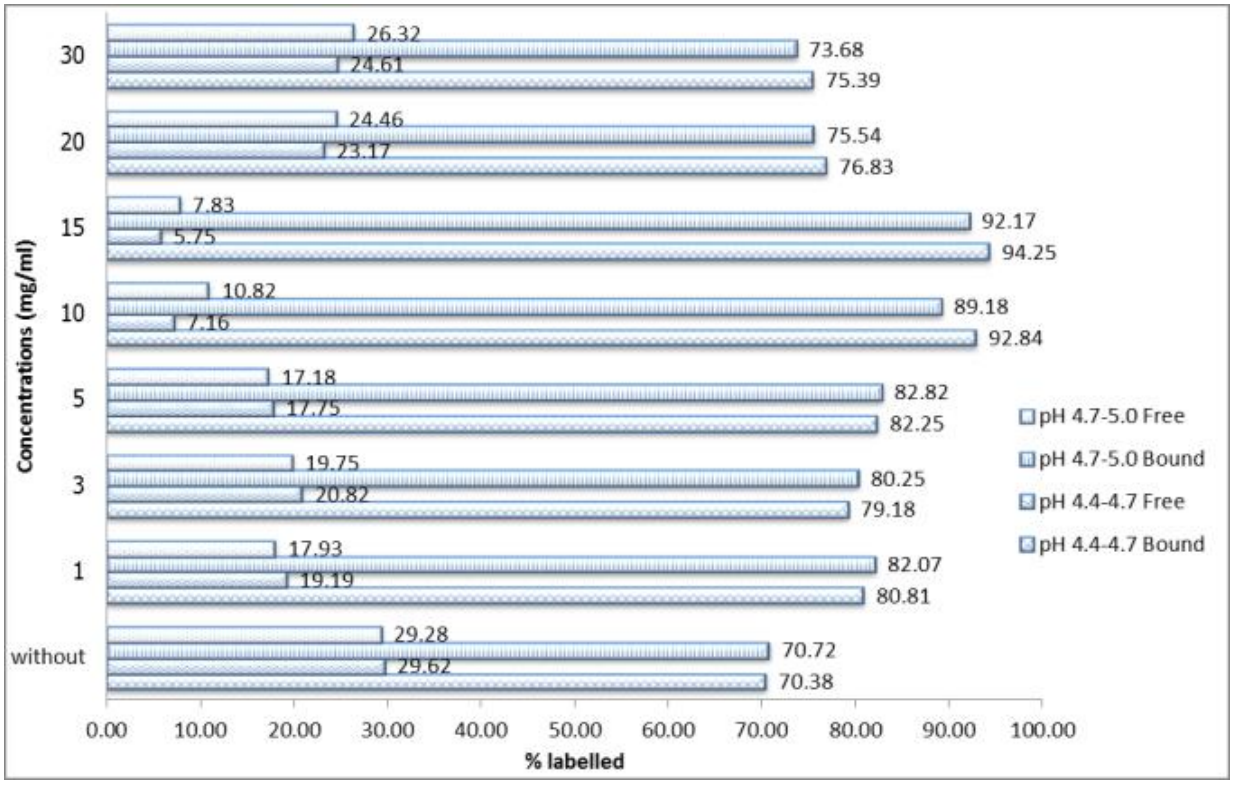


(b)

Fig. 2 The Labeled percentage with concentration of gentisic acid (a) sodium acetate as pH adjustment solution (b) ammonium acetate as pH adjustment solution



(a)



(b)

Fig. 3 The Labeled percentage with concentration of accobic acid (a) sodium acetate as pH adjustment solution (b) ammonium acetate as pH adjustment solution

The biodistribution study on BALB/cMlac-nu models.

The biodistribution study of ^{68}Ga- DOTAVAP-P1 in BALB / cMlac-nu mice which transplanted liver cancer cell were shown in Fig. 4 and Fig. 5. The results can be seen that ^{68}Ga-DOTAVAP-P1 is specific to inflammation in liver cancer, considering the% ID / g value of each study organ.

^{68}Ga- DOTAVAP-P1 showed a good tendency to be used in the diagnosis of non-infectious inflammation. And can develop further into labeling and radiation for targeted treatment The results of this study did not find the toxicity of synthetic molecules ^{68}Ga- DOTAVAP-P1. The compound can be quickly removed through the kidney and can circulate in the blood system more than 3 hours. The analysis results of organ accumulation showed the specificity. ^{68}Ga- DOTAVAP-P1 have been shown to target several major organs. The biodistribution study also showed that ^{68}Ga- DOTAVAP-P1 is specific to the occurrence of inflammatory conditions in liver cancer. The %ID/g of imflammatory muscle around the cancer is three times higher than normal muscl. There were nude mice that do not found cancer while observing from the outside, but when dissected the carcass found that all of transplanted nude mice had cancer stick to the kidney area. During the experiment, the animals do not have behavioral changes and there's no animals were found to die during the experiment.

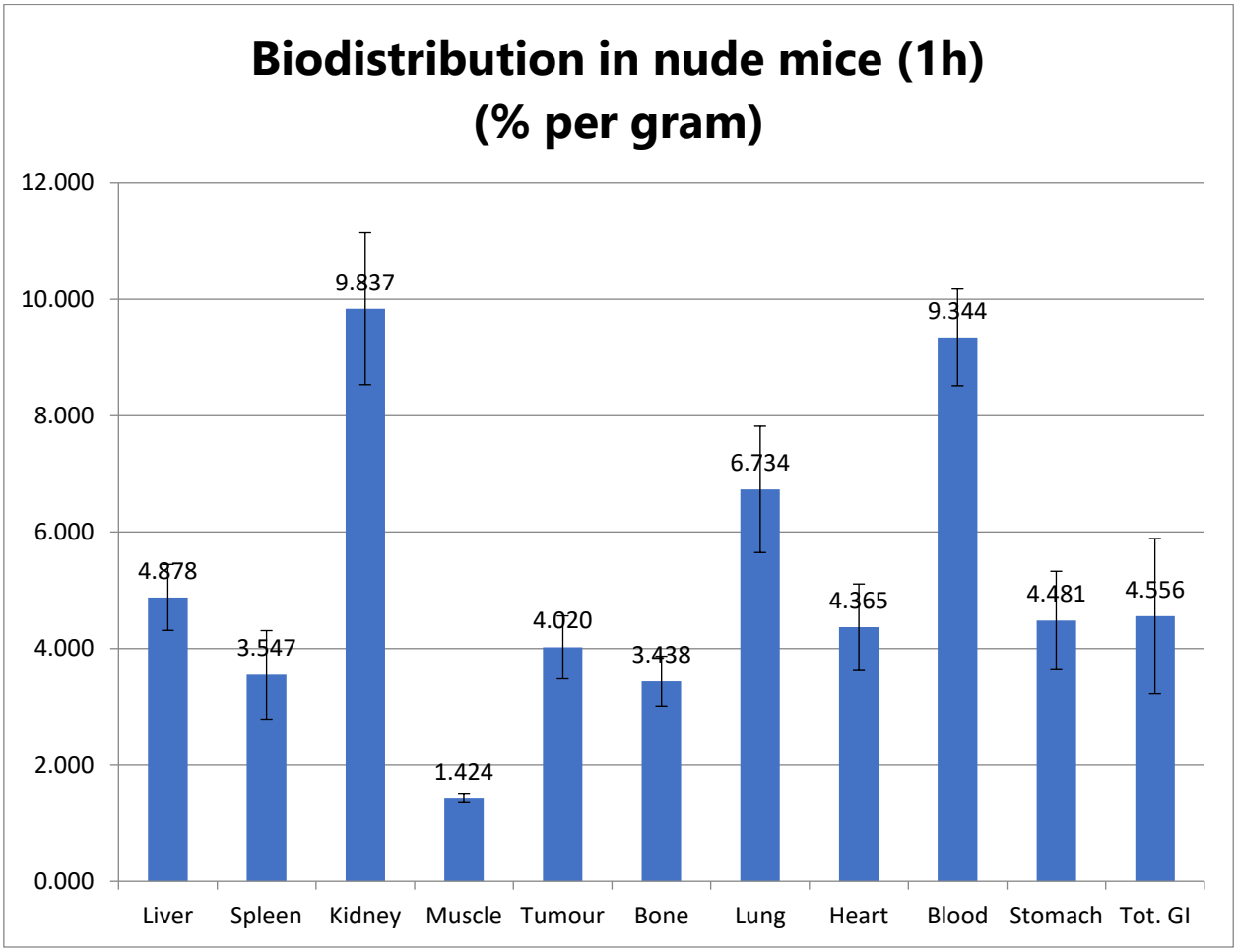


Fig. 4 Biodistribution in BALB/cMlac-nu mice (1h) (% per gram)

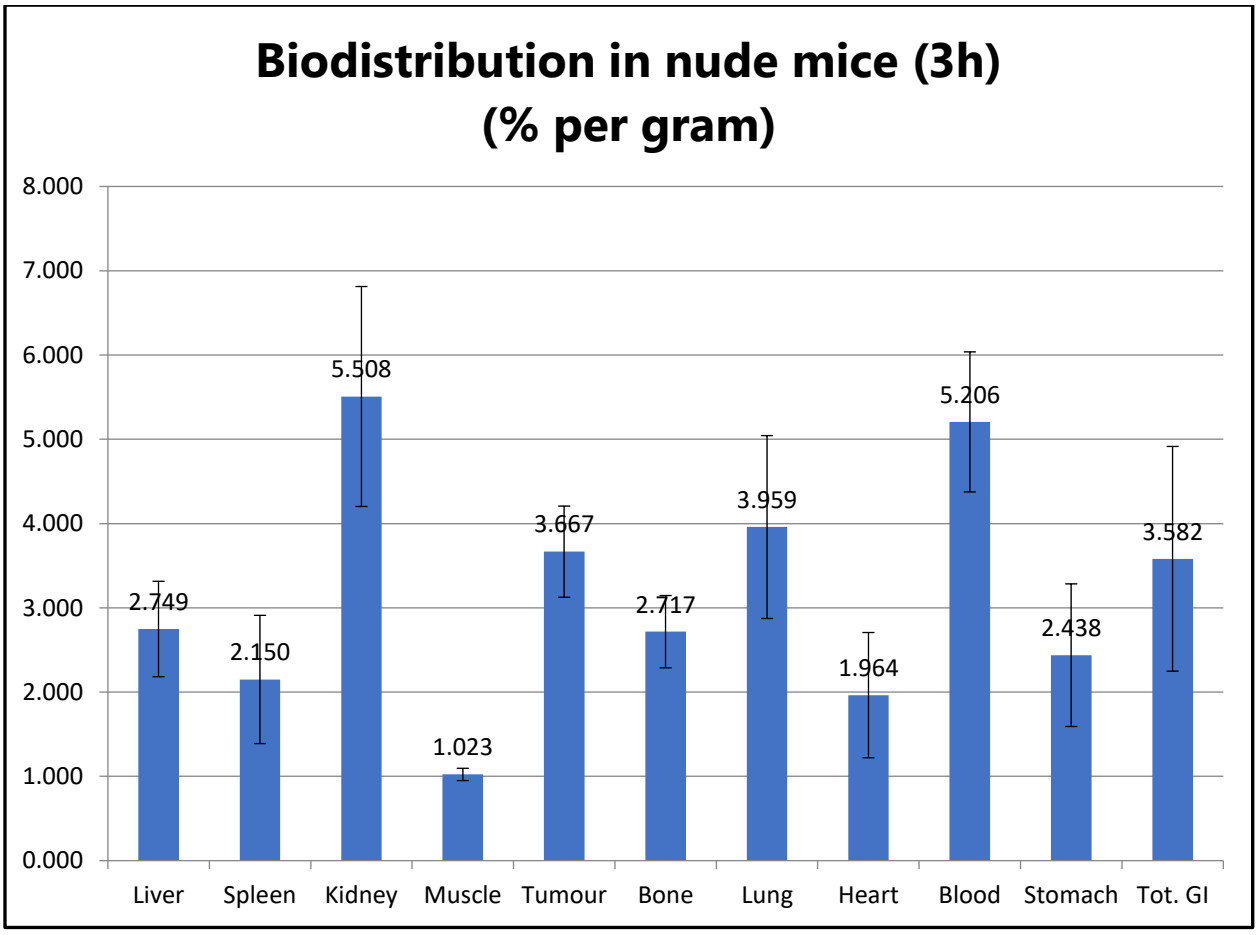


Fig. 5 Biodistribution in BALB/cMlac-nu mice (3h) (% per gram)

Discussions

The results obtained from this experiment showed that sodium acetate and ammonium acetate can be use as pH adjustment solution and at pH 4.4-4.7 showed the highest radiochemical purity of the labelled compound ^{68}Ga- DOTAVAP-P1. As a radiolytic stabilizer, the suitable concentrations of both gentisic acid and ascorbic acid can significantly increase radiochemical purity of ^{68}Ga- DOTAVAP-P1 radiolabeled compound.

In biodistribution study, the results of this experiment shown ^{68}Ga- DOTAVAP-P1 is a promising candidate for in vivo applications given their low accumulation in irrelevant organs, clearance times, and biocompatibility. The results showed efficient targeting to inflammatory tissue that gradually dissipates over 3 hours' time period. Organ distribution data showed initial clearance through the renal tissue with a subsequent shift to RES clearance at higher specific activity. Given these findings, the 100% survival rate at the specific activity range from 1.5-2.4 mCi/nmole peptide and the total volumn not exceed 100 ul.

Recommendations

For futher work, DOTAVAP-P1 can be promising candidate for labeling with diagnostic types of isotopes such as F-18, TC-99m or Cu-64 and labeling for therapeutic types ones such as Re-188, Lu-177 or Y-90 for use in the sterile inflammation on non-infectious disease.

References

[1] Anu A., Tiina H., Henri J.S., Sirpa J. and Anne R. (2011). Mini-PEG spacering of VAP-1-targeting ^{68}Ga-DOTAVAP-P1 peptide improves PET imaging of inflammation. The EJNMMI Research SpringerOpen Journal, 1(10), 1-7.

[2] Medzhitov R., Origin and physiological roles of inflammation. (2008). Nature, 454, 428-435.

[3] Mantovani A., Allavena P., Sica A., Balkwill F. (2008). Cancer-related inflammation. Nature, 454, 436-444.

[4] Aspinall A.I., Curbishley S.M., Lalor P.F., Weston C.J., Blahova M., Liaskou E., Adams R.M., Holt A.P., Adams D.H. (2011). CX(3)CR1 and vascular adhesion protein-1-dependent recruitment of CD16(+) monocytes across human liver sinusoidal endothelium, J. Hepatology, 51, 2030-2039.

[5] Gotthardt M., Bleeker-Rovers CP., Boerman OC., Oyen WJ. (2010). Imaging of inflammation by PET, conventional scintigraphy, and other imaging techniques. J Nucl Med., 51, 1937-1949.

[6] Airenne T.T., Nymalm Y., Kidron H., Smith D.J., Pihlavisto M., Salmi M., Jalkanen S., Johnson M.S., Salminen T.A. (2008). Crystal structure of the human vascular adhesion protein-1: unique structural features with functional implications. J. Protein Sci., 14, 1964-1974.

The observation of Koebner phenomenon with topical 0.1% Triamcinolone acetonide in combination with a fractional Erbium YAG laser for the treatment of psoriasis

Kittikun Ngamudomkiat, M.D.*, Assistant Professor Punyaphat Sirithanabadeekul, M.D. , Voraphol Vejjabhinanta, M.D.*****

*Division of Dermatology, Chulabhorn International College of Medicine, Thammasat University, Pathumthani,
Thailand
**Chulabhorn International College of Medicine, Thammasat University, Pathum Thani, Thailand
***Institute of Dermatology, Rajvithi Road, Phayathai, Bangkok, Thailand

****Corresponding author: tel: +66(0)830756233 Email address: dermsx@outlook.com

Abstract

Background: Topical corticosteroids are the most common treatment for psoriasis. However, the thickening and hardening from hyperproliferation of the psoriasis's skin can block the entrance of topical agents into the lesion site. Erbium YAG laser can forming a dense channel and increasing drug penetration rate. Erbium YAG laser associated with faster healing times and fewer side effects, because of its superficial absorption depth, decreased ablation, and less residual thermal damage may not cause Koebner phenomenon.

Objective: This study aimed to evaluated the adverse effect (Koebner phenomenon) of topical 0.1% triamcinolone acetonide in combination with a fractional Erbium:YAG laser for the treatment psoriasis.

Methods:A 1 week, pilot study was conducted in 10 volunteers. Patients with psoriasis at least mild severity, aged >18 years were enrolled. They received treatment of fractional Erbium YAG laser on their lesion at first visit then received topical 0.1% triamcinolone acetonide gel apply once daily on the same lesion. The adverse effect evaluation was to observe in this patient's group at immediately and week1

Results: Ten participants with mean (SD) age of 54 years and at least mild severity were enrolled into the study. No Koebner phenomenon at immediately and 1 week after this combination treatment

Conclusion: The topical 0.1% triamcinolone acetonide in combination with a fractional Erbium:YAG laser on psoriatic lesion has no shown Koebner phenomenon at immediately and 1 week after treatment in male and female participant who have psoriatic lesion.

Introduction

Koebner phenomenon is traumatic induction of psoriasis on non-lesional skin. It occurs more frequently during flare of disease and is an all-or-none phenomenon. Koebner phenomenon is observed in approximately 25% of patients with psoriasis. A particular patient may be patient may be "Koebner-negative" at one point in time and later become "Koebner-positive". Estimates of lifetime prevalence rise as high as 76% when factors such as emotional stress, and drug reactions are included. Psoriatic lesions can also be induced by other forms of cutaneous injury, e.g. sunburn, morbilliform drug eruption, viral exanthem. Various environmental stress factors on the skin have provoked KP, including trauma, such as burns, friction,insect bites, and surgical incision, as well as allergic and irritant reactions (1).

The Koebner reaction usually occurs 7–14 days after injury (2).

Koebner phenomenon is not specific for psoriasis but can be helpful in making the diagnosis when present. The recognition that many other skin diseases, such as vitiligo, lichen planus, Darier disease, bullous dermatoses and etc, also arise at sites of cutaneous injury (1).

Koebner phenomenon has been studied most extensively in psoriasis, but the pathogenesis of this phenomenon is still obscure. The response to the trauma in psoriatic patients was divided into 1.maximum Koebner response (ie, psoriasis would develop throughout the trauma site), 2. minimal response (ie, psoriasis would develop in focal areas); 3. abortive koebnerization (ie, psoriatic lesions would appear after trauma but would then resolve spontaneously in 12 to 20 days), and 4. no psoriatic reaction after trauma (1).

Topical treatment is the first choice for psoriasis. However, thickening of stratum corneum and difficult area to treat of psoriasis usually poor compliance in only topical treatment.

Laser-assisted transdermal drug delivery has been studied frequently in the recent years. Laser penetration deep into the dermis or subcutaneous layer to transmit drugs with large molecular weight and/or high charges. Nevertheless, laser-assisted transdermal drug delivery is one type of traumatic induction that may be can produce Koebner phenomenon

The advent of fractional ablative laser allows the creation of microscopic hole within the skin while leaving the surrounding tissue intact and therefore allows a quicker recovery. Fractional ablative procedures are available with carbon dioxide laser (CO2 laser 10,600 nm) and Erbium YAG laser (Er:YAG laser, 2940 nm).

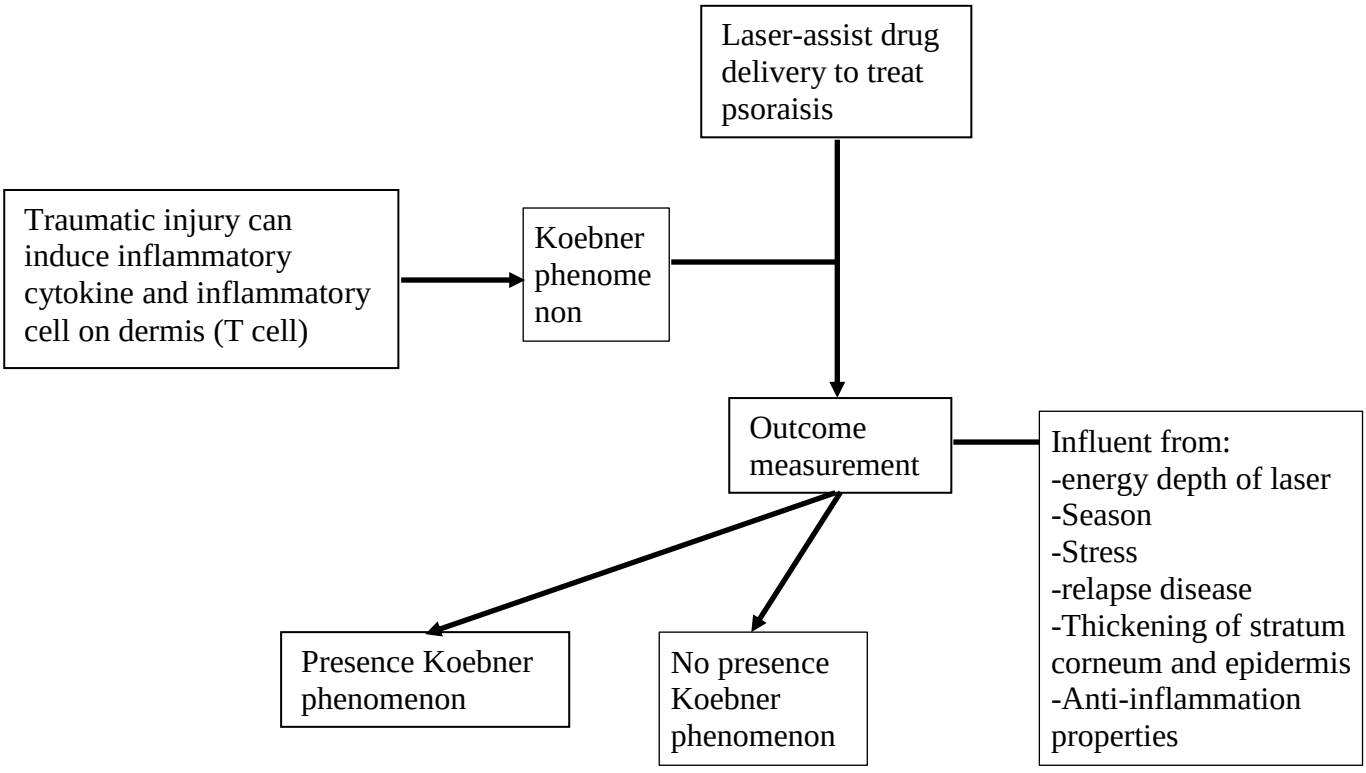
Er:YAG laser is associated with faster healing times and fewer side effects, compared to CO2 laser, because of its superficial absorption depth, decreased ablation, and less residual thermal damage (3). Therefore, we consider to use fractional Erbium YAG laser that may not cause Koebner phenomenon from this reasons.

In our study, we use topical 0.1% triamcinolone acetonide in combination with a fractional Erbium:YAG laser for the treatment psoriasis. This study aim to evaluate adverse effect (Koebner phenomenon) immediately and after 1 week for this combination treatment in psoriatic patients.

Hypothesis

Use topical 0.1% triamcinolone acetonide in combination with a fractional Erbium:YAG laser in treatment of psoriasis not have Koebner phenomenon at immediately and 1 week.

Conceptual framework



Methods

A. Study design

Observational study to evaluate the adverse effect (Koebner phenomenon) of topical 0.1% triamcinolone acetonide in combination with a fractional Erbium:YAG laser for the treatment psoriasis in men or woman aged >18years old. was conducted at the outpatient dermatology clinic of Thailand Tobacco Monopoly Hospital. This study was approved by the Human Ethics Committee of Thammasat University.

B. Study Participants

Ten male and female aged 39 to 72 years with Fitzpatrick skin Types III to V, who have been diagnosed for psoriasis >=6 months' duration with clinical diagnosis: Patients who have dry flaky lesion and well demarcated plaques with any supporting diagnosis- personal or family history of psoriasis, or confirmed or suspected psoriasis on the other parts of the body (trunk and limb, especially on the extensor surface of the extremities). At least mild psoriasis on lesions (defined by the Psoriasis Area and Severity Index (PASI) score >10 were enrolled into the study.

Subjects were asked to avoid any topical treatment on lesions during the study. The exclusion criteria are subjects with any topical treatment on psoriasis in the past 2 weeks or oral systemic medication for psoriasis 3 months prior to start of the study, with presence of seborrhoeic dermatitis or other inflammatory or connective tissue diseases that could interfere with the evaluation of psoriasis, pregnant and lactating women.

C.Methods

In this study, the treatment will be assigned for each patients. Each patient will get fractional Erbium:YAG laser on lesions at first visit then each patient will get topical 0.1% triamcinolone acetonide gel apply on same lesions once daily for 7 days. Along with prescribing non-medical shampoo apply adequately once daily. Other topical applications or cosmetic products that will affect the result will be prohibited throughout the study. The use of 2940 nm Er:YAG (Fotona XS Dynamis, Slovenia) promoted the absorption of topical drugs for psoriasis. Er:YAG laser treatment parameters were as follows: Er:YAG fractional laser with the 50-µm energy depth (4).

D.Assessment

Adverse effect (Koebner phenomenon) results will be objectively assessed by clinical photographs which captured before (baseline), after laser treatment (immediately) and week 1 (7day after combination treatment) by using digital camera (Nikon d50, Nikon Corporation, Tokyo, Japan).

Photographic documentation is used by identical camera setting, lighting and fixed patient positioning will be obtained. A distance and angle between the patient and the camera will be fixed. Flash lamps will be placed in fixed positions to the camera to ensure those all parts of the hand will be under controlled light. Two blinded dermatologist will assessed the Koebner phenomenon in each patient after laser treatment (immediately) and week 1.

Result

The demographic data were analyzed using standard descriptive statistics. A total of 10 female and male subjects with a mean age of 54 years were included and completed the study.

Statistical analyses

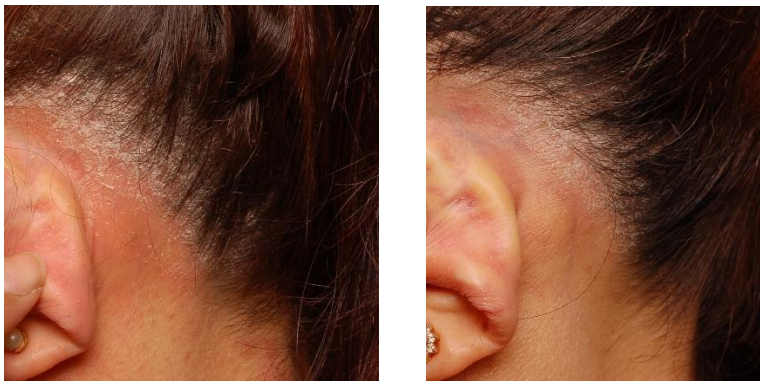
	Total (N=10)
Number	10
Age (years) MEAN (SD) RANGE	 54(10) 39-72
Severity Mild Moderate to severe	 3(30) 7(70)

Table I. baseline Demographic data

The Koebner phenomenon will be observed in ten patients which assessed after laser treatment (immediately) and week 1. After laser treatment (immediately), no psoriatic reaction after trauma in ten patients (no Koebner phenomenon). Also at 1 week after combination treatment, no psoriatic reaction in ten patients too.

	observe Koebner intermediately		observe Koebner after 1 week	
No.	have	not have	have	not have
1		/		/
2		/		/
3		/		/
4		/		/
5		/		/
6		/		/
7		/		/
8		/		/
9		/		/
10		/		/

Table II. The result of Koebner phenomenon in ten patients at immediately and after 1 week in patients who treated with 0.1% triamcinolone acetonide combination with fractional Erbium YAG in treatment of psoriasis



(A) (B)

Fig.1 Target photograph of digital camera for observe Koebner phenomenon at (A) Baseline, (B) after 1 week

Discussion

Psoriasis is highly visible and has been found to have an impact on the quality of life of patients, their appearance can be only localized scales or can manifest as widespread with hyperkeratotic plaques. Scales can extend visibly beyond the hair margins and involve the face, neck, and ears. Patients with lesions involvement might experience intense itching.

The current mainstay of treatment is topical preparations that consist of an active ingredient within a many formulation. The most important active ingredients available for psoriasis are corticosteroids.

Numerous preparations that are available for the treatment of psoriasis contain high-potency steroids, such as betamethasone dipropionate lotion or clobetasol propionate solution; both of these steroids are classified as superpotent (Class 1 steroids) (5). Currently we have many studies which use low or medium potent steroid for treatment of moderate to severe psoriasis (such as triamcinolone acetonide, desoximetasone, hydrocortisone) and can reduce adverse effect from high potency steroid used.

Triamcinolone acetonide is a low to medium potent corticosteroid that have anti-inflammation, anti-hyperproliferation, immunosuppressive and vasoconstrictive effect that can direct resolve at pathogenesis of psoriasis. In addition, triamcinolone acetonide have fluorine group in their structure that can increase their affinity and penetration of drug (desoximetasone and hydrocortisone not have fluorine group). Therefore, we consider to use triamcinolone acetonide in our study.

Thickening and hardening from hyperproliferation of the skin block the entrance of topical agents into the lesion site. Laser energy can changes the molecular arrangement of the tissue, thereby forming a dense channel and increasing drug penetration rate. Er:YAG laser is a good method for enhancing transdermal absorption of both lipophilic and hydrophilic drugs (4).

The theory of the thermal damage, commonly referred as the microthermal treatment zone. Comparing with fractional CO2 laser, fractional Er:YAG has less undesired thermal effects, and thus is therefore better adapted to achieving the desired effects in drug delivery, due to less thermal coagulation. The side effects are also minimized, allowing a quicker recovery within 24 hours or even an hour due to less damage(6) by re-epithelialization and microscopic epidermal necrotic debris (MENDs) formation, which is thought to represent the elimination of the thermally damaged keratinocytes through the migration of the viable keratinocytes that are present at the margins of the wound.

Er:YAG (2940 nm) ablates different depths of tissue and increases the drug percutaneous absorption with superficial penetration depth (100–150 μm) had rapid recovery (1–3 days) and had completely recovered within 4 days (7). Er:YAG laser is associated with faster healing times and fewer side effects, compared to CO2 laser, because of its superficial absorption depth, decreased ablation, and less residual thermal damage (3)

The multilayered envelop of the epidermis varies in thickness, depending on cell size and number of cell layers, ranging from 0.8 mm on palms and soles down to 0.38- 0.06 mm on the eyelids (8). The normal thickness of epidermis are average 40 μm (9).Capillaries reach to within 0.2 mm (200 μm) of skin surface and provide sink conditions for most molecules penetrating the skin barrier (8). The average thickening of dermis are 900-1500 μm (9).

The appropriate of depth for laser-assist drug delivery on normal skin may be more than amount 40 μm that can through epidermis but less than 200 μm for reduce systemic side effect from drug direct into microcirculation. From this data we decide to use Er:YAG laser on energy depth 50 μm in this study.

There are articles on Er:YAG fractional laser that had been applied in the promotion of drug delivery for psoriasis (only on extremities area) in 2017 and 2018.

In 2017 Ruilian Li et al. studied 2940-nm Er:YAG fractional laser enhanced the effect of topical drug for psoriasis. A total of five (four males and one female) recalcitrant psoriasis patients were given laser treatment eight times at 1-week intervals with the following parameters: 5–11% spot density, pulse duration of 500 μs and 250-μm spot size. Psoriatic lesion at both knee divide in 2

groups: laser once every 1 week + topical calcipotriol ointment group twice every day and topical drug alone group for 8 weeks. Er:YAG laser produces mild burning pain during treatment in most patients and they can tolerate.The side effects and complications of laser treatment were limited to hyperpigmentation. The pigmentation in all patients gradually disappeared after 3 month of treatment. No other adverse reactions were reported (4).

In 2018, Shahenda A. Ramez et al. studied novel methotrexate soft nanocarrier/fractional erbium YAG laser combination for clinical treatment of plaque psoriasis. Thirty patients with plaque psoriasis presenting to the Dermatology Outpatient Clinic of the National Research Centre were enrolled in this study. Assessment parameters included follow-up photography for up to 8 weeks of treatment, estimation of the psoriasis severity [TES (thickness, erythema, scales)] score. Fractional Erbium:YAG laser (Fotona, LLC, Farmers Branch, TX) with a wavelength of 2,940 nm and an articulated arm was used to deliver the laser beam onto the skin. A spot diameter of 7 mm was used to achieve fluent of 3 J/cm2, and the laser hand piece was located 2 cm from the skin surface. Weekly follow up with the patients was conducted in the clinic, in which one of the two plaques was treated with fractional erbium:YAG laser, and the other was left as a control. No adverse effect report in this study(10).

Both articles on Er:YAG fractional laser that had been applied in the promotion of drug delivery for psoriasis do not have report of Koebner phenomenon after laser treatment.

The Koebner phenomenon is one of the most well-known entities in dermatology. This isomorphic phenomenon is now known to involve numerous diseases, among them vitiligo, lichen planus, and Darier disease. The pathogenesis of the Koebner phenomenon is still obscure but may involve cytokines, stress proteins, adhesion molecules, and autoantigens.

The Koebner reaction usually occurs 7–14 days after injury (2). Thus, we consider to follow up 1 week after the treatment in our study.

Two steps may be essential in Koebner phenomenon. A first nonspecific inflammatory step contributes to the production of many substances, including cytokines, stress proteins, adhesion molecules, or autoantigens translocated from intracellular areas. In the second step theremay be disease-specific reactions, including by T cells, B cells, autoantibodies, and immune deposits under the restriction of genetic backgrounds.

In 2008, Role of NGF and Its Receptor System in the Pathogenesis of Psoriasis by Siba P. Raychaudhuri et al., show that : the role of nerve growth factor (NGF) in KP and psoriatic skin due to its key pathologic events of psoriasis-keratinocyte proliferation, angiogenesis, and T-cell activation -was assessed(11).The authors examined the kinetics of NGF expression, keratinocyte proliferation, and migration of T lymphocytes in the epidermis in Koebner-induced developing psoriatic plaques. A marked upregulation of NGF was noticed 24 hours after traumatization of skin, which reached its maximum level in the second week. This was not evident in Koebner-negative patients and healthy controls. In addition, an upregulation of tumor necrosis factor-a (TNF) was noted in the lesions. This is in line with previous reports that showed an increase in the expression of interleukin 1 and tumor necrosis factor-a in psoriatic plaque,(2*) presumed to contribute to the rise of NGF.

Various reports suggest that trauma has to cause both epidermal cell injury and dermal inflammation to produce Koebner phenomenon. Suction blisters, for example, do not progress to psoriasis(12). This may be accounted for by epidermal–dermal separation with minimal cell injury or inflammatory reaction caused by suction. In a study that used low-pressure suction or tape stripping, or both, psoriasis developed only where the blister roof was removed(13). These findings suggested that rupture of the epidermis can initiate the Koebner response, but secondary dermal events are necessary for a psoriatic lesion to form.

From our result, in ten patients who was received topical 0.1% triamcinolone acetonide in combination with a fractional Erbium:YAG laser for the treatment psoriasis, there are no Koebner phenomenon (no psoriatic reaction; not increase erythema, not increase induration, not increase desquamation, not increase area involvement) at intermediate and 1 week after combination treatment. The theory in this condition may be come from these two factor: First, the appropriate of depth for laser-assist drug delivery, the energy depth of laser in our study is 50 μm that can penetrate

stratum corneum, epidermis and minimal part of upper dermis on lesions. Our laser parameter can be laser-assist drug delivery to conduct topical triamcinolone acetonide (lipophilic) through stratum corneum and epidermis (hydrophilic layer) to increase drug absorbtion. However, this energy depth of laser not enough for penetrate to all dermis. Thicker and harder skin than normal skin from pathology may be other reasons that why our laser not penetrate too much (minimal cell injury- no secondary dermal events) and not produce Koebner phenomenon.

Second is anti-inflammatory effect from corticosteroid. From previous study, suspected pathogenesis of Koebner phenomenon is related with dermal cell and process such as cytokine (TNF), T cells migration, B cells, autoantibodies, keratinocyte proliferation. Triamcinolone acetonide is corticosteroid that have anti-inflammation, anti-hyperproliferation, immunosuppressive and can treat psoriasis by related with T cell and inflammatory cytokine (TNF). During use triamcinolone acetonide in psoriasis may be inhibit or resolved Koebner phenomenon in our patients.

Our result demonstrate that it was safe from Koebner phenomenon when use topical 0.1% triamcinolone acetonide in combination with a fractional Erbium:YAG laser in treatment of psoriasis. The limitations of this study are the small sample size, short period of the study and only one depth of laser to be comparable. To the best of our knowledge, we suggest that you should have more sample size, long period of study and more parameter to comparative in further study.

Conclusion

This study demonstrates for the first time that use topical 0.1% triamcinolone acetonide in combination with a fractional Erbium:YAG laser in treatment of psoriasis and not have Koebner phenomenon on lesion during experimental.

Reference

Sagi L, Trau H. The koebner phenomenon. Clinics in dermatology. 2011;29(2):231-6.

Thai KE. Fitzpatrick's Dermatology in General Medicine. Australasian Journal of Dermatology. 2008;49(3):175-.

Tannous Z. Fractional resurfacing. Clinics in dermatology. 2007;25(5):480-6.

Li R, Zhou J, Su H, Wang M, Wang Y, Xiao S, et al. 2940-nm Er: YAG fractional laser enhanced the effect of topical drug for psoriasis. Lasers in medical science. 2017;32(6):1393-7.

Pauporte M, Maibach H, Lowe N, Pugliese M, Friedman D, Mendelsohn H, et al. Fluocinolone acetonide topical oil for scalp psoriasis. Journal of dermatological treatment. 2004;15(6):360-4.

Laubach HJ, Tannous Z, Anderson RR, Manstein D. Skin responses to fractional photothermolysis. Lasers in Surgery and Medicine: The Official Journal of the American Society for Laser Medicine and Surgery. 2006;38(2):142-9.

Lee W-R, Shen S-C, Lai H-H, Hu C-H, Fang J-Y. Transdermal drug delivery enhanced and controlled by erbium: YAG laser: a comparative study of lipophilic and hydrophilic drugs. Journal of controlled release. 2001;75(1-2):155-66.

Gaikwad AK. Transdermal drug delivery system: Formulation aspects and evaluation. Compr J Pharm Sci. 2013;1(1):1-10.

Chopra K, Calva D, Sosin M, Tadisina KK, Banda A, De La Cruz C, et al. A comprehensive examination of topographic thickness of skin in the human face. Aesthetic surgery journal. 2015;35(8):1007-13.

Ramez SA, Soliman MM, Fadel M, Nour El-Deen F, Nasr M, Youness ER, et al. Novel methotrexate soft nanocarrier/fractional erbium YAG laser combination for clinical treatment of plaque psoriasis. Artificial cells, nanomedicine, and biotechnology. 2018:1-7.

Raychaudhuri SP, Jiang W-Y, Raychaudhuri SK. Revisiting the Koebner phenomenon: role of NGF and its receptor system in the pathogenesis of psoriasis. The American journal of pathology. 2008;172(4):961-71.

Pedace FJ, Muller S, Winkelmann R. The biology of psoriasis. An experimental study of the Koebner phenomenon. Acta dermato-venereologica. 1969;49(4):390-400.

Powles A, Baker B, Rutman A, McFadden J, Valdimarsson H, Fry L. Epidermal rupture is the initiating factor for the Koebner response in psoriasis. Acta dermato-venereologica. 1990;70(1):35-8.

Study of pH values in Bottled Drinking Water Sold at Convenience Stores

Nachattamar Rungratmaneemas
Department of Anti-Aging and Regenerative Medicine, College of Integrative Medicine, Dhurakij Pundit University, Thailand, ncr.dpu@gmail.com

ABTRACT

Background: Maintaining pH balance can lead to good health and longevity. A pH level in human body can be influenced by many factors. One of them is drinking water. In early 2018, Thai social media reported a misunderstanding incident on the result of pH test of bottled drinking water. Therefore, the researcher aimed to study pH level in bottled drinking water using a precise standard method.

Objective: To study and compare the average pH value of bottled drinking water sold at convenience stores between flat water and mineral water.

Study design: Samples of this study were 12 brands of bottled drinking water (450-600 ml.) sold at convenience stores during February 18-24, 2019. Samples were randomized and divided into 6 brands of flat water and 6 brands of mineral water. pH value was tested by using pH meter in a certified standard laboratory.

Study result: Average pH value of mineral water was 7.45 (S.D.=0.378), with pH range of 6.89-8.00. It was found that 50 percent of flat water was acidic. Average pH of flat water was 7.21 (S.D.=0.542), with pH range of 6.38-7.77. Bottled drinking water sold at convenience stores had pH value more than 7 at a significance level of 0.05(p-value<0.001). From the study, there was no difference between pH values of mineral water and flat water at a significance level of 0.05(p-value=0.068).

Conclusion: Mineral water had an average pH higher than 7 (alkaline). There was no difference between the average pH of mineral water and flat water.

Key words: pH, Bottled drinking water, Mineral water, Flat water, Convenience stores

1. Background

Water is an important part of life. Human body contains 70 percent of water, especially a baby has water up to 74 percent. Our human body must circulate water all the time, so we should choose the quality drinking water because water plays a key role in the body. On the other hand, if body is dehydrated for three days, it may result in death. If we do not drink enough level of water everyday, our body system may malfuncation. Therefore, the body should receive sufficient amount of water to help cells to have vitality and resist defunction or aging (Somsak Worakamin, 2013).

pH value is used for acid-alkaline measurement and pH scale ranges from 0 to 14. If pH of a substance is less than 7 , the substance is acidic; if pH f a substance is greater than 7 , that substance is alkaline, but if the pH is equal to 7, that substance is neutral. (Anusit Kuakul, 2017)

There is a biochemist saying that pH is The Real Silent Killer. The reason for this nickname is that people do not care about the acid status in their blood, which it is a silent danger that will destroy health and cause death. Normally, blood pH in human is between the range of 7.35 to 7.45, which is weakly alkaline. If blood pH is 6.8 (acid), person will lose consciousness and die. If blood pH is below 7.3 (pH 7.3 is still alkaline), person will begin to have symptom called Acidosis. (Somsak Worakamin, 2013)

If the body lacks alkalinity from drinking water or food, calcium and magnesium will be extracted from bone in order to increase alkalinity in blood making body's pH return to about 7.4 as before. But the subsequent disadvantage is that bone loses calcium, this may cause osteoporosis. If calcium is continuously extracted from heart, it would be cause of heart problem and cause of death. The best drinking water should have pH of around 8.5 . The reason is that lifes of peope tend to cause acidic condition easily. Some popular brands of drinking water in countries have pH level at 2.5, which is considered to be very acidic. The organs in body system will function well, pH level in blood must be 7.4.

Therefore, the water we choose to drink should be more alkaline than blood to react with acids and counterbalance the original pH of blood to 7.4 (Somsak Worakamin, 2013)

From the initial observation on the commercial label of bottled drinking water sold in market, most did not specify pH. In addition, there is a group of consumers who have doubts about pH level in bottled drinking water. Therefore, they try to find an approximate pH value manually by using the color comparison of pH Test Kit. Absolutely, the result is incorrect. This may be caused by using the wrong test set leading confusion to people in society as appeared on online media in Thailand in early 2018 (NewsMonitor News Team, 2018)

Figure 1. News on misunderstanding in testing pH of bottled drinking water appearing in online media. From the topic: "Dr.Jessada counters a Youtuber's video on testing pH in drinking water – making misunderstanding due to using a wrong test method" by NewsMonitor News Team, 2018, *Matichon.* Retrieved October 15, 2018, from https://www.matichon.co.th/news-monitor/news_936401

The above information makes the researcher interested in studying and comparing an average pH in bottled drinking water sold at convenience stores between flat water groups and mineral water groups by using a precise standard method in order to provide correct information to consumers for considering how to select bottled drinking water sold at convenience stores to help promote thier good healths.

2. Literature

Somsak Worakamin (2013) said that the ideal drinking water should look like:

1. Mineral Water
2. Alkaline Water
3. Micro Cluster or Small Cluster
4. No contaminants that harmful to health.

The International Bottled Water Association provides the definitions for bottled dringking water as follows:

1. Drinking water is water produced from good quality water source (Qualified) which may be groundwater or tap water. The manufacturing process must have many steps that can improve the quality of water such as filtering through charcoal layer to remove odor and resin layer to reduce hardness of water and to sterilize microorganisms that may be contaminated in water through ultraviolet light (UV) or Ozone (O_3).

2. Purified water is water produced by the refining process or used electricity to separate minerals that are contaminated, or filtered by a method called Reverse Osmosis (RO).

3. Natural water is underground water including mineral water and water from spring, well, artesian well, excluding public water sources or tap water. (Wisit Jawasit & Sitima Jittinan, 1994)

Natural mineral water is water stored in the space between rocks layers including groundwater. Groundwater is raw water that contains many minerals in the amount that is not harmful to drinker. It is different that natural mineral water has the type and the amount of mineral elements with specific properties according to the source of the mineral water and must be produced only in the raw water source area. Pre-packaged production method can be done only by adjusting the amount of gas contained in natural mineral water or dispose of unstable compounds by sedimentation or filtration method only. However, the above production method must not change the important compounds in natural mineral water. (Food and Drug Administration, n.d.; Sudjai Wongchari & Ritikrai Phawaphutanon, 2009, p.9; Thairath Online, 2013) Other process of drinking water production in sealed containers such as use of Resin, Reverse osmosis (RO), Ozone (O_3) and Ultraviolet light (UV) may affect the composition of water. Therefore, it is considered that such process is not consistent with the Notification of the Ministry of Public Health (No. 199) B.E.2543, Natural Mineral Water (Ministry of Science and Technology, 2016)

All 3 types of water are widely sold in Thailand. According to the Food Act B.E. 2522, drinking water and purifying water are required to have quality or standard in the type of consumable water in closed containers. For natural water products from various sources under the law are considered to be natural mineral water. (Wisit Jawasit & Sitima Jittinan, 1994), according to the quality standard of drinking water in sealed containers, the Ministry of Public Health defines pH values at 6.5-8.5 (Notification of the Ministry of Public Health No. 135, 1991)

Wutthipong Thitirux (2016) studied the opinions of people on bottled water by randomly collecting data from 400 Thai people aged 18 years and over. It is found that most consumers often buy bottled water from convenience stores corresponding with the research of Chantisa Sirisuntron (2016) studied on the marketing factors that affect the buying behavior of bottled water of consumers in Nonthaburi Province by randomly surveying from a sample of 400 people. It was found that the top three factors that consumers were interested in were drinking water quality, distribution channels that are convenient to buy, and savings, respectively. Best seller size of bottled water is 500-600 ml.

A pH can be tested in many methods; each method provides different values as follows

1. Litmus paper can only present that the sample is acid or alkaline
2. Universal indicators:

2.1 Universal indicator paper can show acidity and alkalinity more accurately than Litmus paper because it has a color bar to compare how much the sample is tested with pH value.

2.2 Universal indicator solution (pH Test Kit) roughly determines pH value in any pH range. This method, the amount of the substance tested and the amount of universal indicators solution used in the test are important for interpretation. Using in the wrong amount, the color may come out wrong.

3. pH meter is a tool that is accurate and provides more than 3 precision devices mentioned above, by using a voltage difference between two electrodes that occur between the indicator electrode and reference electrode and then changing the voltage difference to a pH value, and the result is displayed clearly in numbers. Using Benchtop pH Meter in laboratory is considered as a Gold Standard Method.

In 1931, Dr. Otto Warburg received the Nobel Prize in Medicine from his discovery that is cancer occurs in the absence of oxygen. When considering the acid-alkaline chemistry of the solution, it is found that oxygen is less soluble in acidic solution. Therefore, the acid condition of body promotes osteoporosis and heart disease problems, as well as cancer. The ideal drinking water must therefore has a weak alkalinity to act as a buffer to reduce the risk of these diseases.

Lee et al. (2004) studied by injecting melanoma cancer cells into rats and tracked the differences between groups treated with alkaline water and tap water. It was found that cancer cells in a group of rats fed with alkaline drinking water grew more slowly, thus helping rat survive significantly longer . Alkaline drinking water also showed inhibition of metastasis by reducing the number of colonies of cancer cells. They concluded that the anti-cancer effect of alkaline drinking water is probably due to the ability to reduce the amount of ROS and the ability to balance the immune system.

Jin et al. (2006) said that alkaline water is known to have various anti-cancer abilities including removal of ROS and lowering blood sugar level. Therefore, there was a study to determine the effect of alkaline drinking water on control of spontaneous diabetes in Otsuka Long-Evans Tokushima Fatty (OLETF) mice. It was found that the glucose levels of both groups increased. However, the glucose levels of the group of rats fed with alkaline water were significantly lower than the control group after 12 weeks ($p<0.05$). Total cholesterol levels and triglycerides of group was fed with alkaline drinking water were significantly lower than the control group. These results indicate that alkaline water stimulates the growth of OLETF mice in the growth stage. And drinking alkaline water in the long term can decrease glucose levels, triglycerides and blood cholesterol.

Hypothesis:

1. Bottled dringking water sold at convenience stores in the mineral water group has an average pH more than 7 (Alkaline).

2. Bottled of waters sold at convenience stores in the mineral water group has an average pH greater than flat water.

3. Methods

This research is a quantitative research study (Waewdao Promsen, 2011, pp. 95-102). Sampling bottled water sold at general convenience stores or convenience stores located in fuel stations during February 18, 2019 - February 24, 2019 to analyze the pH value. pH value was tested with benchtop pH meter in certified standard laboratory.

Samples: 450-600 ml of bottled water sold at convenience stores

Sampling methods: Selected 12 brands of drinking water by drawing lots, which were divided into 6 brands of flat water and 6 brands of mineral water. Collected 3 samples of each brand from different stores (total 3 6 samples). Removed tis trade label and writed the sample code attached to the bottle. The samples were deliverd to the laboratory.

Research instrument:

1. Benchtop pH meter IONIX EC10 and Pen type pH meter
2. Combination pH electrode
3. Standard buffer solution pH 4, 7 and 10

4. Findings

The mineral water groups of bottled water sold at convenience stores, which were analyzed by the benchtop pH meter, had the average pH of 7.45, Standard Deviation 0.378, and pH Range of 6.89-8.00. One brand was found that it was acidic water (M6) as shown in Table 1.

Table 1
Shows pH values of bottled water sold at convenience stores in mineral water groups analyzed with benchtop pH meter.

Brand	Sample 1 (pH)	Sample 2 (pH)	Sample 3 (pH)	$\bar{x}$ (pH)	S.D.	Range
M1	7.30	7.43	7.57	**7.43**	**0.133**	7.30 – 7.57
M2	7.35	7.44	7.23	**7.34**	**0.109**	7.23 – 7.44
M3	7.23	7.20	7.29	**7.24**	**0.049**	7.20 – 7.29
M4	7.73	7.73	7.89	**7.78**	**0.094**	7.73 – 7.89
M5	8.02	7.94	8.03	**8.00**	**0.052**	7.94 – 8.03
M6	6.95	6.84	6.88	**6.89**	**0.054**	6.84 – 6.95
Total				**7.45**	**0.378**	

The flat water groups of bottled water sold at convenience stores, which were analyzed by the benchtop pH meter, had the average pH of 7.21, Standard Deviation 0.542, and pHRange of 6.38-7.77. 50 percent of flat water group was found that it was acidic water (D3, D5 and D6) as shown in Table 2.

Table 2
Shows pH value of bottled water sold at convenience stores in flat water groups were analyzed by benchtop pH meter.

Brand	Sample 1 (pH)	Sample 2 (pH)	Sample 3 (pH)	$\bar{x}$ (pH)	S.D.	Range
D1	7.45	7.88	7.67	**7.67**	**0.213**	7.45 – 7.88
D2	7.62	7.58	7.57	**7.59**	**0.027**	7.57 – 7.62
D3	6.95	6.85	6.82	**6.87**	**0.067**	6.82 – 6.95
D4	7.69	7.81	7.81	**7.77**	**0.069**	7.69 – 7.81
D5	6.80	6.74	7.38	**6.97**	**0.351**	6.74 – 7.38
D6	6.58	6.29	6.27	**6.38**	**0.172**	6.27 – 6.58
Total				**7.21**	**0.542**	

When comparing the average pH of mineral water groups of bottled water sold at convenience stores, which were analyzed by benchtop pH meter with a constant equal to 7 by the independent t-test, it is found that the bottled water sold at convenience stores in the mineral water group had an average pH more than 7 (alkaline) at significance level 0.05 ($t = 5.018$, p-value <0.001) as shown in Table 3.

Table 3

Shows comparison of the average pH of mineral water analyzed by benchtop pH meter, with a constant value of 7, by the independent t-test statistic.

Water Type	n	$\bar{x}$	S.D.	t	p-value
Mineral water groups	18	7.45	0.378	5.018	< 0.001

Note: The results of the normal distribution showed that the pH of mineral water groups have normal distrtibution (p-value> 0.05).

When comparing the average pH of mineral water groups of bottled water sold at convenience stores, which were analyzed by benchtop pH meter with a constant equal to 7 with the independent t-test, it is found that there was no difference between pH values of mineral water group and flat water group sold at convenience stores at a significance level of 0.05(p-value=0.068). an average pH of more than 7 (alkaline) at significance level 0.05 (t = 5.018, p-value <0.001) as shown in Table 3.

When comparing the average pH of bottled water sold at convenience stores analyzed by benchtop pH meter between mineral water groups and flat water groups by the independent t-test, it was found that there was no difference between pH values of mineral water group and flat water group sold at convenience stores at a significance level of 0.05(p-value=0.068). an average pH of more than 7 (alkaline) at significance level 0.05 (t = 5.018, p-value <0.001) as shown in Table 4.

Table 4

Shows the results of analyzing the difference in the average pH value of bottled water sold at convenience stores analyzed by the benchtop pH meter between mineral water groups and flat water groups by the independent t-test.

Water Type	n	$\bar{x}$	S.D.	t	p-value
Mineral water groups	18	7.45	0.378	1.530	0.068
Flat water groups	18	7.21	0.542		

Note: The results of the normal distribution showed that the pH values of mineral water groups and flat water groups have normal distrtibution (p-value> 0.01).

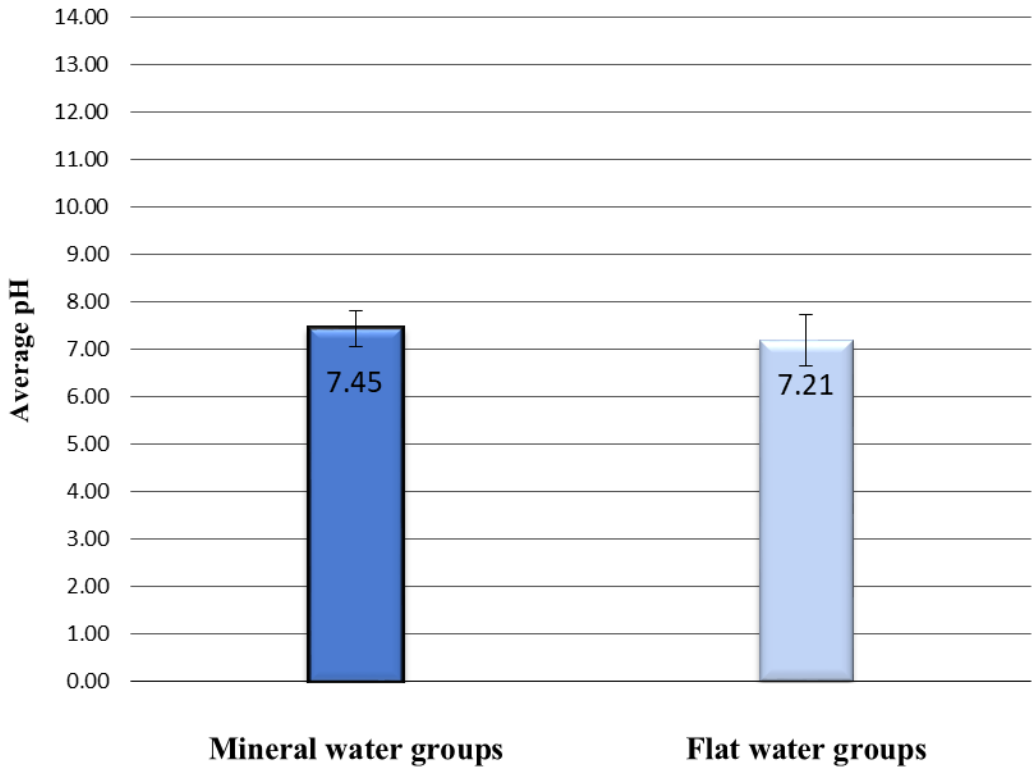


Figure 2. Shows the average pH of bottled water sold at convenience stores in the mineral water groups and the flat water groups analyzed by benchtop pH meter.

5. Discussion

From this study, it was found that the results of the average pH analysis of bottled water sold at convenience stores, in mineral water group is 7.45, SD 0.378, and pH Range of 6.89-8.00, and in flat water groups is 7.21, SD 0.542, and pH Range of 6.38-7.77. There were acidic or alkaline levels in both groups beaed on each brand, The average pH of mineral water group was at the level that meets the water quality standard in sealed containers of the Ministry of Public Health (pH 6.5-8.5) corresponding to consistent with the past research result on the quality of bottled water sold in Chonburi (Subhandit Nimrat, Hathaihip Bancherdcharatlert, & Verapong Vuthiphandchai, 2014, pp. 454-459). For the average pH of some flat water groups, pH level is lower than the water quality standard in sealed containers that is the flat drinking water: D6 brand with the average pH of 6.38, corresponding to the results of the study of bottled water, clear bottles that are sold in Nan Province. (Subhandit Nimrat & Verapong Vuthiphandchai, 2014, pp. 57-64) pH decreases, such as the number of bacteria, coliforms or high temperature (Westlabblogcanada, 2017)

The comparative analysis of the average value of the pH of bottled bottled water sold in an alkaline mineral water convenience stores may be due to the production process of mineral water that must be a procedure which does not cause the compound Important in natural mineral water changes, there are still minerals that are alkaline in the water. For example, the mineral water type Bicarbonate water (Bicarbonate water) that Contains more than 600 milligrams of bicarbonate per liter, helping to neutralize acidic secretions (Ministry of Science and Technology, 2016, p. 5)

The results of the research showed that average value pH bottled of water sold at convenience stores, mineral water groups and ordinary water groups are no different, but if there is a more diverse water brand, it may be See the average of different water groups.

The ph average of mineral water and plain water no difference, it is because the ph of plain water some remained relatively high almost as far as mineral water that is plain water with

contuse d1 d2 and d4 have ph average 7, 677. 59 and 7. 77, respectively, which considering the water raw of the 3 brand has resources confirm that comes from the ground water, which may have elements of the substance inorganic with organic compounds some kind for your alkaline more than water raw that came from the water supply, or may be because in the manufacturing process of plain water of 3 brands, if not steps to filter the granular, such as reverse osmosis or to kill microorganisms with the gas ozone (O_3) the Zoe light ultra-Violet (UV), it may be made in the water also has elements similar to the natural mineral water, which has made you searched from the data source publicly available water of 3 brands it does not specify the production process detailed it so it is unlikely to know why water 3 brand has ph average high almost as far as mineral water.

On the other hand, the average pH of the M6 brand mineral water is 6 .8 9 , which is relatively low. It may be possible to follow exceptions in the production of natural mineral water, which can adjust the volume of gas contained in the water. Which can be added. Probably carbon dioxide filling process as a result pH bottled waters sold at convenience stores comparing with Mineral water groups and Flat water groups has no different.

Therefore, in practice, if you consider the consumer of bottled water sold in convenience stores to aim for the benefits of alkalinity in promoting good health, you can choose to drink both mineral water and normal water groups.

Due to the analysis of acidity - different with the pH meter in the laboratory, which is a Gold Standard laboratory, there are complicate procedures and high cost of analysis to look for alternatives that may be examined. Analyzing easily and with a lower cost, the researcher therefore further examined by analyzing the pH value of bottled water that is classified as In the convenience stores, bought with a pen-type pH meter for comparison, but the results showed that the average pH of the mineral water groups from the Gold Standard method were different from the pen-type pH meter at the level Significant 0. 05 ($t = 17. 301$, p-value <0. 001) and the average pH of the normal water groups from the Gold Standard method are different from the pH meter Pen at significance level 0. 05 ($t = -3. 198$, p-value = 0.005)

Therefore, the pH meter can not be used to replace the pH meter in the laboratory.

6. Recommendations

Since drinking water is a fundamental factor having a healthy and long-lasting life, it is close to everyone. Therefore, the researcher sees that drinking water in the various aspects are of great interest. Suggestions as follows

1. In-depth study of how the average pH of drinking water that passes through various types of production processes in Thailand is different.
2. If you want to consider drinking water to aim for the excellent mineral benefits the body, may examine the amount of minerals in the mineral water from different mineral water sources.

7. References

Food and Drug Administration. (n.d.). Guidelines for permission to manufacture natural mineral water: in the case of using groundwater as raw water source. Retrieved March 29, 2019, from http://www.fda.moph.go.th/sites/food/Unit/3-NaturalMineralWater.pdf

Jawasit W. & Chittinan S. (1994). Drinking water and minerals. Retrieved November 4, 2018, from https://www.doctor.or.th/article/detail/3445

Jin, D., Ryu, S. H., Kim, H. W., Yang, E. J., Lim, S. J., Ryang, Y. S., . . . Lee, K. J. (2006). Anti-Diabetic Effect of Alkaline-Reduced Water on OLETF Rats. Bioscience, Biotechnology, and Biochemistry, 70(1), 31-37. doi:10.1271/bbb.70.31

Kuakul A. (2017). pH of the solution. In *acid-base solution*. Retrieved November 5, 2018, from https://www.scimath.org/lesson-chemistry/item/

7189-2017-06-08-14-48-54
Lee, K.-J., Park, S.-K., Kim, J.-W., Kim, G.-Y., Ryang, Y.-S., Kim, G.-H., . . . Kim, H.-W. (2004). Anticancer Effect of Alkaline Reduced Water(International Conference on Mind Body Science : Physical and Physiological Approach joint with The Eighteenth Symposium on Life Information Science). Journal of International Society of Life Information Science, 22(2), 302-305.
Ministry of Science and Technology, Department of Science Service. (2016). Natural Mineral Water. *Information processing ready to use*. Retrieved March 27, 2019, from http://siweb.dss.go.th/repack/fulltext/IR%2038.pdf
NewsMonitor News Team. (2018, 30 April). Dr.Jessada post countered the challenge of proving YouTube drinking water. Misunderstandings - create misunderstandings using the wrong test method. *Matichon.* Retrieved from https://www.matichon.co.th/news-monitor/news_936401
Nimrat S., Bancherdcharatlert H. & Vuthiphandchai V. (2014). Quality assessment of bottled water sold in Chonburi province. *Journal of Science and Technology Mahasarakrm University, 33*(5), 454-459.
Nimrat S., & Vuthiphandchai V. (2014). Physical and microbiological quality of clear bottled drinking water sold in Nan province. *Journal of Science and Technology Ubon Ratchathani University, 16*(3), 7-64.
Notification of the Ministry of Public Health No. 135. (1991). *Drinking water in sealed containers No. 2*. Retrieved October 15, 2018, from http://www.pcd.go.th/info_serv/reg_std_water01.html
Notification of the Ministry of Public Health No. 199. (2000). *Natural Mineral Water*. Retrieved March 27, 2019, from http://food.fda.moph.go.th/law/data/announ_moph/P199.pdf
Promsen W. (2011). Qualitative Research and Quantitative Research. *RMUTI Journal, 4*(1), 95-102.
Sirisuntron C. (2016). *Market factors that affect buying habits bottled water consumer in Nonthaburi*. (Master's thesis). Bangkok: Bangkok University.
ThaiRathOnline. (2013, 4 May). Warning drinking 'mineral water' every day harm the body, losing balance. *ThaiRath*. Retrieved from http://www.thairath.co.th/content/342657
Thitirux W. (2016). *Media exposure, attitude and behavioral intention towards a bottled drinking water products in Thailand*. (Master's thesis). Bangkok: Chulalongkorn University.
Westlabblogcanada. (2017). How Does Temperature Affect pH?. Westlab. Retrieved March 26, 2019, from https://www.westlab.com/blog/2017/11/15/how-does-temperature-affect-ph
Wongchari S. & Phawaphutanon R.. (2009). PhuPhanThong Natural Mineral Water. *Journal of Groundwater Resources, 2*(December), 9.
Worakamin S. (2013). *Water for life* (8th ed.). Bangkok: SamCharoenPanich (Bangkok).

Prevalence and Comparison of High Homocysteine and Dyslipidemia in Office Personals of a Rice Exporting Company

Banchob Junhasavasdikul[a] Sumio Goto[b] Amporn Krobthong[c] Payong Wanikiat[d]

Kamon Chaiyasit[e] Rangsit Sarachitti[f]

a College of Integrative Medicine, Dhurakij Pundit University, dr.banchob@outlook.com

b Japan Medical & Health Tourism Center, Japan Health & Research Institute,

s_goto410@j.medical-healthcare.com

c College of Integrative Medicine, Dhurakij Pundit University, payong.wni@ dpu.ac.th

d College of Integrative Medicine, Dhurakij Pundit University, ampornkrob@gmail.com

e Integrative Nutrition and Herbal Medicine Association, Vitallife Wellness Center at

Bumrungrad International Hospital, kamon@inhma.org

f College of Integrative Medicine, Dhurakij Pundit University, rangsit.sar@dpu.ac.th

Abstract

Homocysteine (Hcy) is a sulfur amino acid. It is an intermediate substance from the metabolism of methionine. The transsulfuration will turn it into cysteine the precursor of glutathione. Remethylation can recycle Hcy back to methionine . The disturbance of Hcy metabolism leads to hyperhomocysteinemia (HHcy). There were more evidences suggested that elevations of Hcy in plasma was a risk factor for occlusive vascular disease, increased cardiovascular mortality, stroke. The objective of this study was to find the prevalence and comparison of HHcy and dyslipidemia in Thai office workers. Researchers did an observational study on the serum level of Hcy and lipid profile of office workers from the results of their annual checkup. Two offices of a rice exporting company, which the administrators understand the important of Hcy and ready for co-operation, were purposively selected. All the middle management personals were included in the study, men and women. The Gr-1 in main office, situated in Bangkok metropolitan, aged 21->60 yrs. The Gr-2, in the office situated in the same area of the rice refining factory, Chachengsao province, aged 31->50 yrs. Result: as the sample sizes were too small, researchers compared them by percentage instead of by Chi-squre. The result showed 27.03% of dyslipidemia and 54.05% of HHcy in the Gr-1 (n = 35), 20% of dyslipidemia and 84% of HHcy in the Gr-2 (n = 25). Discussion: There were great different between prevalence of HHcy and dyslipidemia in both group, 1.99 fold in Gr-1 and 4.2 folds in Gr-2 There were also great different of HHcy between both gr., even though not much difference on the prevalence of dyslipidemia. Conclusion: there were overlooked populations of high risk for CVD and stroke who had HHcy with normal lipid profile. Ambient particulate matter may be another factor lead to HHcy.

Key word: Homocysteine (Hcy), high Homocystiene (HHcy), dyslipidemia

Back ground

Cardiovascular disease (CVD) and stroke

Cardiovascular disease is the most common cause of mortality in developed countries. The Framingham Heart Study was the major contributing study in stressing this world health problem. The study had provided substantial insight into the epidemiology of cardiovascular disease and its risk factors. Epidemiologic studies had played an important role in elucidating the factors that predispose to cardiovascular disease and highlighting opportunities for prevention. (Syed S., Mahmood., Daniel, Levy., Ramachandran S., Vasan., Thomas J. Wang., 2014). Life style and eating habits were major factors. Cholesterol reducing by every means had been emphasized as the key answer of this world wide problem. On the October 11, 2013, the Framingham Heart Study celebrated 65 years since the examination of its first participant in 1948 (Syed S., Mahmood., Daniel, Levy., Ramachandran S., Vasan., Thomas J. Wang., 2014). But on the contrary the problem was still persisted and widespread. The incidence of death from cardiovascular and circulatory diseases has risen by one third between 1990 and 2010, such that by 2015 one in three deaths worldwide will be due to cardiovascular diseases (Lozano R, Naghavi M, Foreman K, et al. (2012).

CVD and stroke are two major non-communicable diseases of Thailand. Data from the Policy and Strategic Bureau, Thailand Ministry of Public Health showed that in 2015 stroke was the second most common cause of death for Thai people (ranked after cancer), with the mortality rate at 112.8/100,000 pop., whereas CVD ranked as the fourth (29.9)(hfocus, 2017). The Epidemiology Department, Thailand Ministry of Public Health reported, as of Dec. 31, 2015, the incidence rate of ischemic cardiovascular disease (ICD) in 76 provinces except Bangkok had increased every year from 2011-2015. The highest was in 2014 with the incidence of 189.23 /100,000 pop. In 2015 founded 98,148 new cases (150.01 / 100,000 pop.). Thailand had the prevalence rate of CVD at 1,140.31 /100,000 pop. The highest incidences of ICD were founded in middle region (202.69), followed by northern (172.48), southern (166.81) and north eastern region (130.06). The highest province was Chantaburi (498.68). Chacherngsao ranked at the eighth top ten provinces of ICD (259.38) (Yodwatana, 2015). As for stroke which was the leading cause of death and long term disability. The estimated prevalence of stroke is 1.88% among adults 45 years and older (Suwanwela, 2014). The Thai Epidemiology stroke study during 2004-6, revealed the incidence as 201-483/100,000 pop. (35yrs)(193,200 cases), prevalence 1880/100,000 pop. (1.88%) M:F 2.1:1 (752,000 cases), mortality rate M 94/100,000 pop. F 72 /100,000 pop.(37,600+28,800=66,400 cases)(Towanabut, 2017).

Co-relation of cholesterol to CVD and stroke

Raised cholesterol increases the risks of heart disease and stroke. Globally, a third of ischemic heart disease is attributable to high cholesterol. Overall, raised cholesterol is estimated to cause 2.6 million deaths (4.5% of total) and 29.7 million disability adjusted life years (DALYS), or 2.0% of total DALYS. Raised total cholesterol is a major cause of disease burden in both the developed and developing world as a risk factor for Ischemic heart disease and stroke (WHO, 2019). A landmark study that helped establish that therapeutic interventions to lower cholesterol levels result in reduced risk of cardiovascular morbidity or mortality was the Lipid Research Clinics Coronary Primary Prevention Trial (LRC-CPPT)(Nelson, 2014). The guideline for treatment of dyslipidemia by Thai Royal College of Medicine and Thai Endoclinology Association mentioned the criteria to diagnose dyslipidemia: Total Cholesterol (TC) <200 mg./dl., LDL-C<100 mg./dl., HDL-C 40 mg./dl., and Triglyceride (TG)<150 mg./dl. Including

TC/HDL-C <4.5 and LDL-C/HDL-C <3.0 (Ngam-ukot, Sritara, Pantumjinda, Komin, Srimada, 2015).

Hcy, the emerging risk factor

Besides blood cholesterol, there were additional inflammatory markers to detect the risk. The National Cholesterol Education Program (NCEP) pointed out that elevations of serum Hcy are positively correlated with risk for CHD(NIH, 2002), with many research evidences (Folsom AR, Nieto FJ, McGovern PG, Tsai MY, Malinow MR, Eckfeldt JH, Hess DL, Davis CE. , 1998)(Whincup PH, Refsum H, Perry IJ, Morris R, Walker M, Lennon L, Thomson A, Ueland PM, Ebrahim SBJ. , 1999)(Bostom AG, Rosenberg IH, Silbershatz H, Jacques PF, Selhub J, D'Agostino RB, Wilson PWF, Wolf PA , 1999)(Giles WH, Croft JB, Greenlund KJ, Ford ES, Kittner SJ., 2000). Framingham studies showed that plasma Hcy concentration is inversely related to the intake and plasma levels of folate and vitamin B6 as well as vitamin B12 plasma levels. Prospectively elevated plasma Hcy is associated with increased total and cardiovascular mortality, increased incidence of stroke, increased incidence of dementia and Alzheimer's disease, and higher prevalence of chronic heart failure, increased incidence of bone fracture, and higher prevalence of chronic heart failure. It was also shown that elevated plasma Hcy was a risk factor for preeclampsia and maybe neural tube defects (Selhub, 2008). Several clinical trials were underway to test whether Hcy lowering will reduce CHD risk (Clark R, Collins R., 1998). It had been predicted that the recent institution of folate fortification of foods would reduce average levels of Hcy in the U.S. population (Tucker KL, Mahnken B, Wilson PWF, Jacques P, Selhub J., 1996)(Tucker KL, Selhub J, Wilson PWF, Rosenberg IH., 1996). Recent data show that this had occurred (Jacques PF, Selhub J, Bostom AG, Wilson PWF, Rosenberg IH., 1999). Substantial increases in serum folate in young women have also been documented (Centers for Disease Control and Prevention., 2000).

Nevertheless, Adult Treatment Program-3 (ATP III) of NCEP maintained that the strength of association between Hcy and CHD is not as great as that for the major risk factors. Moreover, an elevation of Hcy is not as common as that of the major risk factors and the relatively low prevalence of elevated Hcy in the U.S. population. For these reasons, ATPIII did not list elevated Hcy as a major risk factor to modify LDL-cholesterol goals. Even though elevated homocyteine is not classified as a major risk factor, some investigators hold that the association with CHD is strong enough to make it a direct target of therapy (NIH, 2002).

Literature

Multi-factors for CVD and stroke

The major risk factors of CVD and stroke were long established as hypertension, diabetes, dyslipidemia, metabolic syndrome, and atrial fibrillation. Significant economic and health transitions from predominantly rural to urbanized communities may be responsible for the increasing prevalence of these risk factors (Suwanwela, 2014). A systemic review and meta-analysis on the prevalence of risk factors for cardiovascular diseases in Bangladesh showed the risk factor Type 2 DM, hypertension, dyslipidemia and smoking with CVD more in urban area (Fatema, Zwar, Milton, Rahman, 2016). A meta-analysis on lifestyle factors, cardiovascular disease and all-cause mortality in middle-aged and elderly women showed that smoking and higher BMI were associated with an increased risk of these endpoints and physical activity and moderate alcohol intake were associated with a reduced risk for CVD and mortality (Colpani, Baena, Jaspers, van Dijk, Farajzadegan, et al., 2018). A meta-analysis showed that blood glucose level was a risk marker for CVD among apparently healthy individuals without diabetes.

Increasing levels of glycemia among patients with diabetes mellitus (DM) was associated with increasing risk of cardiovascular disease (CVD). Recent follow-up data from the Diabetes Control and Complications Trial support the notion that intensive glycemic control in patients with DM can slow atherosclerosis (Levitan, Song, Ford. et al., 2004).

Dyslipidemia

On dyslipidemia, current classification schemes and treatment levels for hyperlipidemia are based on NCEP - ATP-III guidelines. Diagnosing and managing hyperlipidemia as a way to prevent CVD was a common activity for primary care physicians. Thai Royal College of Medicine had given the definition of dyslipidemia as the abnormal lipoprotein metabolism leading to change the serum lipid level to the higher risk for atherosclerosis (Sittisuk, Sukontasan, Sunthonttum, Derojanawong, Nitiyanun, et al., 2016). It was defined as elevation total or low-density lipoprotein (LDL) cholesterol levels, or low levels of high-density lipoprotein (HDL) cholesterol. It is an important risk factor for coronary heart disease and stroke (Fodor, 2011). Dyslipidemias may be manifested by elevation of the total cholesterol, the "bad" low-density lipoprotein (LDL) cholesterol and the triglyceride concentrations, and a decrease in the "good" high-density lipoprotein (HDL) cholesterol concentration in the blood (Shiel Jr., 2018).

There were additional, markers for risk factor analysis are based on the contribution to CVD by inflammatory proteins and other cytokines. In 2011, a consensus panel of the National Lipid Association published a review of the clinical utility of various proposed markers such as: CRP, Apo-B, LDL-P were recommended in intermediate risk patients, Lp-PLA2, Lp(a) were considered in selected patients, Imaging (carotid intima thickening coronary artery calcium) was consider in intermediate risk patients, LDL subfraction, HDL subfractions, fibrinogen and Hcy were not recommended (NLA, 2011).

More evidences on Hcy

On the other sides Hcy co-relation to CVD were continuously reported (Refsum H, Ueland PM, Nygard O, Vollset SE., 1998)(Boushey CJ, Beresford SAA, Omenn GS, Motulsky AG, 1995)(Malinow MR, Bostom AG, Krauss RM., 1999)(Stehouwer CDA, Weijenberg MP, van den Berg M., Jakobs C, Feskens EJM, Kromhout D., 1998). It had been claimed to be a significant risk factor for the development of a wide range of diseases, including thrombosis (Cattaneo, M, 1999), neuropsychiatric illness (Morris, MS., 2003)(Smach, MA., Jacob, N., Golmard, JL., Charfeddine, B., Lammouchi, T., et al., 2011)(Smith, AD., Smith, SM., de Jager, CA., Whitbread, P., Johnston, C., et al., 2010)(Dietrich-Muszalska, A., Malinowska, J., Olas, B., Głowacki, B., Bald, E., et al., 2012), and fractures (McLean, RR., Jacques, PF., Selhub, J., Tucker, KL., Samelson, EJ., et al., 2004)(van Meurs, JB., Dhonukshe-Rutten, RA., Pluijm, SM., van der Klift, M., de Jonge, R., et al., 2004). It was also found to be associated with microalbuminuria which was a strong indicator of the risk of future cardiovascular disease and renal dysfunction (Jager, A., Kostense, PJ., Nijpels, G., Dekker, JM., Heine, RJ., et al., 2001). Vitamin B_{12} deficiency, when coupled with high serum folate levels, has been found to increase overall Hcy concentrations as well (Selhub, J., Morris, M. S., Jacques, P. F., 2007)(Wikipedia, 2019).

What is Hcy?

It is a non-proteinogenic α-amino acid. It is a homologue of the amino acid cysteine, differing by an additional methylene bridge ($-CH_2-$). It is biosynthesized from methionine by the removal of its terminal C methyl group. Hcy can be recycled into methionine or converted into cysteine with the aid of certain B-vitamins. A high level of Hcy in the blood makes a person

more prone to endothelial cell injury, which leads to inflammation in the blood vessels, which in turn may lead to atherogenesis, which can result in ischemic injury (Boudi, Brian F., 2013). HHcy is therefore a possible risk factor for coronary artery disease. Coronary artery disease occurs when an atherosclerotic plaque blocks blood flow to the coronary arteries, which supply the heart with oxygenated blood. Hcy is not obtained from the diet (Selhub, J., 1999). Instead, it is biosynthesized from methionine via a multi-step process. First, methionine receives an adenosine group from ATP, a reaction catalyzed by S-adenosyl-methionine synthetase, to give *S*-adenosyl methionine (SAM). SAM then transfers the methyl group to an acceptor molecule, (e.g., norepinephrine as an acceptor during epinephrine synthesis, DNA methyltransferase as an intermediate acceptor in the process of DNA methylation). The adenosine is then hydrolyzed to yield L-Hcy. L-Hcy has two primary fates: conversion via tetrahydrofolate (THF) back into L-methionine or conversion to L-cysteine (Champe, PC., Harvey, RA., 2008).

Hcy can be recycled into methionine. This process uses N5-methyl tetrahydrofolate as the methyl donor and cobalamin (vitamin B_{12})-related enzymes. More detail on these enzymes can be found in the article for methionine synthase. Abnormally high levels of Hcy in the serum, above 15 µmol/L, are a medical condition called hyperhomocysteinemia or high homocysteine (HHcy)(Merck, 2017)(Wikipedia, 2019).

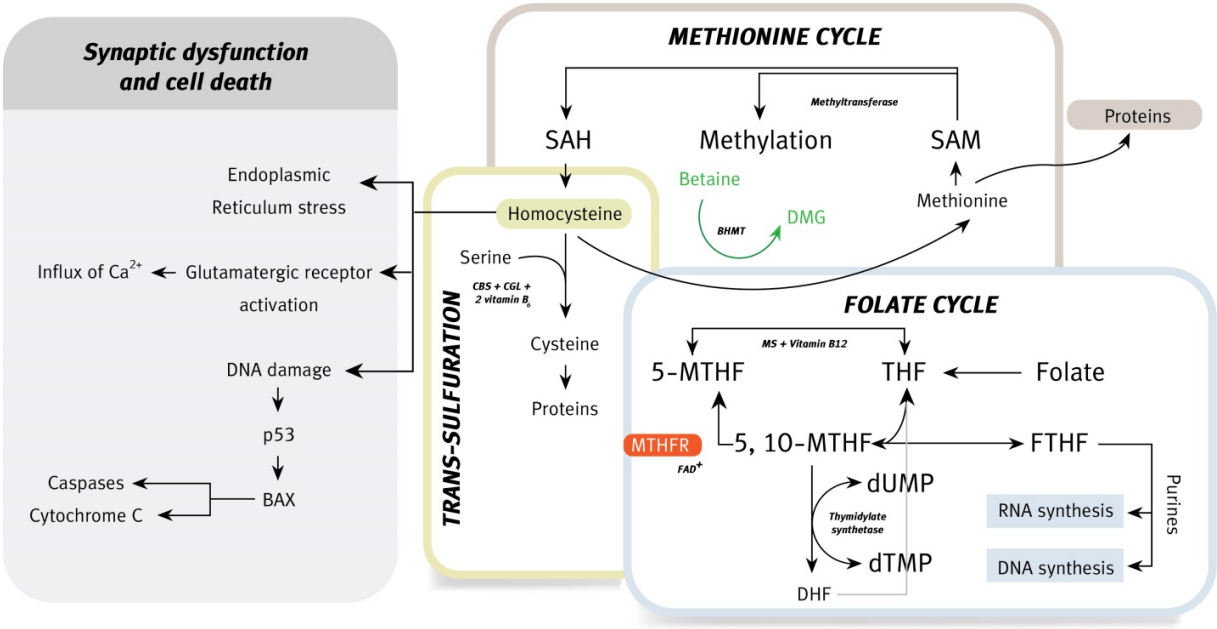


Fig 1: MTHFR metabolism: folate cycle, methionine cycle, trans-sulfuration and hyperHcymia. 5-MTHF: 5-methyltetrahydrofolate; 5,10-methyltetrahydrofolate; BAX: Bcl-2-associated X protein; BHMT: betaine-Hcy S-methyltransferase; CBS: cystathionine beta synthase; CGL: cystathionine gamma-lyase; DHF: dihydrofolate (vitamin B9); DMG: dimethylglycine; dTMP: thymidine monophosphate; dUMP: deoxyuridine monophosphate; FAD^+ flavine adenine dicucleotide; FTHF: 10-formyltetrahydrofolate; MS: methionine synthase; MTHFR: mehtylenetetrahydrofolate reductase; SAH: S-adenosyl-L-Hcy; SAME: S-adenosyl-L-methionine; THF: tetrahydrofolate.
Modified from https://en.wikipedia.org/wiki/Hcy

Prevalence of High Hcy (HHcy)

While the ATPIII mentioned that elevation of Hcy is not as common as that of the major risk factors and the relatively low prevalence of elevated Hcy in the U.S. population. Therefore, ATPIII did not list elevated Hcy as a major risk factor to modify LDL-cholesterol goals (NIH, 2002). Current evidences revealed HHcy in many populations. Janson et al, showed a very high prevalence of HHcy in a randomly chosen group of elderly people living in the city of Buenos Aires. Thus, 69.8% of the subjects were considered to have HHcy. The proportion of HHcy in men (76.2%) was significantly higher than in women (66.4%). whereas the prevalence in American individuals older than 60 years old was 43.2% and 46.5% for men and women, respectively (Janson, Galarza, Murua, Quintana, Przygoda, et al., 2002). Shuxia, et al showed HHcy prevalences of 80.0% and 78.2% for the Uyghur and Kazakh populations, respectively, which were higher than the prevalence observed in other regions in China and significantly higher than the prevalence in the Han population (45.0%). Among the Kazakh, the prevalence of hypertension was 35.1%, In Uyghur, the prevalence of hypertension was 30.6%, (Shuxia, Hongrui, Heng, Mei, Jia, et al, 2015). The prevalence of hypertension accompanied by HHcy was high that it reached 45.1% of the study population and accounted for 86.8% of the total participants with hypertension in Northern China (Ye, Yuan, Xiaofan, Yintao, Dongxue, et al., 2017). In Thailand, Leowatana measured plasma total Hcy concentrations in 3,345 Shinawatra employees (1,133 males, 2,212 females aged between 20-65 years) by using fluorescence polarization immunoassay (FPIA) method. When more than 12 micromol/L was used as the cut-off value, it was found that 33.6% of males and 6.69% of females were classified as HHcy subjects.(Leowattana, Bhuripanyo, Mahanonda, Pokum, 2001). Study in Thai smokers, the prevalence of HHcy in smokers (62%) was more common than in non-smokers (33%) 174 smokers and 97 non-smokers (aged 19-62) participant (Suriyaprom, Tungtrongchitr, Pongpaew, Phonrat, 2009).

Association of Hcy and PM2.5

There were many factors caused the increasing of Hcy. Ambient atmospheric pollution was another factor. A study on air pollution and Hcy by Cizai Ren, et al. showed that increases in $PM_{2.5}$ and black carbon were associated with 1.5% (95% confidence interval = 0.2% to 2.8%) and 2.2% (0.6% to 3.9%) increases in total plasma homocysteine, respectively (Cizao, Ren., Sung, Kyun Park., Pantel S., Vokonas., David, Sparrow., Elissa, Wilker., et al, 2010).

Methodology

An observational study was done on the serum level of Hcy and lipid profile of office workers from the results of their annual checkup. Two offices of a rice exporting company, which the administrators understand the important of Hcy and ready to co-operate, were purposively selected.

Inclusion criteria: all the middle management personals were included in the study, men and women. The high ranked administrators and low level personals were excluded to avoid variable factors like different in life style and ambient atmospheric pollution.

Hcy level was an added request on the fasting blood exams for the annual checkup of the company.

Observational units:

there were 2 observational groups: Gr-1 the office personals in the company main office, situated at Bangkorlaem District, Bangkok metropolitan. Gr-2 the office personals in the rice refining factory, situated at Chachengsao province.

Statistically analysis

The data will present in Mean and percentage and compare among two groups and display in Pie chart.

Demographic data of observational units were:

Table 1: Demographic description of office personals in main office Gr-1

Personal character	Number	Percentage
Sex		
Male	7	18.92
Female	30	81.08
Total	**37**	**100.00**
Age		
21 – 30 yrs.	1	2.70
31 – 40 yrs.	15	40.54
41 – 50 yrs.	14	37.84
51 – 60 yrs.	5	13.51
> 60 yrs.	2	5.41
Total	**37**	**100.00**

Table 2: Demographic description of office personals in rice refining factory Gr-2

Personal character	Number	Percentage
Sex		
Male	15	60.00
Female	10	40.00
Total	**25**	**100.00**
Age		
31 – 40 yrs.	9	36.00
41 – 50 yrs.	13	52.00
> 50 yrs.	3	12.00
Total	**25**	**100.00**

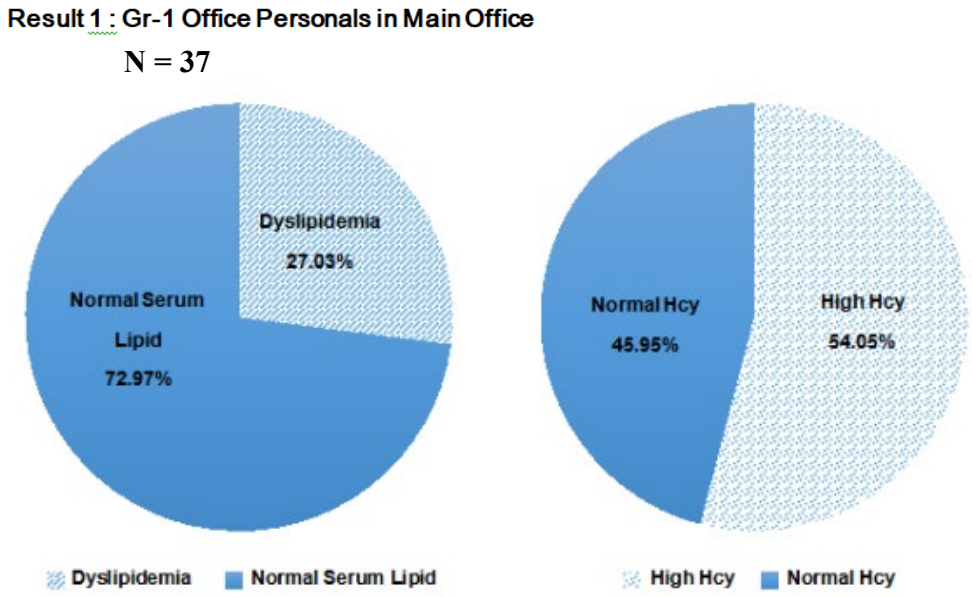
Finding

From the pool data of lipid profile and serum Hcy, the index of dyslipidemia of each individual were judged by TC/HDL-C <4.5 and/or LDL-C/HDL-C <3.0 as guided by the Guideline for treatment of dyslipidemia, Thai Royal College of Medicine and Thai Endoclinology Association. (Ngam-ukot, Sritara, Pantumjinda, Komin, Srimada, 2015). As for Hcy, the serum level of 15 µmol/L, are a medical condition called HHcy (Merck, 2017).

As the sample sizes were too small, researchers compared them by percentage instead of by Chi-squre. The results were:

Table 3: Percentage of Abnormal Hcy and Dyslipidemia in Office Personals in Main Office

Serum Lipid	Hcy		Total
	> 15 (abnormal)	≤ 15 (normal)	
Dyslipidemia	9	1	10
	24.32%	2.70%	27.03%
Normal	11	16	27
	29.73%	43.24%	72.97%
Total	20	17	37
	54.05%	45.95%	100.00%

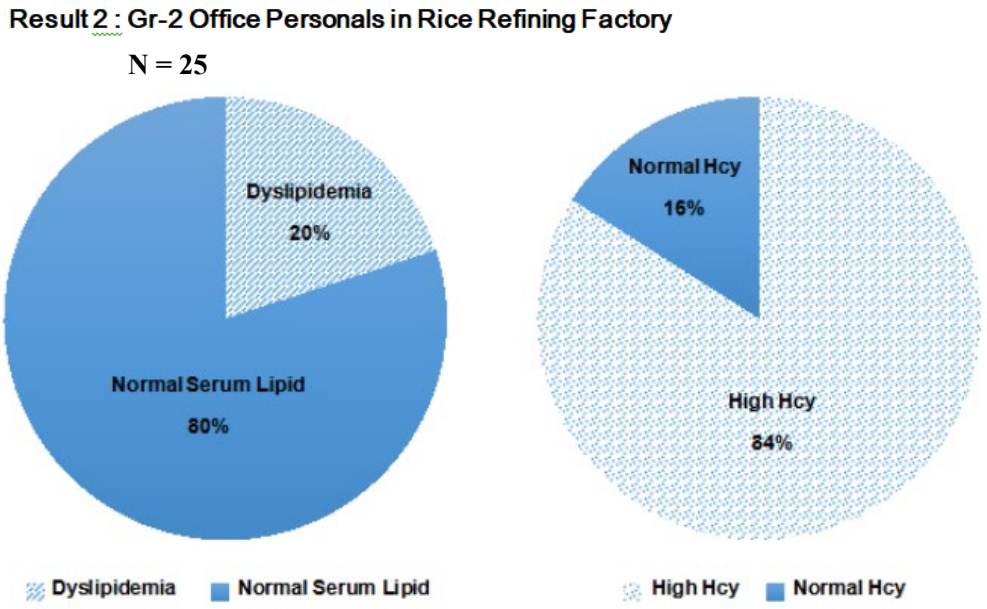


The Mean Hcy level was 15.81 µmol/L

The prevalence of HHcy was greater than dyslipidemia at 1.99 fold.

Table 4: Percentage of Abnormal Hcy and Dyslipedemia in Office Personals of Rice Refining Factory

Serum Lipid	Hcy		Total
	> 15 (abnormal)	≤ 15 (normal)	
Dyslipidemia	5	0	5
	20.00%	0.00%	20.00%
Normal	16	4	20
	64.00%	16.00%	80.00%
Total	21	4	25
	84.00%	16.00%	100.00%



The Mean Hcy level was 20.29 µmol/L
The prevalence of HHcy was greater than dyslipidemia at 4.2 folds.
The Gr-2 prevalence of HHcy was higher than Gr-1 at 1.54 folds.

Discussion

Hcy was another risk factor for CVD and stroke. The incidence of these 2 diseases increased every year even though so many campaign on various risk factors like: saturate fat, trans fat, high cholesterol diet, smoking, uncontrolled BMI, DM, hypertension, sedentary lifestyle etc. had been done. Hcy had been scarcely mentioned for the public awareness. The ATPIII of NCEP still maintained that the strength of association between Hcy and CHD is not as great as that for the major risk factors and there still be relatively low prevalence of elevated Hcy in the U.S. population. By the literature review, there were more reports on high prevalence of Hcy in many populations. This retrospective study also confirmed the same finding.

The interesting findings from this research were:

1.This research finding of 54.05% of HHcy in office personals was higher than those of American elderly and central Chinese. It was also higher than Thai non-smokers and Thai IT male office personals in two other studies.

2.This research finding of 84% of HHcy in the rice refining factory office personals was markedly high and could compare to the Argentinian elderly, Uyghur and Kazakh people in North-Western China. It was higher than smokers in another Thai study.

3.This study show great different between Mean Hcy level of 2 groups. The rice refining factory group was markedly higher, 20.29 μmol/L to 15.81 μmol/L in main office group.

4.This study also showed different between the prevalence of HHcy in those 2 groups. The rice refining factory group has higher rate of 1.54 folds.

5.This observational study showed markedly different on the prevalence of HHcy and dyslipidemia on both groups.

The whole picture of these finding came to support the research hypothesis that, there were some overlooked HHcy populations with normal lipid profile. Usually after annual checkup, the normal lipid people would feel saved from the threatening of CVD and stroke. But actually if anyone had HHcy, he was still at risk for life threatening diseases.

What were the risk factors created the great prevalence of HHcy in both groups expecially in Gr-2? Some assumptions were: improper diet, stressful lifestyle, ambient atmospheric pollution especially in the rice refining factory.

Recommendation

Further investigations in a bigger scale on the prevalence and co-relation of HHcy and dyslipidemia in other various population groups are advocated. Accompany with finding the serum level of folate, vitamin B6 and vitamin B12 and other predisposing risk factors such as co-relation with atmospheric particulate matter may give some clue for the cause of HHcy. Finding the MTHFR gene defect may also be considered.

References

Bostom AG, Rosenberg IH, Silbershatz H, Jacques PF, Selhub J, D'Agostino RB, Wilson PWF, Wolf PA. (1999), Nonfasting plasma total Hcy levels and stroke incidence in elderly persons: the Framingham Study. Ann Intern Med;131:352-5.

Boudi, Brian F., (2013). "Noncoronary Atherosclerosis". Medscape. Archived from the original on 2013-05-11.

Boushey CJ, Beresford SAA, Omenn GS, Motulsky AG. (1995), A quantitative assessment of plasma Hcy as a risk factor for vascular disease: probable benefits of increasing folic acid intakes. JAMA;274:1049-57.

Cattaneo, M (1999). "HyperHcymia, atherosclerosis and thrombosis". Thrombosis and Haemostasis. 81 (2): 165–76. doi:10.1055/s-0037-1614438. PMID 10063987
Centers for Disease Control and Prevention. (1999). Folate status in women of childbearing age—United States, MMWR 2000;49:962-5.
Cizao, Ren., Sung, Kyun Park., Pantel S., Vokonas., David, Sparrow., Elissa, Wilker., et al, (2010), Air Pollution and Homocysteine: More Evidence that Oxidative Stress-related Genes Modify Effects of Particulate Air Pollution, March; 21(2); 198-206, doi: 10.1097/EDE.0b013e3181cc8bfc
Champe, PC and Harvey, RA. (2008). "Biochemistry. Lippincott's Illustrated Reviews" 4th ed. Lippincott Williams and Wilkins.
Clark R, Collins R. (1998), Can dietary supplements with folic acid or vitamin B6 reduce cardiovascular risk? Design of clinical trials to test the Hcy hypothesis of vascular disease. J Cardiovasc Risk;5:249-55.
Colpani, Baena, Jaspers, van Dijk, Farajzadegan, et al., (2018). Lifestyle factors, cardiovascular disease and all-cause mortality in middle-aged and elderly women: a systematic review and meta-analysis. Eur J Epidemilo. Sep; 33(9): 831-845. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/29524110
Dietrich-Muszalska, A; Malinowska, J; Olas, B; Głowacki, R; Bald, E; Wachowicz, B; Rabe-Jabłońska, J (2012). "The oxidative stress may be induced by the elevated Hcy in schizophrenic patients". Neurochemical Research. 37 (5): 1057–62. doi:10.1007/s11064-012-0707-3. PMC 3321271. PMID 22270909
Fatema, K., Zwar, NA., Milton, AH., Ali, L., Rahman, B. (2016), Prevalence of risk factors for cardiovascular diseases in Bangladesh: A systemic review and meta-analysis. PLos One, Aug 5; 11(8). Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/27494706
Fodor, George. (2011), Primary prevention of CVD: Treating dyslipidemia. Clinical Evidence Handbook. Publication of BMJ publishing group, May 15; 83(10): 1207-1208. Retrieved from https://www.aafp.org/afp/2011/0515/p1207.html
Folsom AR, Nieto FJ, McGovern PG, Tsai MY, Malinow MR, Eckfeldt JH, Hess DL, Davis CE. (1998), Prospective study of coronary heart disease incidence in relation to fasting total Hcy, related genetic polymorphisms, and B vitamins: the Atherosclerosis Risk in Communities (ARIC) Study. Circulation;98:204-10.
Giles WH, Croft JB, Greenlund KJ, Ford ES, Kittner SJ. (2000), Association between total homocyst(e)ine and the likelihood for a history of acute myocardial infarction by race and ethnicity: results from the Third National Health and Nutrition Examination Survey. Am Heart J;139:446-53.
Hfocus, (2017). Five most common causes of death in Thai people. Hfocus on Health System. Retrieved from https://www.hfocus.org/content/2017/03/13590
Jacques PF, Selhub J, Bostom AG, Wilson PWF, Rosenberg IH. (1999), The effect of folic acid fortification on plasma folate and total Hcy concentrations. N Engl J Med;340:1449-54.
Jager, A; Kostense, PJ; Nijpels, G; Dekker, JM; Heine, RJ; Bouter, LM; Donker, AJ; Stehouwer, CD (2001). "Serum Hcy levels are associated with the development of (micro)albuminuria: the Hoorn study". Arteriosclerosis, Thrombosis, and Vascular Biology. 21 (1): 74–81. doi:10.1161/01.ATV.21.1.74. PMID 11145936
Janson, Jorge J., Galarza, Carlos R., Murua, Alicia., Quintana, Irene., Przygoda, Pablo A., et al., (2002), Prevalence of hyperHcymia in an elderly population, Am. J. Hyp., V15, Iss 5, p 394-397. Retrieved from https://academic.oup.com/ajh/article/15/5/394/165665

Leowattana, W., Bhuripanyo, K., Mahanonda, N., Pokum, S. (2001), Prevalence of hyperHcymia in normal healthy Thai subjects, J Med Assoc Thai, Suppl 3:s722-9. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/12002914

Levitan, Emily B., Song, Yiqing., Ford, Earl S. (2004). Is Nondiabetic Hyperglycemia a Risk Factor for Cardiovascular Disease?A Meta-analysis of Prospective Studies. JAMA, Oct 25. Retrieved from https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/217549

Lozano R, Naghavi M, Foreman K, et al. (2012), Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. The Lancet. 2012;380:2095–128.

Malinow MR, Bostom AG, Krauss RM. (1999), Homocyst(e)ine, diet, and cardiovascular diseases: a statement for healthcare professionals from the Nutrition Committee, American Heart Association. Circulation;99:178-82.

McLean, RR; Jacques, PF; Selhub, J; Tucker, KL; Samelson, EJ; Broe, KE; Hannan, MT; Cupples, LA; Kiel, DP (2004). "Hcy as a predictive factor for hip fracture in older persons". The New England Journal of Medicine. 350 (20): 2042–doi:10.1056/NEJMoa032739. PMID 15141042.

Merch Manuals Professional Edition (2017), HyperHcynemia - homotology and oncology – . merckmanuals.com. Archived from the original on 2017-06-09.

Morris, MS (2003). "Hcy and Alzheimer's disease". Lancet Neurology. 2 (7): 425–8. doi:10.1016/s1474-4422(03)00438-1. PMID 12849121.

Nelson, Robert H. (2014), Hyperlipidemia as a risk factor cardiovascular disease. Prim Care, 40(1): 195-211. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3572442/?_escaped_fragment_=po=20.8333

Ngam-ukot, Pungjai., Sritara, Piyamit., Pantumjinda, Kamman., Komin, Surat., Srimada, Vithaya., (2015). Guideline for treatment of dyslipidemia. Thai Royal College of Medicine and Thai Endoclinology Association. Retrieved from https://khoyanoi.blogspot.com/2016/10/2558.html

NIH. (2002), Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III), National Cholesterol Education Program National Heart, Lung, and Blood Institute. National Institutes of Health NIH Publication No. 02-5215. Retrieved from https://www.nhlbi.nih.gov/files/docs/resources/heart/atp-3-cholesterol-full-report.pdf

NLA. (2011). Clinical Utility of Inflammatory Markers & Advanced Lipoprotein Testing: Advice from Lipid Specialists, Journal of Clinical Lipidology. Retrieved from https://www.lipid.org/nla/Clinical_Utility_Inflammatory_MarkersKang SS, Wong PWK, Malinow MR. Hyperhomocyst(e)inemia as a risk factor for occlusive vascular disease. Ann Rev Nutr 1992;12:279-98.

Refsum H, Ueland PM, Nygard O, Vollset SE. (1998). Hcy and cardiovascular disease. Annu Rev Med;49:31-62.

Syed S., Mahmood., Daniel, Levy., Ramachandran S., Vasan., Thomas J. Wang., (2014), The Framingham Heart Study and the Epidemiology of Cardiovascular Diseases: A Historical Perspective, Lancet, Mar 15; 383(9921): 999-1008. Pub online 2013 Sep 29, doi: 10:1016/S0140-6736(13)61752-3

Selhub, J. (2008), Public health significance of elevated Hcy, Food Nutr. Bull, 29(2 Suppl): S116-25. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/18709886

Selhub, J. (1999). "Hcy metabolism". Annual Review of Nutrition. 19: 217–246. doi:10.1146/annurev.nutr.19.1.217. PMID 10448523
Selhub, J.; Morris, M. S.; Jacques, P. F. (2007). "In vitamin B12 deficiency, higher serum folate is associated with increased total Hcy and methylmalonic acid concentrations". Proceedings of the National Academy of Sciences. 104 (50): 19995–20000. doi:10.1073/pnas.0709487104. ISSN 0027-8424
Shiel Jr., William C. (2018), Medical definition of dyslipidemia. Medterms medical dictionary a-z list. Retrived from https://www.medicinenet.com/script/main/art.asp?articlekey=33979
Shuxia, Guo., Hongrui, Pang., Heng, Guo., Mei, Zhang., Jia, He., et al, (2015). Ethnic Differences in the Prevalence of High Hcy Levels Among Low-Income Rural Kazakh and Uyghur Adults in Far Western China and Its Implications for Preventive Public Health. Int J Env.Res. Pub. Hlth, 12(5): 5373-5385. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4454973/
Sittisuk, Surapant., Sukonthasan, Apichart., Sunthornthum, Surajit., Derojanawong, chaicharn., Nitiyanun, Wannee., et al. (2016). Guideline for pharmalogical management of dyslipidemia to prevent cardiovascular diseases, Royal College of Medicinal Physician of Thailand. Retrieved from
Smach, MA; Jacob, N; Golmard, JL; Charfeddine, B; Lammouchi, T; Ben Othman, L; Dridi, H; Bennamou, S; Limem, K (2011). "Folate and Hcy in the cerebrospinal fluid of patients with Alzheimer's disease or dementia: a case control study". European Neurology. 65 (5): 270–8. doi:10.1159/000326301. PMID 21474939.
Smith, AD; Smith, SM; de Jager, CA; Whitbread, P; Johnston, C; Agacinski, G; Oulhaj, A; Bradley, KM; Jacoby, R; Refsum, H (2010). "Hcy-lowering by B vitamins slows the rate of accelerated brain atrophy in mild cognitive impairment: a randomized controlled trial". PLoS ONE. 5 (9): e12244. doi:10.1371/journal.pone.0012244. PMC 2935890. PMID 20838622.
Stehouwer CDA, Weijenberg MP, van den Berg M., Jakobs C, Feskens EJM, Kromhout D. (1998), Serum Hcy and risk of coronary heart disease and cerebrovascular disease in elderly men: a 10-year follow-up. Arterioscler Thromb Vasc Biol;18:1895-901.
Suriyaprom, Kanjana., Tungtrongchitr, Rungsunn., Pongpaew, Patpong., Phonrat, Benjaluck. (2009), Hcy and vitamin status in healthy Thai smokers, J. Nut.Env. Med., 15(1): 9-21. Retrieved from https://www.researchgate.net/publication/232093326_Hcy_and_vitamin_status_in_healthy_Thai_smokers
Suwanwela, Nijasri C. (2014). Stroke Epidemiology in Thailand. Journal of Stroke, 16(1); 1-7. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3961816/
Towanabut, Somchai. (2017). Impact of stroke service plan in Thailand and near future. Lecture at Prasat Neurological Institute, Bangkok, Thailand. Aug 15. Retrieved from http://neurothai.org/media/download/2017/1108_01_MidYearMeeting2017/11Nov2017/impacT%20of%20STROKE%20&NEAR%20FUTURE.pdf
Tucker KL, Mahnken B, Wilson PWF, Jacques P, Selhub J. (1996), Folic acid fortification of the food supply: potential benefits and risks for the elderly population. JAMA;276:1879-85.
Tucker KL, Selhub J, Wilson PWF, Rosenberg IH. (1996), Dietary intake patterns relates to plasma folate and Hcy concentrations in the Framingham Heart Study. J Nutr;126:3025-31.
van Meurs, JB; Dhonukshe-Rutten, RA; Pluijm, SM; van der Klift, M; de Jonge, R; Lindemans, J; de Groot, LC; Hofman, A; Witteman, JC; van Leeuwen, JP; Breteler, MM; Lips, P; Pols,

HA; Uitterlinden, AG (2004). "Hcy levels and the risk of osteoporotic fracture". The New England Journal of Medicine. 350 (20): 2033–41. doi:10.1056/NEJMoa032546. hdl:1765/8452. PMID 15141041

Whincup PH, Refsum H, Perry IJ, Morris R, Walker M, Lennon L, Thomson A, Ueland PM, Ebrahim SBJ. Serum total Hcy and coronary heart disease: prospective study in middle aged men. Heart 1999;82:448-54.

WHO. (2019), Global Health Observation (GHO) data, WHO. Retrieved from https://www.who.int/gho/ncd/risk_factors/cholesterol_text/en/

Wikipedia, (2019), Hcy, Reteieved from https://en.wikipedia.org/wiki/Hcy on Apr 28.

Ye, Chang., Yuan, Li., Xiaofan, Guo., Yintao, Chen., Dongxue, Dai, et al. (2017). The Prevalence of Hypertension Accompanied by High Hcy and its Risk Factors in a Rural Population: A Cross-Sectional Study from Northeast China, Int. J. Env. Res. Pub. Hlth., 14(4): 376. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5409577/

Yoswatana, Pakpoom., (2015). Annual Epidermiological Surveillance Report, p.216-218. Retrived from http://www.boe.moph.go.th/Annual/AESR2015/aesr2558/Part%201/11/cad.pdf

EFFECT OF ONLINE DYNAMIC MINDFULNESS PRACTICING IN THE LINEAGE OF LUANGPOR TEEAN'S TEACHING: ON THE STATUS OF MINDFULNESS, DEPRESSION, ANXIETY AND STRESS IN WORKING PEOPLE

Banchob Junhasavasdikul[a] Yasuaki Goto[b] Sasithorn Anantasopon[c] Kamon Chaiyasit[d] Kullaya Pisitsungkagarn[e] Payong Wanikiat[f] Amporn Krobthong[g]

a College of Integrative Medicine, Dhurakij Pundit University, dr.banchob@outlook.com
b Japan Health & Research Institute, y.goto@jph-ri.or.jp
c Research Service Center, Sasithorn.ana@dpu.ac.th
d Integrative Nutrition and Herbal Medicine Association, Vitallife Wellness Center at Bumrungrad International Hospital, kamon@inhma.org
e Faculty of Psychology, Chulalongkorn University, Kullaya.D@chula.ac.th
f College of Integrative Medicine, Dhurakij Pundit University, payong.wni@ dpu.ac.th
g College of Integrative Medicine, Dhurakij Pundit University, ampornkrob@gmail.com

Abstract

Dynamic Mindfulness Practicing in the lineage of Luangpor Teean Jittasubho (DMLT) is a unique Vipassanà practice involving rhythmic hand and arm movement. It is a valuable and effective mindfulness meditation technique capable of leading quickly to reduction in suffering and even to full enlightenment. The purpose of this study was to study the effect of online individual practice on the status of mindfulness and the 3 aspects of negative emotions: stress, anxiety and depression in working people. It was a preliminary quasi-experimental research. The subjects were purposive sampling of 27 psychologically healthy staffs of the College of Integrative Medicine, Dhurakij Univesity, aged 27-55 years old, both men and women. The method was letting them practice individually at home twice a day in the morning and evening by following the online sound clips of 17 minutes for 12 days continuously. The total practicing time for 6 minutes of online introduction plus 7 minutes twice a day of 12 days practice was equal to 174 minutes (not including 1 hour of orientation meeting), without sitting still meditation and no psychotherapy in the experiment. The data were analyzed by means of Freiburg Mindfulness Inventory: FMI and Depression Anxiety Stress Scales (DASS-21) comparing the result of post-test-1 on 6^{th} day and post-test-2 on 12^{th} day to the pre-test. The results were compared by Pair-t test as following: 1.After the experiment, the average FMI test scores of the perceived value of the post-test-1 and post-test-2 were higher than the pre-test value with a statistically significant of .05 2.After the experiment, the average DASS-21 test scores of the perceived value of the post-test-1 and post-test-2 for stress, anxiety and depression were lower than the pre-test value with a statistically significant of .05, .05 and .05 consecutively. Conclusion: The online DMLT can increase the status of mindfulness and decrease the 3 aspects of negative emotion in working people. The " Online DMLT" has the identity of: 1) Easy 2) Assessable 3) Convenient 4) Save time 5) Stand-alone therapy 6) Online guidance. Further experiments on larger scales are required expecting that this "Online DMLT" will turn to be an alternative choice for mindfulness practice in psychologically healthy persons for online home use in order to reduce suffering or even to full enlightenment.

Key word: DMLT, mindfulness, meditation, Sati, Samathi, stress, anxiety, depression,

Background

Mindfulness meditation practicing had been practiced in the Eastern countries for thousands of years. It is a way to decrease suffering, gaining happiness and getting wisdom.

The Western point of view

In the last few decades, Westerners gained more interest in mindfulness meditation practicing. Most Western discussions acknowledge its roots in Buddhist meditation traditions. Instruction in mindfulness has become widely available in Western society. Meditation centers in North America and Europe offer retreats in the Buddhist traditions with guidance and instructions in the mindfulness practicing (Baer, 2014).

Many people meditate to reduce psychological stress and stress-related health problems. The Westerners need to know what the evidence says about the health benefits of meditation. A systemic review and meta-analysis on meditation programs for psychological stress and well-being, reviewed 18,753 citations, 47 trials were included with 3,515 participants shew that mindfulness meditation programs had moderate evidence of improved anxiety, depression, and pain and low evidence of improved stress/distress and mental health–related quality of life. (Goyal, et al., 2014).

As for mindfulness, from the Western psychological perspective, mindfulness is typically defined as a form of nonjudgement and nonreactive attention to experiences occurring in the present moment, including bodily sensation, cognitions, emotions, and urges, as well as environmental stimuli such as sights, sound, and scents (Kabat-Zinn, 1990; Linehan, 1993a.). Bishop et al. provided a two component of mindfulness: 1) the intentional self-regulation of attention so that it remains focused on present-moment experiences as they arise, 2) an attitude of openness, acceptance, and curiosity toward whatever arises (Bishop, 2004). The current therapeutic methods being used are as following (Baer, 2014): Mindfulness-based stress reduction-MBSR (Kabat-Zinn, 1982), Mindfulness-based cognitive therapy-MBCT (Segal, Williams & Teasdale, 2002), Dialectical behavior therapy-DBT (Linehan, 1993a; 1993b) and Acceptance and commitment therapy-ACT (Hayes, Strosahl, & Wilson, 1999). These training methods utilized mindfulness complimentarily to support psycho-therapy.

Wisdom of the East

The Eastern Buddhist wisdom has delicately defined meditation (Samathi) as the determined mind, stableness of mind, calmed and steadfast mind without distraction, a state of mind which steadfast on something (Prarajvoramuni, 1985a) , whereas mindfulness (Sati) is another aspect. It means knowing, ability to recognize, the action to steadfast the mind, (Prarajvoramuni, 1985b). According to Buddhist preach, Sati and Samathi are two in five strengths to rid off obstacles for gaining wisdom. When one is doing meditation he needs Samathi as the main mental frame work and Sati as the supporting strength. Whereas, when one is practicing mindfulness, Sati is the main mental framework and Samathi is the supporting strength. An article from Chopra Center mentions that, it is difficult for the human mind to stay in the present moment. As the mind spends its time focused on the past (in regret mode), the future (in worry mode). A wandering mind is an unhappy mind. Mindfulness is all about being aware, when one is being actively mindful, he is noticing and paying attention to his thoughts, feelings, behaviors, and movements. One can practice mindfulness anytime,anywhere by showing up and being fully engaged in the here and now. Mindfulness can be practiced both informally (at any time/place) and formally (during seated meditation). Whereas meditation is

usually practiced for a specific amount of time, mindfulness can be applied to any situation throughout the day (Eisler, 2019).

As for Buddhist practicing, besides sitting with closed eyes meditation in a steadfast mind (Samathi), there is another way of Dynamic Mindfulness practicing in the lineage of Luangpor Teean's teaching (DMLT) which can be done by rhythmic hand and arm movement, with opened eyes aiming for knowing and awareness of the present moment (Sati).

Luangpor Teean stressed his preaching on Vipassana (mindfulness meditation for enlightenment) by advocating Gayanusathipathan (mindful stableness by following physical body). It means that keeping the mind to be aware of every physical motion in order to make the mind being firmed to the present time. He also preached Jittanusathipathan (mindful stableness by following thinking). It means that keeping awareness to every motion of the mind. One just be knowing every thinking or emotion, without judgement. By repeating body and mind awareness will empower one's own mindfulness and getting the wisdom at the end (Suvanno, Prasuvan., 2010).

To conclude the understanding, DMLT compares to the Western style of mindfulness meditation, DMLT is a practice by just gaining awareness of the present moment during rhythmic hand and arm motion, whereas meditation is to concentrate the mind to the state of stableness and steadfastness. DMLT is a motion method with opened eyes, instead of sit still and closed eyes for meditation. DMLT can be done anywhere, anytime, whereas meditation needs appropriate circumstances of peacefulness and quietness for a certain period of time.

Literature

On method, time taking of meditation and/or mindfulness training

The systemic review and meta-analysis on meditation programs for psychological stress and well-being found that meditation training programs vary in several ways, including the type of mental activity promoted, the amount of training recommended, the use and qualifications of an instructor, and the degree of emphasis on religion or spirituality. Popular techniques, such as transcendental meditation, emphasize the use of a mantra. Other popular techniques, such as mindfulness-based stress reduction, emphasize training in present-focused awareness or mindfulness. Most trials were short-term but ranged from 3 weeks to 5.4 years in duration. Mindfulness-based stress reduction programs typically provided 20 to 27.5 hours of training during 8 weeks. The other mindfulness meditation trials provided about half this amount. Transcendental meditation trials were estimated to provide 16 to 39 hours in 3 to 12 months, whereas other mantra meditation programs provided about half this amount (Goyal, et al., 2014).

On clinical trial and result of meditation and/or mindfulness training

Systemic review of the efficacy of meditation techniques as treatments for medical illness shew the strong evidence for efficacy was found for epilepsy, symptoms of the premenstrual syndrome and menopausal symptoms. Benefit was also demonstrated for mood and anxiety disorders, autoimmune illness, and emotional disturbance in neoplastic disease. No serious adverse events were reported in any of the included or excluded clinical trials. (Arias, Steinberg, Banga, Trestman, 2006). Systemic review of Goyal et al. (2014) on various kinds of meditation and/or mindfulness training revealed fifteen trials studied psychiatric populations, including those with anxiety, depression, stress, chronic worry, and insomnia. Five trials studied smokers and alcoholics, 5 studied populations with chronic pain, and 16 studied populations with diverse medical problems, including those with heart disease, lung disease, breast cancer, diabetes mellitus, hypertension, and human immunodeficiency virus infection. Results indicated that

mindfulness meditation program had moderate evidence of improved anxiety, (0.38 at 8 weeks and 0.22 at 3-6 months), depression (0.30 at 8 weeks and 0.23 at 3-6 months), and pain (0.33) and low evidence of improved stress/distress and mental health–related quality of life. The review found low evidence of no effect or insufficient evidence of any effect of meditation programs on positive mood, attention, substance use, eating habits, sleep, and weight. They found no evidence that meditation programs were better than any active treatment (ie, drugs, exercise, and other behavioral therapies) (Goyal, et al., 2014). A study on effectiveness of Buddhist meditation (Vipassana) on self-esteem, creative visualization and health status in elderly people in 2 month meditation training shew that the experimental group experienced significantly increased self-esteem, creative visualization, health status, skin resistance and skin temperature, significant decreased pulse, respiration and blood pressure (Pongpieng, S., 2000). An academic article on Vipassana meditation during sickness advocated 30 min. mindfulness walking, 30 min. seated meditation accompanying DMLT 20 min. for 10 days can keep the patients mind observing symptoms without anger or depression (Nuibandan, Chinnavongs, 2012).

Result of MBSR and MBCT

A review and meta-analysis on direct comparison study between MBSR and standard relaxation training found that both treatments were equally able to reduce stress. Furthermore, MBSR was able to reduce ruminative thinking and trait anxiety, as well as to increase empathy and self-compassion in healthy person (Chiesa, Serretti, 2009). Systemic review and meta-analysis on mindfulness-based interventions in schools shew that mindfulness-based interventions in children and youths hold promise, particularly in relation to improving cognitive performance and resilience to stress (Zenner, Herrnleben-Kurz, Walach, 2014). Another systemic review on mindfulness-based stress reduction: a non-pharmacological approach for chronic illnesses shew the improvement in the condition of patients after MBSR therapy. These studies were focused on patients with chronic diseases like cancer, hypertension, diabetes, HIV/AIDS, chronic pain and skin disorders (Niazi & Niazi, 2011). On vascular diseases, a systemic review and meta-analysis of randomized controlled trials shew that MBSR and MBCT had beneficial effects for stress, depression and anxiety, but the physical outcomes of diseases were less evident (Abbott, et al., 2014).

As for psychological diseases, a systematic review and meta-analysis for psychiatric disorders shew that 1) MBCT in adjunct to usual care was significantly better than usual care alone for reducing major depression (MD) relapses in patients with three or more prior depressive episodes 2) MBCT plus gradual discontinuation of maintenance ADs was associated to similar relapse rates at 1 year as compared with continuation of maintenance antidepressants 3) the augmentation of MBCT could be useful for reducing residual depressive symptoms in patients with MD, and for reducing anxiety symptoms in patients with bipolar disorder in remission, and in patients with some anxiety disorders (Chiesa, Serretti, 2011).

Online mindfulness training

As for the online training, there were some experiments encouraging online practice. A systematic review and meta-analysis on web-based mindfulness interventions for mental health treatment shew results support the effectiveness of web-based mindfulness interventions in reducing depression and anxiety and in enhancing quality of life and mindfulness skills, particularly in those with clinical anxiety (Sevillia-Llewellyn-Jones,Jones, Santesteban-Echarri, Pryor, McGorry, Alvarez-Jimenez, 2018). A study on effects of a mindfulness meditation app on subjective well-being: active randomized controlled trial and experience sampling study on

undergraduate students completed 3 weeks of MT with Wildflowers (n=45) or 3 weeks of cognitive training with a game called 2048 (n=41), revealed improved mood (r=.14) and a reduction of stress (r=-.13) immediately after session compared with before the training, decreased post-session stress over 3 weeks (r=-.08). MT also relative to cognitive training resulted in greater improvements in attentional control (r=-.24). Both groups demonstrated increased subjective ratings of awareness (r=.28) and acceptance (r=.23) from pre- to post-intervention, with greater changes in acceptance for the MT group trending (r=.21)(Walsh, Saab, Farb, 2019).

On Dynamic Meditation and DMLT

A study on effect of dynamic meditation on mental health in 60 subjects of experimental and control group of 21-day training in dynamic meditation indicated that in post-condition, experimental group scored better than control group on integration of personality, autonomy and environmental mastery (Iqbal, Singh, Aleem, 2016). As for DMLT, a paper studying DMLT practicing on self-esteem for 8 weeks, in 60 elderlies divided into experimental and control group. Results represented that it can improve self-esteem and encourage higher quality of life in elderly (Unthai, 2015). A paper studying DMLT on the health behavior of persons with Diabetes Type 2 shew that health behavior mean score of the experimental group after intervention was significantly higher than that of before (Phochaja, 2018). Another paper studying learning development for special kids of 10 subjects, divided into experimental and control group, shew that after the DMLT intervention the experimental group students had less inattentive behavior than the students in control group at 0.05 level of significance. The inattentive behavior of the students in the experimental group after the experiment was less than that before the experiment with a level of significance. After practicing they stayed focused in classroom and had less interrupt teachers and their friends (Poonpipat, Intanont, 2018). A study on the effective of education and movement mindfulness meditation program (DMLT) on anxiety among older persons before cystoscope Samples were 40 men and women aged 60 years and over before cystoscopy, random assigned into control group and experimental group. The experimental group received the education and movement mindfulness program for two weeks. The mean score of anxiety after DMLT was significantly lower than that of before at .05, the mean score of anxiety before cystoscopy cases in the experimental group was significantly lower than that in the control group at .05 (Kawnaul, Choowattanapakorn, 2017).

How can DMLT relieve suffering?

How can DMLT, a Buddhist way of Gayanusatipathan focusing on physical motion of mindfulness practicing, help practitioner escape from suffering without psychotherapy? Let us learn from a case study, researcher had ever treated. A man of 68 years old suffering from acid regurgitation for 20 years, failed from conventional medical treatment. He accepted that he got the disease after his business being deceived by his sister in law. Twenty years passed, he still felt regret of such event even though he was living with a very happy family and had successfully raised his 3 children to be the high rank administrators of the governmental organization and university. Researcher just explained him about keeping his mind to the present time instead of wandering the mind to the painful passed experiences. Then taught him DMLT and appointed 2 weeks follow up. This man had recovered from his 20 years suffering in just one visit with DMLT homework, without medication or psychotherapy. There were some more cases got similar fruitful results, by the researcher's clinical experiences.

Conceptual frame work from literature review

Buddhist wisdom had delicately differentiated meditation and mindfulness into 2 aspects Samathi and Sati, which had different characters and benefits, also had synergizing supports to each other. Nowadays the mindfulness and meditation had been examined by the Western point of view. They had done numerous evident based researches on many variety practices which proved the effectiveness of meditation and/or mindfulness. Most researches were on seated closed eyes meditation and/or mindfulness awareness of daily activities. Many researches were done on some weeks training course utilizing mindfulness meditation as a supportive means for psychotherapy.

Nevertheless, the dynamic way of mindfulness practice in a unified pattern of movement so called DMLT was still scarcely investigated, even though it has some better characteristics. It can be done with opened eyes, any place / any time, doing as self-practice, may have "stand alone" therapeutic effect without psycho-therapy.

Research hypothesis

Therefore researchers determined to do a research studying the effect of DMLT on psychologically healthy working people. And as it is an easy way of practice, we have the hypothesis that the "Online DMLT" can affirm the home practice, helping the experimental unit to develop self-awareness, decreasing stress, anxiety and depression.

Researchers hope that this preliminary study, first in psychologically healthy working people, may lead to larger scale of studies and more variety of experimental groups. And at last the "Online DMLT" would turn to be an easier choice assessing for self-practice in order to escape suffering or even get the awakening wisdom.

Buddhist wisdom		**Western practice**	**Online DMLT**	**Research hypothesis**
-meditation (Samathi + Sati) -mindfulness (Sati + Samathi)	->	-mindfulness meditation -closed eyes + awareness of daily activities -weeks training course -as a subset to compliment psycho-therapy	-> -mindfulness unified motion -opened eyes -anytime / any place -self-practice -"stand alone" therapy -online guidance	-> -increase mindfulness -decrease stress -decrease anxiety -decrease depression

Method

This is a quasi-experiment research design to study the effect of online individual practicing DMLT on the status of mindfulness and the depression, anxiety and stress in working people.

1. The experimental group was purposive sampling of 27 psychologically healthy staffs of the College of Integrative Medicine, Dhurakij Univesity, aged 27-55 years old, both men and women. As it is a preliminary research, the reason for purposive selection of this group is because of the occupational predisposition background of experimental unit in understanding and acceptance on mindfulness practice and easier to get co-operation in everyday self-practice.

2. Research instruments were:

2.1 A questionnaire for detecting level of mindfulness -Freiburg Mindfulness Inventory: FMI free downloaded from www.mindfulness-extended.nl. It composed of 14 items with 4 rating scale, follow the Likert Scale as: 1 for never experienced, 2 for sometimes, 3 for often experienced, 4 for experiencing all the time. It is a useful, valid and reliable questionnaire for measuring mindfulness, developed by Walach, H. et al., supported by the Samuelin Institure, Newport Beach California (Walach, Buchheld, Buttermuller, Kleinknecht, Schmidt, 2006). The FMI is a consistent and reliable scale capturing several important aspects of mindfulness, which

probably is one-dimensional. In general contexts, where knowledge of Buddhist background of mindfulness cannot be expected, the short form of 14 items is more suitable.

2.2 A questionnaire for detecting mental status – Depression Anxiety Stress Scales (DASS-21), an instrument that is often used to assess subjective depressive and anxiety complaints in patients is the Depression Anxiety Stress-Scale (DASS) developed by Lovibond and Lovibond (Lovibond, Lovibond, 1995). It is predominantly aimed at assessing the perceived severity of symptoms related to depression, anxiety and stress free downloaded from http://headspace.org.au/assets/ which is a website of headspace National Youth Mental Health Foundation. It was a self-evaluation for such 3 aspects of negative emotion composed of 21 items with 4 rating scale, following the Likert Scale as: 0 as not match with me at all, 1 as may match with me or sometimes occurred, 2 as match with me or often occurred, 3 as very match with me or very often occurred.

Interpretation is:

	Depression	**Anxiety**	**Stress**
Normal	0-4	0-3	0-7
Mild	5-6	4-5	8-9
Moderate	7-10	6-7	10-12
Severe	11-13	8-9	13-16
Extremely Severe	14+	10+	17+

3. Preparing experimental steps:

3.1 The researcher studied and practice the method of DMLT. It had 14 postures of continuous arms and hands motion. The practicing procedure was as following:

-Sitting on a chair placing both hands on the lap
-Turn the right hand on the side, be aware of motion and stop
-Flex the right elbow, be aware of motion and stop
-Lower the right hand on to the naval, be aware of motion and stop
-Turn the left hand on the side, be aware of motion and stop
-Flex the left elbow, be aware of motion and stop
-Lower the left hand on to the naval, be aware of motion and stop
-Raise the right hand from the naval to the chest, be aware of motion and stop
-Move the right hand from the chest to the level of shoulder, be aware of motion and stop
-Lower the right hand to the lap, on the side position, be aware of motion and stop
-Over turn the right hand on the lap, be aware of motion and stop
-Raise the left hand from the naval to the chest, be aware of motion and stop
-Move the left hand from the chest to the level of shoulder, be aware of motion and stop
-Lower the left hand to the lap, on the side position, be aware of motion and stop
-Over turn the left hand on the lap, be aware of motion and stop

Figure 1: Fourteen posture of DMLT download from http://pohdhamma.blogspot.com/2015/07/blog-post.html, assess on Apr 21, 2019

3.2 Prepare 1 introductory and 12 every day practicing sound clips.

4. Experiment and Data collection:

4.1 Orientation meeting for the experimental unit of 27 persons in a meeting room. Room number 7203, Dhurakij Pundit University was used. Activities were as mentioned in the flow chart.

4.2 Home practice, Activities were as mentioned in flow chart. The total practicing time for 6 minutes of online introduction, 7 minutes twice a day of 12 days practice is equal to 174 minutes (not including 1 hour of orientation meeting). Experimental unit were so affirming not to over excess practicing in order to control dose of intervention.

Orientation meeting		**Home Practice**
-objective/expectation/		-one online sound clip
-downside/how to quit		per day
-consent form signing	->	-practice online guidance
-medical history/vital sign		twice a day
(exclude psychological &		-fill up post-test-1 on 6th day
critical cardiovascular pt.)		post-test-2 on 12th day
-Pre-test fill up		-send back to researchers
-Training DMLT		
-Setting line group		

5. Statistic data analysis

5.1 Total score analysis from FMI (Freiburg Mindfulness Inventory) questionnaire of pre-test and post-test by Pair t-test at the significant of .05

5.2 Total score analysis from DASS-21 questionnaire of pre-test and post-test by Pair t-test at the significant .05 by dividing into 3 aspects:

1) Stress: question number 1,6,8,11,12,14,18
2) Anxiety: question number 2,4,7,9,15,19,20
3) Depression: question number 3,5,10,13,16,17,21

Finding

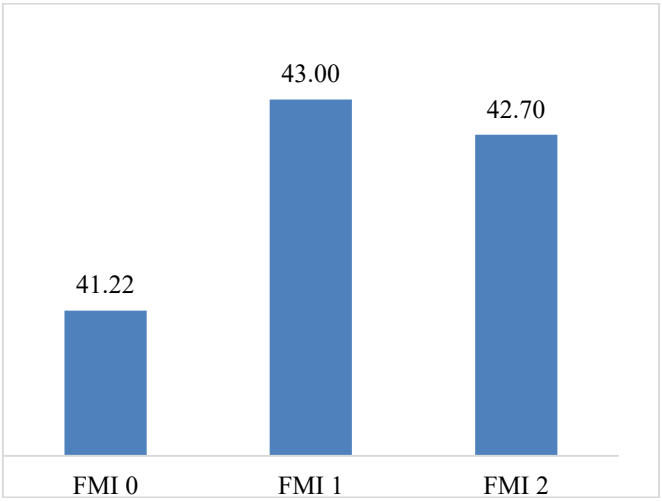
There were 27 persons in this experiment, 6 males and 22 females. The demographic description are as following:

Table 1: Demographic Description of Sample

	Respondent Demographic	**Number of respondents**	**Percentage of respondents**
Gender	Male	6	21.43
	Female	22	78.57
Age	25-38	15	55.56
	39-52	8	29.63
	53-66	4	14.81
	Mean	38.57	
	SD	10.54	
Position	College administrator	5	18.52
	College teacher	16	59.26
	Personal	6	22.22
Education Level	Bachelor degree	6	22.22
	Master degree	16	59.26
	Ph.D.	5	18.52
Total		27	100.00

By evaluating the mindfulness status of experimental unit using FMI questionnaire and the 3 aspects of negative emotions by DASS-21 test on the 6^{th} day and 12^{th} day of experiment. The statistical analyzing method got the following results:

1. The total score of post-test 1 for FMI-1 was significantly higher than the pre-test ($p<0.05$), meanwhile, for FMI-2 was not.

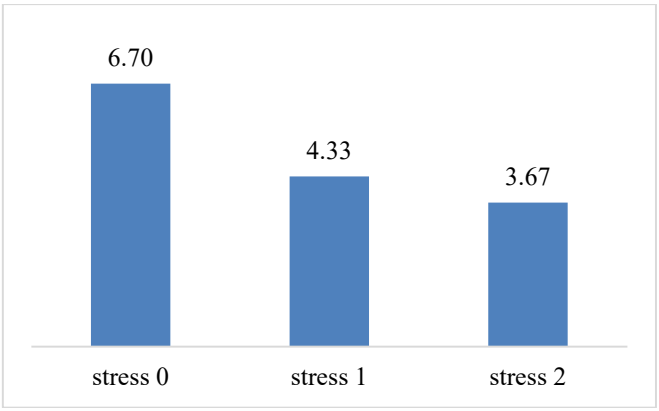


"FMI-1" is the total score of pose-test-1, "FMI-2" is he total score of pose-test-2

Table 2: Pair t-test total score from FMI for Pre-test to Post-test-1 (on the 6th day) and Post-test-2 (on the 12th day)

	Paired Differences Mean	t-test	p-value
FMI 1 - FMI 0	1.778	2.575	.016
FMI 2 - FMI 0	1.481	1.281	.211

2. The total score of post-test-1 for Stress 1 and post-test-2 for Stress 2 from DASS-21 on the aspect of stress was statistically significant lower than the pre-test. ($p<0.01$)

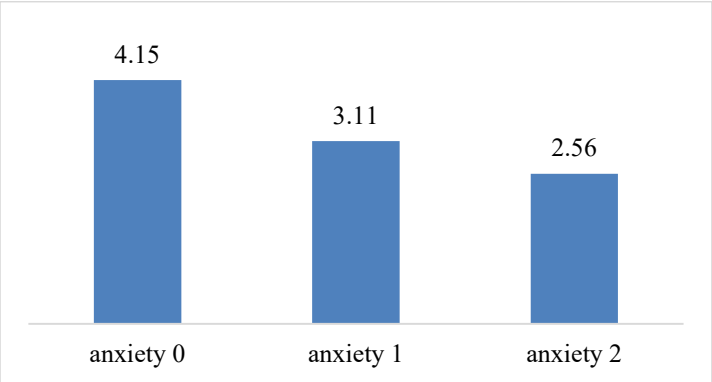


"stress 1" is the total score of pose-test-1, "stress 2" is the total score of pose-test-2

Table 3: Pair t-test total score from DASS-21 on the aspect of stress (item 1, 6, 8, 11, 12, 14, 18) for Pre-test to Post-test-1 (on the 6th day) and Post-test-2 (on the 12th day)

	Paired Differences Mean	t-test	p-value
stress 1 – stress 0	-2.370	-4.506	.000
stress 2 – stress 0	-3.037	-4.371	.000

3. The total score of Post-test-1 for Anxiety 1 and post-test-2 for Anxiety 2 from DASS-21 on the aspect of anxiety was significantly lower than the pre-test. ($p<0.05$ and $p<0.05$, respectively)

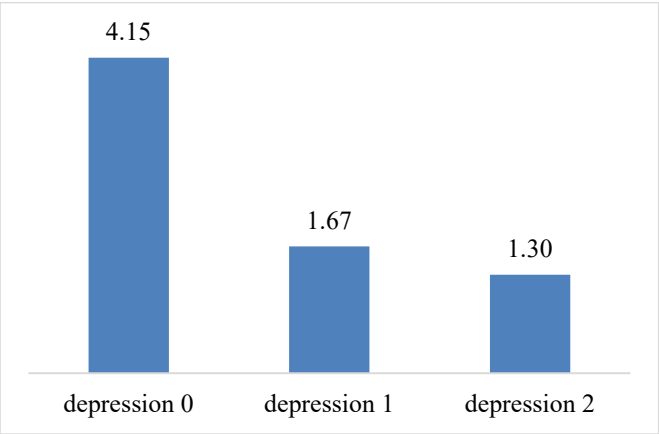


"anxiety 1" is the total score of pose-test-1, "anxiety 2" is the total score of pose-test-2

Table 4: Pair t-test total score from DASS-21 on the aspect of anxiety (item 2, 4, 7, 9, 15, 19, 20) for Pre-test to Post-test-1 (on the 6th day) and Post-test-2 (on the 12th day)

	Paired Differences Mean	t-test	p-value
anxiety1 - anxiety0	-1.037	-2.251	.033
anxiety2 - anxiety0	-1.593	-3.331	.003

4. The total score of post-test-1 for Depression 1 and Post-test-2 for Depression 2 from DASS-21 on the aspect of depression was statistically lower than the pre-test. ($p<0.01$)



"depression 1" is the total score of pose-test-1, "depression 2" is the total score of pose-test-2

Table 5: Pair t-test total score from DASS-21 on the aspect of depression (item 3, 5, 10, 13, 16, 17, 21) for Pre-test to Post-test-1 (on the 6th day) and Post-test-2 (on the 12th day)

	Paired Differences Mean	t-test	p-value
depression 1 - depression 0	-2.481	-4.711	.000
depression 2 - depression 0	-2.852	-5.033	.000

Discussion

This research was to study the effect of online practicing DMLT on the status of mindfulness, stress, anxiety and depression on psychologically healthy 27 working people both men and women. Letting the experimental unit practiced online guided sound clips for 7 minutes twice a day continuously for 12 days. Total practicing time was 174 minutes. The results revealed that the experimental unit got a better status of mindfulness, getting better score of FMI questionnaire, which mean that they got more self-awareness and because of this they were more free from the 3 aspects of negative emotions, proved by the better results of DASS-21.

This DMLT research shew: 1) improved stress at 0.05 2) improved anxiety at 0.05 3) improved depression at 0.05 4)improved mindfulness at 0.05

In comparing this research with the Western style of meditation, systemic review and meta-analysis on meditation programs for psychological stress and well-being (Goyal, et al., 2014), reviewed 47 trials were included with 3,515 participants shew: 1) improved anxiety (0.38 at 8 weeks and 0.22 at 3-6 months), 2) improved depression (0.30 at 8 weeks and 0.23 at 3-6 months) 3) improved pain perception (0.33) 4) low evidence of improved stress/distress and mental health–related quality of life

In comparison this DMLT research with the effect of DMLT training on anxiety among older persons before cystoscopy on 40 men and women aged 60 years for 2 weeks (Kawnaul, Choowattanapakorn, 2017). Such research shew: 1) lower anxiety score comparing before and after training at 0.05 2) lower anxiety score comparing experimental unit than that of the control group at 0.05.

In comparing this online DMLT research with another online training, the study on effects of a mindfulness meditation app on subjective well-being, studying on 45 experimental subjects and 41 control cognitive training with a game called 2048 (Walsh, Saab, Farb, 2019), : Before and after training MT app shew:1) improved mood (r=.14), both state and trait effects 2)reduction stress (r=-.13) immediately comparing 3) decreased post-session stress over 3 weeks (r=-.08). The MT app compared to cognitive training shew: greater improvements in attentional control (r=-.24). Both groups demonstrated pre to post intervention shew: 1) increased subjective ratings of awareness (r=.28) 2) increased acceptance (r=.23) 4) had greater changes in acceptance for the MT group trending (r=.21).

The different of this research to the 3 previous researches may be from the effectiveness of practicing method, size of experimental group or the measuring instruments.

In conclusion, this research for online DMLT in working people had a characteristic of: 1) Easier: The principle of mindfulness is just gaining awareness of the present moment whereas meditation is to concentrate the mind to the state of stableness and steadfastness. So DMLT is easier to do. 2) Assessable: DMLT is a motion method with opened eyes, instead of sit still and closed eyes for meditation. So DMLT is more assessable 3) Convenience: DMLT can be done anywhere, anytime, whereas meditation needs appropriate circumstances of peacefulness and

quietness. So, DMLT is more convenient. 4) Save time: DMLT needs shorter time to gain fruitful results. This experiment, as an example, needs 174 minutes last for 12 days, whereas classical MBSR, MBCT, DBT and ACT may need the practicing time of 20 to 27.5 hours during 8 weeks. So, DMLT needs shorter time. 5) Stand-alone therapy: mindfulness meditation need group session, home practicing is just supporting mean whereas DMLT can be done without psycho-therapy 6) Online guidance: Normally DMLT also needs group session but proved by this research DMLT can be done with online guiding.

Recommendation

This "Online DMLT" research can increase the status of mindfulness and decrease the 3 aspects of negative emotion in working people. It combined the advantage of DMLT with the modern technology of online teaching. It has the following identity: 1) Easier, 2) Assessable, 3) Convenience, 4) Save time, 5) Stand-alone therapy and 6) Online guidance. As it is a preliminary study there were limitations like: the number of experimental unit, the selection of experimental group, the lacking of control group comparing with other experimental method, also the offline and online comparison.

The future directions should be experiments on larger scales, with control group of different modes of intervention and/or with offline and online comparison. Researchers expected that by the next fruitful results this " Online DMLT" will turn to be an alternative choice for mindfulness practice in psychological healthy persons for online home use in order to reduce suffering or even to full enlightenment.

References

Abbott, Rebecca A., Whear, Rebecca., Rodgers, Lauren R., Bethel, Alison., Thompson, Coon., Kuyken, Willerm., Stein, Ken., Dickens, Chris. (2014). Effectiveness of mindfulness-based cognitive therapy in vascular disease: A systematic review and meta-analysis of randomized controlled trials, Journal of Psychosomatic Research, Vol. 76, Iss. 5, p. 341-351. Retrieved from https://www.sciencedirect.com/science/article/pii/S0022399914000543

Arias, Albert J., Steinberg, Karen., Banga, Alok., Trestman, Robert L., (2006). Systemic review of the efficacy of meditation techniques as treatment for medical illness. J. of Alt. and Comp. Med., Vol. 12, No. 8. Retrieved from https://doi.org/10.1089/acm.2006.12.817

Baer, Ruth A.(2014). Introduction to the core practice and exercise, Mindfulness based treatment approaches, Academic Press, Elsevier Inc., p.3-22.

Bishop, S. R., Lau, M., Shapro, S., Carlson, L., Anderson, N. C., Carmody, J., et al. (2004). Mindfulness: a proposed operational definition, Clinical Psychology: Science and Practice. 11, 230-241.

Chiesa, Alberto., Serretti, Alessandro. (2011), Mindfulness-Based Cognitive Therapy for psychiatry disorders: A systemic review and meta-analysis, Psychiatry Research, Vol. 187, Iss. 3, p. 441-453. Retrieved from https://www.sciencedirect.com/science/article/pii/S0165178110005196

Chiesa, Alberto., Serretti, Alessandro.,(2009), Mindfulness-Based Stress Reduction for stress management in healthy people: A review and meta-analysis; J. of Alt. and Comp. Med., Vol.15, No.5, Retrieved from https://doi.org/10.1089/acm.2008.0495

Eisler, Melissa. (2019). What's the difference between meditation and mindfulness?, The Chopra Center. Retrieved from https://chopra.com/articles/whats-the-difference-between-meditation-and-mindfulness

Goyal, Madhav., Singh, Sonal., Sibingo, Erica, M. S., et al. (2014), Systemic review and meta-analysis on meditation programs for psychological stress and well-being. JAMA Intern.Med., 174 (3): 357-368. Retrieved from https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/1809754?e2token=SEN1cmNpb0BhYXJwLm9yZw==?cmp=MIV-SSMEMPG-LINK-20150316

Hayes, S. C., Strosahl, K., & Wilson, K. G., (1999), Acceptance and commitment therapy: an experiential approach to behavior change. New York, Guilford press. Cross ref.

Iqbal, N., Singh, A., Aleem, S. (2016). Effect of dynamic meditation on mental health, J Relig Health. 2016 Feb; 55(1): 241-254. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/26179581

Kabat-Zinn, J. (1990). Full catastrophe living: Using the wisdom of your body and mind to face stress, pain, and illness. New York: Delacorte.

Kabat-Zinn, J. (1982), An outpatient program in behavioral medicine for chronic pain patients based on the practice of mindfulness meditation: Theoretical consideration and preliminary results. General Hospital Psychiatry, 1982, 4, 33-47. Cross ref.

Kawnual, Wipaporn., Choowattanapakorn, Tassana. (2017), The effect of education and ovement mindfulness meditation program on anxiety among older persons before cystoscopy., Journal of the Police Nurses, 9th year, Vol. 2, July-Aug.

Linehan, M. M., (1993a). Cognitive behavioral treatment of borderline personality disorder. New York: Guilford press.

Linehan, M. M. (1993b). Skills training manual for treating borderline personality disorder. New York, Guilford press.

Lovibond SH., Lovibond PF. (1995). Manual for the Depression Anxiety Stress Scales. Sydney Psychology Foundation Australia.

Niazi, Asfandyer K., Niazi, Shaharyar K. (2011), Mindfulness-based stress reduction: a non-pharmacological approach for chronic illnesses. N. Am. J. Med. Sci. 2011 Jan; 3(1): 20-23. Retrieved from doi: 10.4297/najms.2011.320 PMC3336928.

Nuibandan, Aree., Chinnavongs, Tippamas. (2012); Vipassana meditation during sickness, Journal of Nursing Sonkranakarin, 32(2), 69-74.

Phochaja, Chucheap. (2017), Mindfulness Meditation on the Health Behavior of Persons with Diabetes Type 2, Li Hospital, Lamphun Province. Nursing Journal of the Ministry of Public Health, 2017, p.135-145.

Pongpieng, Saovanee. (2000), Effectiveness of Buddhist meditation (Vipassana) on self-esteem, creative visualization and health status in elderly people. Thesis for Master degree on Public Health Nursing, Mahidol University.

Poonpipat, Saritarn., Intanont, Viroj. (2018), The results of Meditation Activities for learning development for special kids. FEU Academic Review.

Prarajvoramuni, Payutto, P. (1985a), Buddhist dictionary – summary of vocabulary, Dansuthakarnpim Co. Ltd., 3rd Edit. p 296.

Prarajvoramuni, Payutto, P. (1985a), Buddhist dictionary – summary of vocabulary,
Dansuthakarnpim Co. Ltd., 3rd Edit. p 302.

Segal, Z. V. William., J.M.G. & Teasdale, J.D. (2002), Minfulness-based cognitive therapy fir depression: a new approach to preventing relapse. New York: Guilford. Cross ref.

Sevilla-Llewellyn-Jones, Julia., Santesteban-Echarri, Olga., Pryor, Ingrid., McGorry, Patrick., Alvarez-Jimenez, Mario. (2018), Web-based mindfulness interventions for mental health treatment: systemic review and meta-analysis; JMIR Mental Health, 2018 Jul-Sep. 5(3) e10278. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6231788/

Suvanno, Prasuvan, (2010), Effect of mindfulness practicing on the lineage of Luangpor Teean Jittasupo: case study in Dharma practitioner in Mahasatipathan 4 center Banlaoponthong village. Thesis for Master degree on Buddhism, University of Royal College of Mahachulalongkorn.

Unthai, Plaikanya. (2015), Effect of dynamic meditation in the lineage of Luangpor Teean's teaching on self-esteem in the elderly. A thesis for the degree of master of science program in sports science, Faculty of Sports Science, Chulalongkorn University.

Walach, H., Buchheld, N., Buttermuller, V., Kleinknecht, N., Schmidt, S. (2006), Measuring Mindfulness—The Freiburg Mindfulness Inventory (FMI), Personality and Individual Differences, 40, 2006, 1543-1555.

Walsh, KM., Saab, BJ., Farb, NA. (2019), Effects of a mindfulness meditation app on subjective well-being: active randomized controlled trial and experience sampling study, JMIR Ment Health, Jan 8; 6 (1): e10844. Doi: 10.2196/10844. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/30622094

Zenner, Charlotte., Herrnleben-Kurz, Solveig., Walach, Harald. (2014), Mindfulness-based interventions in schools-a systemic review and meta-analysis; Frintiers in Psychology, Retrieved from https://doi.org/10.3389/fpsyg.2014.00603

Efficacy and Safety of a single treatment using 1064-nm Picosecond Laser for Treatment of Keratosis Pilaris

Pawadee Laonopkhun M.D.[1], Punyaphat Sirithanabadeekul M.D.[1, 2*]

[1] Division of Dermatology, Chulabhorn International College of Medicine Thammasat University, Pathum Thani, Thailand, 10120

[2] Dermatology Clinic, Samitivej Hospital, Bangkok, Thailand, 10110

*Corresponding author: Tel. +66(0)2564-4444ext. 1535; Fax. +66(0)2564-4440 ext. 7594;

E-mail address: punyaphats.cicm@gmail.com

Abstract

Background: Keratosis pilaris is a common skin disorder characterized by small keratotic papules on the proximal extremities; yet, very few treatment options are currently available, with mostly unpredictable and unsatisfactory results. Picosecond laser has been proven to be effective for the treatment of pigmented skin lesion and skin rejuvenation but has not been studied for the treatment of KP. We hypothesized that picosecond laser would result in significant clinical improvement of KP and serve as a safe modality. **Objective:** This study aimed to evaluate the efficacy and safety of picoseconds laser for the treatment of KP. **Methods:** Fifteen subjects with KP on the both upper arm were recruited and received picosecond laser only one side of the upper arm randomly for one session. At 4-week follow up, global assessment by two dermatologists, patient self-assessment score and adverse effects were evaluated. **Results:** The mean (± S.D.) improvement score from evaluator at the 4-week follow up was statistically significant in the treated side compared to the control side (1.40±0.81 and 0.53±0.57 respectively; p=0.001). The side effects included mild to moderate erythema, burning sensation, itching. Two patients had hyperpigmentation on picosecond laser side at 4 weeks of follow up. No hypopigmentation, infection or scarring was observed throughout the study. **Conclusion:** A 1064-nm picosecond laser has been shown to improve KP compared to control after a single treatment.

Keywords: keratosis pilaris, picosecond laser, laser induced optical breakdown

1. Introduction

Keratosis pilaris is a common hyperkeratotic disorder that usually presents as grouped keratotic follicular papules, sandpaper-like texture, hyperpigmentation with surrounding erythema involving the upper arms, anterior thighs, face, back, and buttocks(1). Because of no impact on general health, some patients with KP are unaware that they are affected, whereas many patients are

influenced on the quality of life especially the patients with lesions on the exposed area which can be cosmetically disturbing(2). Currently, various therapeutic options, such as emollients, topical corticosteroids and keratolytic agents are available with unsatisfied results(3). Therefore, it is challenging for dermatologists to find out the alternative therapeutic modalities for the treatment of KP. Nowadays, new treatment modalities for dermatologic conditions have turned toward laser therapy. Attempts to eliminate KP through various lasers have been investigated over the past decade with variable effectiveness.

Firstly, the picosecond laser was approved by U.S. FDA for the treatment of unwanted tattoos and pigmented lesions in 2012(4). Comparing to traditional nanosecond laser, ultra-short pulse durations of picosecond laser creates a pure photomechanical effect that causes fragmentation of tattoo ink or pigment(5). Furthermore, picosecond laser with specialized diffractive lens array was developed to alter the distribution of energy delivered to the skin with the gold of enabling the more effective treatment of pigmented lesion. This combination deliver high-powered pulses to targeted area while the surrounding area are exposed to lower fluence by LIOB mechanism, stimulating the dermal collagen synthesis and remodeling(6).

Recently, the new 1064-nm picosecond laser with pulse duration of 450 picoseconds was launched in the market. The more shorter pulse duration enable the more stronger photoacoustic impact to break up the targeted tissues using lower fluence. It is believed that not only a more efficient and effective clearance of targeted lesions, but also more comfortable and fewer treatment sessions(7). This is the first study to examine the efficacy and safety of a single treatment using 1064-nm picosecond laser for the treatment of keratosis pilaris.

2. Literature review

Keratosis Pilaris (KP) is a common benign disorder of keratinization characterized by multiple tiny follicular keratotic papules appearance to the skin resembling gooseflesh. Hyperpigmentation and erythema are also found. Sites of predilection of KP are grouped on the lateral and extensor aspects of the proximal extremities but sometimes also the upper thigh, face, buttocks, and trunk (1). In general population, its prevalence is estimated to be at least 50%; it is more common in adolescent females than males, seen in up to 80% of adolescent females(8). Even though this disorder is inherited in an autosomal dominant, no single gene mutation has yet been identified. The pathogenesis of KP is still unknown, but it is frequently seen in conjunction with atopic dermatitis and ichthyosis valgaris(9). Although KP is asymptomatic and has no impact on general health, many patients are affected with cosmetically disturbing and psychologically distressing, prompting them to seek treatment (10). Treatment options vary and focus on preventing excessive skin dryness. Topical treatments have included an emollient cream, a keratolytic agent such as lactic acid, salicylic acid,

and urea cream(11). Furthermore, topical treatments seem to lack of satisfactory efficacy. The result is highly variable and recurrence following treatment discontinuation is often problematic(2).

Over the past decade, various laser and light-based therapies have been investigated to eradicate keratosis pilaris including 532 nm potassium titanyl phosphate laser, 585-nm Pulsed Tunable Dye Laser, 595-nm Pulsed Dye Laser 1064 nm Q-switched Nd:YAG laser, Long-pulsed 1064-nm Nd:YAG laser, 595 nm pulse dye laser, long-pulse 755 nm alexandrite laser, microdermabrasion, 810-nm Diode Laser, Intense Pulsed Light, and Fractional Co_2 laser (12). Unlike existing laser treatments, picosecond laser emits ultra-short pulse duration causing a pure photoacoustic effect which targets the pigment with unaffected surrounding tissues. Developing the fractional handpieces, it has been shown to provide high peak power to concentrated area for generating laser induced optical breakdown (LIOB) by using lower fluence resulting in minimal adverse effects(13,14).

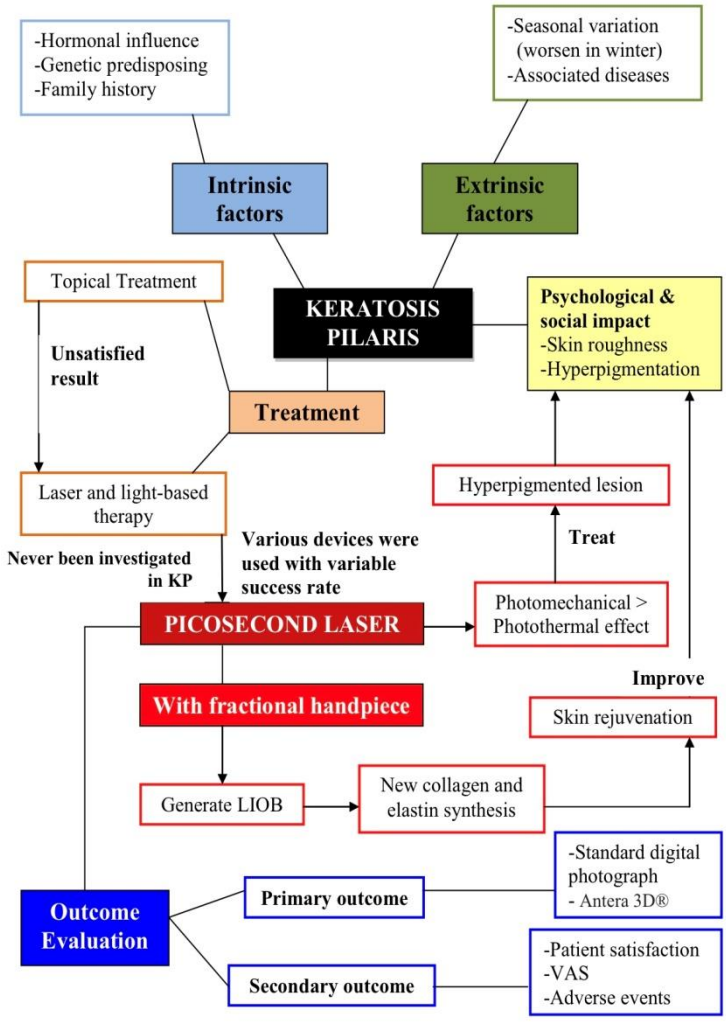


Figure 1: Conceptual Framework

To our knowledge, there has never been a study evaluating the efficacy and safety of 1064-nm picosecond laser for the treatment of keratosis pilaris. As picosecond laser works potentially in pigment fragmentation via photoacoustic mechanism and fractional handpieces have been recently developed for skin resurfacing and rejuvenation, we hypothesized that the 1064-nm picosecond laser would result in significant clinical improvement of keratosis pilaris and serve as a safe and innovative way to augment the current management and treatment options for keratosis pilaris.

3. Materials and Methods

3.1 Patient

This study is a randomized, prospective, evaluator-blinded, comparative study. The study protocol was approved by Human Ethics committee Thammasat University (Faculty of Medicine) including Human Ethics committee Samitivej Sukhumvit hospital. The study confirmed the guidelines of the declaration of Helsinki. All subjected provided written informed consent. Fifteen healthy male and female age 18 years or older with the presence of keratosis pilaris on the both upper arms will be enrolled. We excluded patients who were pregnant or lactating and those who had performed any laser treatments or dermabrasion for KP within past 6 months and received emollients, keratolytic agents, topical steroid within past 1 month were excluded from the study. Patients with active or systemic infection, history of keloid or hypertrophic scar and medication affecting keratinization (e.g., isotretinoin and acitretin) within past 3 years were also excluded.

3.2 Treatment regimen

Our study was conducted at dermatology clinic, Samitivej Sukhumvit hospital. After enrollment, informed consent will be obtained and demographic data will be recorded. The right side and left side of the upper arms will be randomly assigned by the table of randomization to receive picosecond laser treatment. One side will receive the laser treatment (Side A) and the other side will not receive the laser treatment (serve as a control)(Side B). Firstly, topical anesthetic cream (EMLA®; AstraZeneca, Wilmington, DE, USA) will be applied with occlusion for 45 minutes before the laser treatment to minimize pain. After that, all patients will be treated with a 1064-nm picosecond laser (Discovery PICO® ; Quanta system, USA) randomly on one side of the upper arm with spot size 9 mm round handpiece, repetitive rate 10 Hz, 2 passes with fluence of 0.8 J/cm^2 for hyperpigmentation combined with 1064-nm wavelength, spot size of 8 mm fractional handpiece, repetitive rate 5 Hz, 2 passes with fluence of 0.8 J/cm^2 for skin rejuvenation for a single session, while the other side will not receive the laser treatment. Cold air cooling will be applied for comfort during treatment. The clinical end point is mild to moderate erythema.

3.3 Outcome Evaluation

Efficacy

Standard digital photograph will be taken at baseline (week 0, before first treatment) and week 4 under identical settings by the same digital camera. Treatment result will be objectively evaluated by two blinded dermatologists. Global improvement score will be assessed by the grading system for improvement. The grading scale is as follows: grade 0, no change; grade 1, 1-25% improvement (minimal); grade 2, 26-50% improvement (moderate); grade 51-75% improvement (good); grade 4,

>75% improvement (excellent). Moreover, patient self-assessment scores was also assessed by grading scale at week 4 compare to the baseline.

Safety

All patients was asked to determine their level of pain immediately after laser using visual analog scale (VAS, 0-10). The possible adverse reaction (e.g., erythema, itching, burning sensation, petechiae, hyperpigmentaion, hypopigmentation, infection) will be recorded by the physician at every visit.

3.4 Statistical Analysis

In this study, Shapiro-Wilk test was used to check the normality assumption for the data. ANOVA test and Friedman test were used to compare the changes in median of score between each weeks of each groups. To compare the changes in median of score between treated and control side, Wilcoxon matched pairs teest was used. Statistically significant will be considered at p-value less than 0.05.

4. Results

Fifteen subjects completed the study and underwent analysis. Eight were women (53.33%) and seven were men (46.67%). The median age was 27 years old. The median age of onset was 10 years.

4.1 Global assessment

At week 4 after a single treatment, the mean global improvement score from two blinded dermatologist demonstrated significant improvement from baseline in both groups ($p < 0.05$). The mean improvement score was 1.40±0.81 in picosecond laser group and 0.53±0.57 in control group respectively. It was statistically significant improvement at week 4 between these two groups (p=0.001) (Figure 2). 46.67% of subjects achieved grade 2 or more improvement at week 4 follow up (Figure 3).

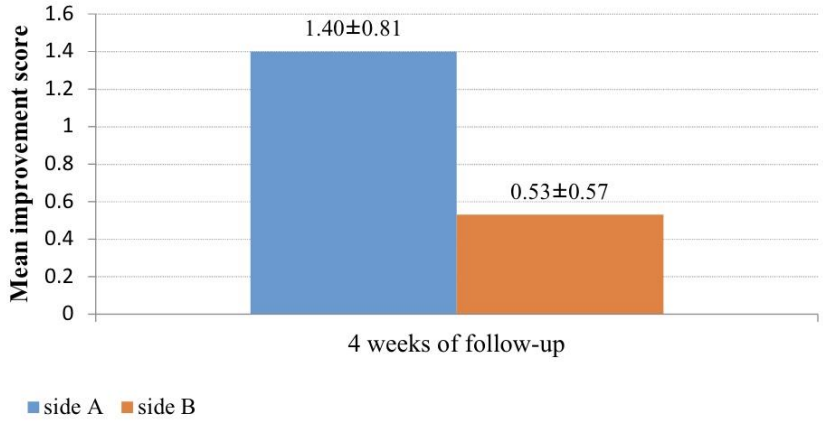
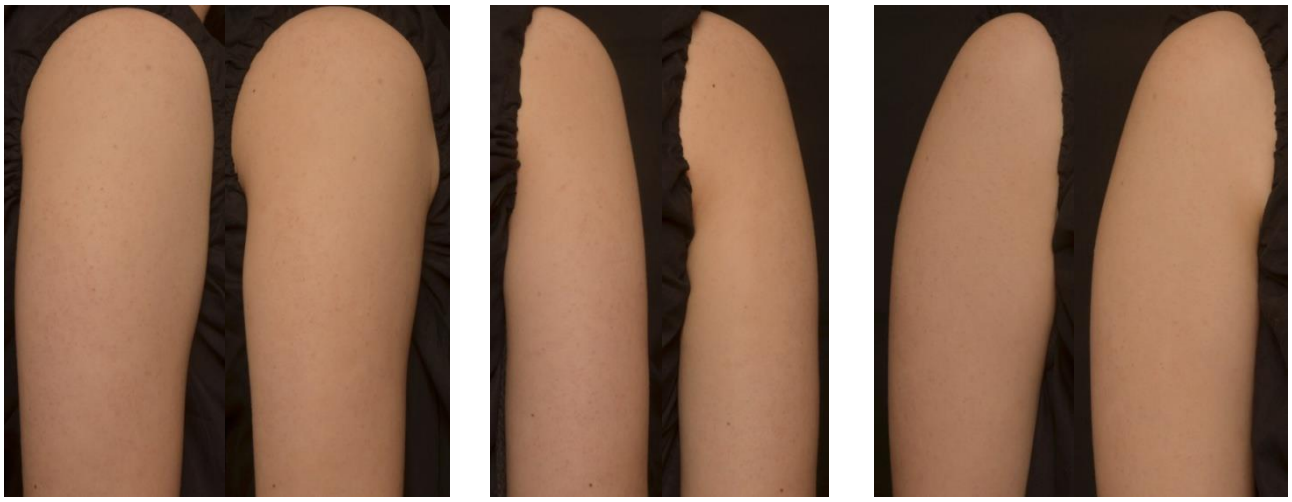


Figure 2: Mean Improvement score at week 4 from two blinded dermatologist

4.2 Patient self-assessment score

The mean patient self-assessment score at week 4 showed significant improvement from baseline in picoseconds laser group (p=0.000) but no significant improvement in control group (p=0.317). The mean patient self-assessment score was 1.60±0.83 in picosecond laser group and 0.07±0.26 in control group respectively. It was statistically significant improvement at week 4 between these two groups evaluating by the patients (p=0.001) (Figure 4).



(a) **(b)** **(c)** **(d)** **(e)** **(f)**

Figure 3: Digital photograph taken before treatment (a,c,d) and 4-week follow up after a single treatment (b,d,f). Treated side demonstrated grade 3 improvement at week 4

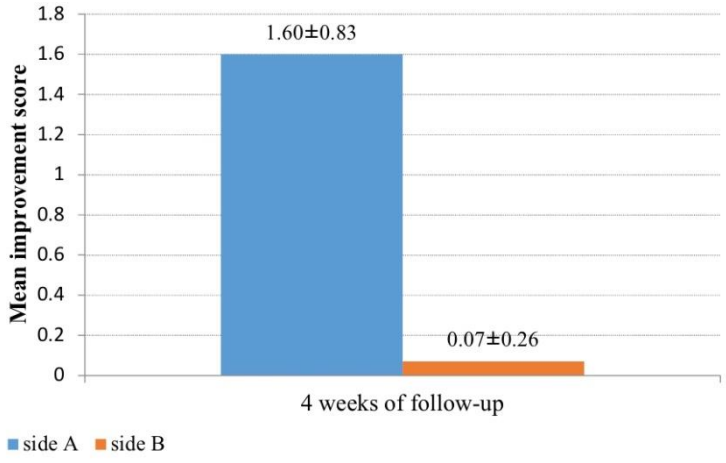


Figure 4: Mean Improvement score at week 4 from patients

4.3 Adverse effects

Pain was recorded on the laser-treated side in all patients. The mean pain score was 5.4±2.29. Erythema and burning sensation were observed immediately after treatment in all laser-treated side

and resolved by no treatments. Two patients had hyperpigmentation on picosecond laser side at 4 weeks of follow up. No hypopigmentation, infection or scarring was observed throughout the study.

5. Discussion

Keratosis pilaris is a very common skin disorder characterized by small folliculocentric keratotic papules causing a huge negative psychological and social impact especially on the patient with lesions on the exposed areas espeacially the extensor aspects of the upper arms. Many topical treatments are available with mostly unsatisfactory. Due to the effects of topical treatments are often limited resulting in gradual recurrence after treatment cessation, various laser and light-based therapy have been explored to eradicate the keratotic component, improve skin texture and also decrease hyperpigmentation. Different types of laser targeting different components of the lesion have been shown in the previous studies with variable success rates.

Because picosecond lasers generate the ultra-short pulse duration which produce significant photomechanical effect and less photothermal effect. This allows for more power to be delivered at a lower fluence, allowing for more effective treatments with fewer adverse effects. Interestingly, developing 1064-nm fractionated picosecond laser leads to greater skin rejuvenation results because of new collagen and elastin synthesis. In the past, many studies have been proved the effectiveness of picosecond laser in treating pigmentary skin lesions and also improving textural irregularity with fractional optic. Our study is the first of its kind to investigate the efficacy and safety of 1064-nm picosecond laser in the treatment of keratosis pilaris with aforementioned theoretical reasons. The study demonstrated that only single session of picosecond laser resulted in a significant improvement at 4-week follow up compare to the baseline and also showed a statistically significant difference in mean improvement score between treated side and control side. For the safety, mild to moderate erythema, itching and burning sensation resolved without any treatments. The patients can tolerate during the procedure due to media pain score of 5.4±2.29. on visual analog scale.

In conclusion, the 1064-nm picosecond laser can be used to improve cosmetic appearance because it can improve both pigmentation and skin texture and serve as a safe and innovative way to augment the current management and treatment options for keratosis pilaris

6. Recommendations

The limitation of this study are the short follow up time and the small sample size. Therefore we did not known how long the laser effect and when the recurrence would occur. Furthermore, the laser setting may be too high which result in hyperpigmentation in 2 subjects.

7. References

S. Hwang and R. A. Schwartz, Keratosis pilaris: a common follicular hyperkeratosis, Cutis,vol.82,no.3,pp.177–180,2008.

Tanawatt Kootiratrakarn, Kowit Kampirapap, and Chakkrapong Chunhasewee, Epidermal Permeability Barrier in the Treatment of Keratosis Pilaris, Dermatology Research and Practice, vol. 2015, Article ID 205012, 5 pages, 2015.

Vasanop Vachiramon, Pattarin Anusaksathien, Silada Kanokrungsee, and Kumutnart Chanprapaph, Fractional Carbon Dioxide Laser for Keratosis Pilaris: A Single-Blind, Randomized, Comparative Study, BioMed Research International, vol. 2016, Article ID 1928540, 6 pages, 2016.

Jakus J, Kailas A. Picosecond Lasers: A New and Emerging Therapy for Skin of Color, Minocycline-induced Pigmentation, and Tattoo Removal. The Journal of Clinical and Aesthetic Dermatology. 2017;10(3):14-15.

Ross V, Naseef G, Lin G, et al. Comparison of responses of tattoos to picosecond and nanosecond Q-switched neodymium:YAG lasers. Arch Dermatol. 1998;134(2):167-171.

Brauer JA, Kazlouskaya V, Alabdulrazzaq H, Bae YS, Bernstein LJ, Anolik R, et al. Use of a picosecond pulse duration laser with specialized optic for treatment of facial acne scarring. JAMA dermatology. 2015;151(3):278-84.

Weiss RA, McDaniel DH, Weiss MA, Mahoney AM, Beasley KL, Halvorson CR. Safety and efficacy of a novel diffractive lens array using a picosecond 755 nm alexandrite laser for treatment of wrinkles. Lasers in surgery and medicine. 2017;49(1):40-4.

Forman L. Keratosis pilaris. Br J Dermatol. 1954;66: 279-282.

Gruber R, Sugarman JL, Crumrine D, et al. Sebaceous Gland, Hair Shaft, and Epidermal Barrier Abnormalities in Keratosis Pilaris with and without Filaggrin Deficiency. The American Journal of Pathology. 2015;185(4):1012-1021.

Fischer, R., et al. A Pilot Study of Intense Pulsed Light Treatment for Keratosis Pilaris. (2015) Cell Immunol Serum Biol 1(1): 17- 19.

11. Garwood JD. Keratosis pilaris. Am Fam Physician. 1978;17:151-152.

Vasanop Vachiramon, Pattarin Anusaksathien, Silada Kanokrungsee, and Kumutnart Chanprapaph, Fractional Carbon Dioxide Laser for Keratosis Pilaris: A Single-Blind, Randomized, Comparative Study, BioMed Research International, vol. 2016, Article ID 1928540, 6 pages, 2016.

Balu M, Lentsch G, Korta DZ, et al. In vivo multiphoton-microscopy of picosecond-laser-induced optical breakdown in human skin. Lasers in Surgery and Medicine. 2017;49(6):555-562.

Zysset B, Fujimoto JG, Puliafito CA, Birngruber R, Deutsch TF. Picosecond optical breakdown: tissue effects and reduction of collateral damage. Lasers in surgery and medicine. 1989;9(3):193-204.

German Experience from the first Single Hyperthermia 25 years ago until a mature cancer therapy concept in field of Integrative Medicine

Michael W. Trogisch

BioMed Clinic Group Thailand-Korea-Germany

Germany, prof.trogisch@yahoo.com

Abstract

As we know from the Evolutionary Medicine, have gene mutated cell DNAs - like all cell DNAs as well - the only task to spread to all the world what they are doing successfully since tens of millions of years. Attempts such cell structures with "sword" (surgery), "poison" (chemotherapy) or "nuclear bomb" (radiation) to destroy, more reminiscent of medieval military campaigns and are not really successful. What then are but the methods, by which you both potentiate and reduce and disrupt and destroy the cancer? The treatment of cancer patients is carried out insofar holistic and complex, as the concept on 5 different, except tidy-important offensive or treatment levels concentrated; namely to: 1. Elimination Tumor Tissue, 2. Improve Immune Defenses, 3. Improvement of the general metabolism. 4. Optimizing Detoxification, 5. Reduction of Stress.
There is a significant weakness, namely that produced by the cancer tissue itself "acidic ambient milieu". In cancer tissues, as basically well known, the pH is significantly lower than in normal healthy tissue. We found substances which only in the acidic cell milieu cells interfere, so act selectively cytotoxic to cancer cells and leave healthy cells untouched. The downer was a while only in that tumor tissue is not always acidic enough and therefore not act in such a borderline pH-environment the components of this pH-Transformation or sometimes sufficient. This problem could be solved, because the methods of the second complex science group comes precisely from the direction of the quasi can ensure such acidic environment. Hyperthermia. It destroys the one hand, cancer cells directly with heat, produces on the other hand an important biological property in cancer tissue, namely a fairly vigorous acidic cell milieu (acidosis); in consequence, we produce with hyperthermia acidic tissue, of which the pH-therapy insofar benefits, as is now - discontinued by the biological basis for their 100% effectiveness. A kind of synergy effect we found through our blood - laser irradiation, in which the light - sensitive property of matter is used. Anti-carcinogenic agents can be substantially enhanced in their tumor effect when these in the target area with monochromatic coherent light waves (laser) wavelength corresponding activated - Photodynamic Therapy.

Keywords: Hyperthermia, pH-Transformation Therapy, Photo Dynamic Therapy

1. Background

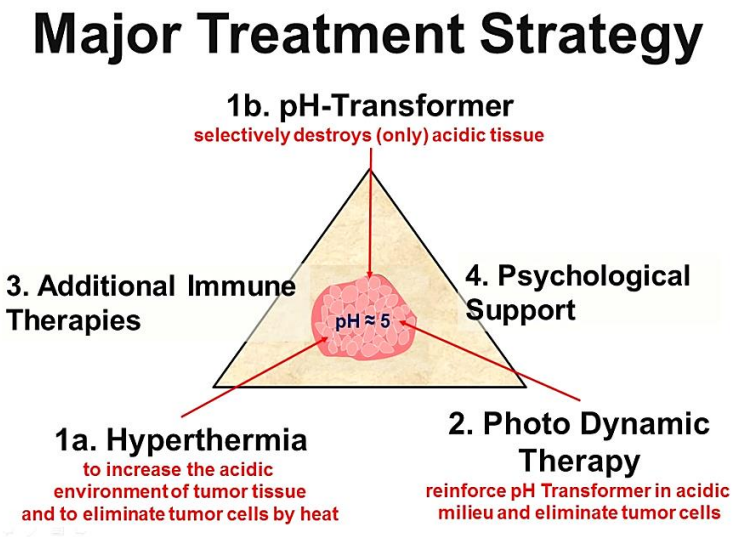
There was on the one hand, the research team of the University of Freiburg/Breisgau Germany, which began to search on the basis of the then young Tumor Biology by such methods about 20 years ago, which exploit the “vulnerabilities " of cancerous tissue therapeutically. Thus, the " pH Transformations therapy ", which basically follows a very simple principle emerged: The research found a significant weakness, namely that produced by the cancer tissue itself "acidic ambient milieu". In cancer tissues, as basically well known, but little had been observed, the pH

is significantly lower than in normal healthy tissue, which has various causes. We then have searched for such substances and these also found that only in the acidic cell milieu cells interfere, so act selectively cytotoxic to cancer cells, ie, and leave healthy cells untouched. Over the last few years then a combination of underdeveloped various active substances and far refined that it is on the one hand be used without complications, but on the other hand tumors inevitably destroyed. This is wonderful and almost unbelievable, but already scientific fact. The downer was a while only in that tumor tissue is not always acidic enough and therefore not act in such a borderline pH environment the components of this pH Transformations therapy or sometimes sufficient. This problem could be solved, because the methods of the second complex science group comes precisely from the direction of the quasi can ensure such acidic environment; Hyperthermia and cancer multistep therapy by Prof. Dr. von Ardenne, Germany.
In Germany which was around 40 years ago, Prof. Dr. mult. rer. nat. Manfred von Ardenne and later by Prof. Dr. Grönemeyer, Prof. Dr. Hager, Prof. Dr. Sahinbas and others well as a few other Medical Resident - rule domains the Cancer Thermotherapy - Hyperthermia. We, BioMed Clinic Group of Prof. Dr. Michael W. Trogisch, are also include more than 20 years to it and heat in different ways, the treatment site partially or even the entire body and thereby destroy the one hand, cancer cells directly with heat, produce the other hand, an important biological property in cancer tissue, namely a fairly vigorous acidic cell milieu (acidosis).

2. Literature

The Core of the Cancer Reversal Concept consists of selective damage of the cancerous tissue with simultaneous stabilization of the healthy tissue. The temperature sensitivities of normal and cancer cells differ under normal conditions marginally; however, their metabolic properties differ greatly. Despite a sufficient supply of oxygen, cancer cells utilize glucose much more than healthy cells. Cancer cells to produce, in the presence of oxygen and glucose (dextrose), to a greater extent, lactic acid. An additional artificially raising the blood glucose level leads to an induced hyperglycemia. This leads to a further increase in the production of lactate and thus a further reduction of the pH value in cancerous tissue and; possible exclusively amplify the temperature and especially Diflunisal sensitivity of the cancer cells. Under these ground conditions, using a hybrid hyperthermia (systemic $\geq$ 39°C and tumoral $\leq$50°C), which has a further reduction in pH to a level of 6. This achieves a selective intensive damage to the cancerous tissue and activates, simultaneously, several cytotoxic components: Heat, Cellular Acidosis of cancer tissue, Membrane pore formation and apoptosis induction by Diflunisal as well as the healthy cells stabilizing parameter. By interaction of the therapy module hyperthermia induced hyperglycemia, relative hyperoxemia (increasing the oxygen partial pressure) and ph-T-infusion there is a real possibility of a high degree of irreversible damage to the tumor cell. A further synergistic effect is produced by laser light, wherein the photosensitive characteristic of different substances is used. Antineoplastic drugs can be improved significantly in their effect, if enabled in the target area with monochromatic coherent light waves with corresponding wavelength. This applies likewise for the active ingredients of the pH-Transformation Therapy, as their largest light absorption is in the infrared range and which is a relatively simple procedure to perform as part of the overall therapy.

3. Methods
(Core Therapies)



pH-Transformation Therapy (pHTT)
As these spectacular events concern all types of tumors, these results mean together with the general cancer cell kill in acidic milieu with Diflunisal-ASA or Diflunisal-PAS combinations a complete solution of the cancer therapy problem. These findings together with the results of effective cell kill in acidic milieu mean a spectacular progress in cancer therapy, meaning a solution for an effective treatment of all kinds of tumors and metastases. The therapy procedures should accomplish complete remission of the tumors. It should be pointed out that the administration of ASA alone is not successful in combating cancer cells. As already outlined ASA solo stimulates proliferation of cancer cells in acidic as well as in basic milieu. The produced acidic cancer cells cannot be attacked by the immune system afterwards, i.e. in consequence tumors would start to grow in acidic milieu. Therefore, if ASA is applied as stimulant at the following 3 days ASA-Diflunisal combinations or Diflunisal-PAS or ASA-PAS combinations have to be administered for eliminating acidic tumor fractions.

Local Hyperthermia
We use a crucial weak point of the tumor, i.e. its decreased ability to adjust higher temperatures in its inside. All blood vessels rapidly extend and the tumor surrounding healthy tissue try to derive the warmth by strengthened blood flow when heating up. Due to some „material problems“ the vessel system of the tumor however does not have this thermal regularization ability and the temperature increases there continuously as a - heat trap. Increased flow speed as well as larger circulation volume around the tumor lead -according to the physical pressure law in liquids (it develops a negative pressure)- to a remarkable less blood circulation in the tumor. Bad blood circulation means for each cell tissue and especially for the tumor:

1. Lack of oxygen (hypoxia).
2. Development of a sour and harmful cell environment.
3. Lack of nutrients and autotoxication (self poisoning).

This results in considerable disturbance of the tumours cell metabolism which leads to tumour cell mortality. From research we know that temperatures exceeding 40º C have a cell-killing or at least a growth-retarding effect on malignant tissues. The temperature generated in these tumour tissue lies between 41ºC and 43ºC. An important impact is the decreased ability of the tumour to adjust the temperature. Overheating leads to an increased blood circulation of the healthy tissue which surrounds the tumour and to less blood circulation inside the tumour. Heat energy in the organic tissue leads to an increase of biochemical reactions. That means that the effect of the chemo and radiotherapy is substantially better in the warmed up tumor tissue, which allows this therapy a reduction of the dose more than 50%. This is very important because all side effects and physical sufferings of the patient are remarkably reduced. The local (deep) hyperthermia is applied successfully with the following kinds of tumors:

- Gynecological tumors (e.g. breast cancer womb cancer, ovary cancer
- Tumors in organs
- Deeply situated kinds of cancer (brain-, liver-, lung-, kidney-, pancreas etc.)
- Lymph-node metastases
- Gastrointestinal Tumors (larynx, esophagus, intestine)
- Sarcomas, Melanomas, Basaliomas etc.,

Hyperthermia has been called the fourth weapon against cancer by many European and American physicians associations and represents a large hope for millions of cancer patients.

Systemic (Whole Body) Hyperthermia

In this procedure the whole body is lightly heated to 38,5 C – 39 C via water-cooled infrared-A radiation. In a state of total relaxation, the patient lies on a translucent net and the entire treatment is comparable to a pleasant sauna bath. Through this artificial fever we can achieve the destruction of cancer cells - similar to local hyperthermia - , improve the immune system, promote blood circulation and durably optimize the metabolism.

Moderate total-body hyperthermia alone causes a significant destruction of malignancies. Most impressive results have been documented in the treatment of sarcomas, melanomas and tumours of the gastrointestinal tract. Recent studies have shown a clear benefit if local or regional hyperthermia is combined with radiation and chemotherapy, compared to the administration of radiation and chemotherapy alone. An intratumoural- or core body temperature of 40.0 C is usually reached in all patients. A very promising new application seems to be the combination of total-body (or regional) hyperthermia and chemotherapy with cytokines (TNF-alpha). Systemic hyperthermia considerably supports the healing process of the following conditions: Cancer, Rheumatic Diseases, MS, ALS, Asthma and respiratory diseases, Blood circulation anomalies. Diabetes and other Lifestyle diseases, Skin diseases and allergies.

Intravenous laser blood irradiation – Photodynamic Laser Therapy

In 2012 Dr. Michael Weber from Germany published a first article in the Journal "Pain and Acupuncture" with the title "New Options of Interstitial and Intravenous Laser Therapy in Oncology". The presented method and case reports in this publication showed a highly synergistic effect of intravenous laser therapy and interstitial laser therapy in combination with the new German photosensitizer Chlorine E6. For PDT Chlorine E6 was applied intravenously first followed by intravenous and interstitial laser therapy with red laser 658 nm according to the absorption maximum of the photosensitizer. Fiber-optic needles were used for direct tumor puncturing and interstitial tumor irradiation. On one hand the intravenous laser can kill

circulating cancer cells and cancer stem cells and cure concomitant infections and on the other hand the interstitial laser technique enables the therapist to target the tumor directly even in deeper areas of the body where external irradiation is not effective. The key solution is to bring enough photon energy directly in or close to the tumor area for killing cancer cells by oxygen radicals. After treatment of several hundred patients in the last 2 years with different tumors this method has been shown to have an overall efficacy of about 70 % and is safe without any severe side effects. Treatments mainly were performed in cancers for lung, head and neck, pancreas, breast and ovarian cancer, also in esophageal and colon cancer using endoscopic technology. Since 2014 two new photosensitizers are available for intravenous and interstitial laser therapy, first pure Hypericin with stimulation by a new developed yellow laser 589 nm and pure Curcumin with stimulation by 405 nm blue laser. Now cancer patients are normally treated with all 3 photosensitizers: Chlorine E6 with red laser activation, Hypericin with yellow laser and Curcumin with blue laser activation red, yellow and blue laser for optimization of the PDT. This treatment can be combined with low dose chemotherapy like 5-FU or Cisplatin whereupon those drugs are also stimulated by laser therapy according to their absorption maximum and so can be used as photosensitizers as well. So today dose chemo drugs can be used in low concentration with laser therapy as well for achieving better results. Since PDT leads to a specific immunization after necrosis or apoptosis a follow up therapy with the macrophage activeting factor GcMAF is recommended. This follow-up immunotherapy will target especially existing or hidden metastases which are not accessible by interstitial PDT.

HIFU Ablation

The High-intensity Focused Ultrasound (HIFU) is a novel, extracorporeal non-invasive image-guided device for the treatment of benign / malignant solid and soft tumours. Safety and feasibility have been studied extensively. The ablation effect can be understood through the harmless passing of ultrasound waves through human tissue, yet, when focused at high intensities, sufficient energy may be deposited to produce a well-demarcated volume of coagulation necrosis, independent of soft tissue type. There is growing evidence of what seems to be an immunological effect as well. The results observed following the treatment of tumours by HIFU are:

- A subsequent reduction in the secretion of immunosuppressive factors (cytokines) originating from tumour cells.
- Activation of Dendritic Cells (DCs) at the periphery of the ablation site from immature to mature cells and evidence of their attacking the remaining tumour cells.
- Tumour debris resulting from HIFU ablation may be a potential tumour–antigen source for the induction of host anti-tumour immune response.
- Significant increase of heat shock proteins (HSPs) in the tumour debris including SP60, HSP27, HSP72, HSP73 and HSP70 allowing the tumour infiltrating antigen presenting cells (APCs) to present chaperoned peptides and antigens directly to T-lymphocytes.
- Change in the gene expression of tumours.

Ozone-Therapy

The ozone therapy is known more than 80 years and is meanwhile used world-wide by therapists with great success. With the ozone therapy own blood is mixed outside of the body with ozone and oxygen and later re-infused into the body. Ozone produces a number of powerful effects in the blood. It is scientifically proved that ozone provides additional oxygen for the cell respiration

which substantially activates the entire metabolism. The improved utilization of oxygen helps among other things to disappear hypoxic pain and conduction disturbances. Ozone essentially helps the liver with the decontamination and diminishes exactly such fats (Cholesterol and triglycerides), which represent an important damage factor for the blood vessels (cardiac infarction, stroke syndrome). Ozone reduces remarkably the urine acid - gout producer number 1- and damage factor for the vessels. It improves the blood flow, reduces blood circulation disturbances and prevents new disturbances. Important is also the germ-killing effect of ozone. Many kinds of bacteria, viruses and mycosis can be influenced strongly with the help of the ozone therapy. Particularly to be mentioned is its catalytic effect in the blood. Some substances (e.g. peroxides) are produced, which impede the growth of a tumor. The Ozone-Therapy is used e.g. for:

- Functional blood circulation disturbances (Migraine, Reynaud Syndrome)
- Tumors
- Fat metabolic disturbances
- diabetes mellitus

Conclusion

We combine these core therapies with other methods to ensure that the cancerous tissue is completely destroyed. Overall, we are talking about rights of a high synergy development among the individual therapies.

But this purely biological - physical processes ranging still not enough to truly succeed, especially to defeat cancer permanently, because cancer itself is not the disease, not the cause of the problem, but the result of a long chain of physiological and psychological developments; we like to use the phrase "gaffes". That is, to eliminate cancer cells not mean long to eliminate their causes; this is a known fact, everyone and for evolutionary biology and integrative thinking physicians.

Our Cancer Therapy Concept will naturally affect those possible causes, in particular the four essential components of our increasingly "non- welfare way of life", elegant told one of our evolution biological conditions opposing lifestyles: 1. faulty diet, 2. lack of exercise, 3. stress, 4. environmental pollution. A cancer therapy without direct A river on these factors is not good, especially just no effective therapy. We therefore need, for example, facilities where we can integrate the "relearning" to a healthy lifestyle; we need above all clinics where the cancer patient is no longer a number but is lovingly cared for all around .We mean by such future clinics not the biological and unsocial and sterile high-tech hospital, but a spa facility in the beautiful ambience, which do not necessarily have to be expensive, a kind resort in natural and healthy environment with manageable numbers of patients. All together gives us a guarantee that we treat the patient individually and lovingly, ultimately successful and also cure or at least can maintain its quality of life for a long time yet. In other words, we have the concept Therapy Concept in hand, responsive at all cancers and promises an average survival rate of more than 75%. The death sentence for cancer patients can be explained in principle be revoked - that is the long hope for quantum leap in cancer therapy.

Referneces

Weiss. T.F. (1996). *Cellular biophysics, Vol. 1. Transport*. Cambridge: MIT Press.

Dewhirst, M.W., Ozimek E.J., Gross, J., et al. (1980). Will hyperthermia conquer the elusive hypoxic cell?. *Radiology*, 137, 811-817.

Vaupel P.W., Kelleher, D.K. (1996). Metabolic status and reaction to heat of normal and tumor issues. In M.H. Seegenschmidt & P. Fessenden (Ed). *Biology, physiology and physics* (pp. 157-176). Berlin, Heidelberg: Springer Verlag.

Hasegawa, T. & Gu, Y.H. (2001). Effects of hyperthermia-induced changes in pH value on Tumor response and thermotolerance. Tokyo: Springer Verlag. (pp.433-438).

Heilbrunn, L.V. (1924). The colloid chemistry of protoplasm, *Am J Physiol*. 69, 190-199.

Yatvin, M.B. & Dennis, W.H. (1987). Membrane lipid composition and sensitivity to killing by hyperthermia, procaine and radiation. In *Cancer Therapy by Hyperthermia and Radiation* (pp.157-159). Baltimore, Munich: Urban & Schwarzenberg.

Streffer, C. (1990). Biological basis of thermotherapy with special reference to oncology, In *Biological basis of oncologic thermotherapy* (pp. 1-72). Berlin: Springer Verlag.

Bowler, K., Duncan, C.J., & Gladwell, R.T. (1973). Cellular heat injury, *Comp. Biochem Physiol*, 45A, 441-450

Belehreadek, J. (1957). Physiological aspects of heat and cold. *Am Rev Physiol*., 19, 59-82.

Urano, M., Douple, E. (1989). *Hyperthermia and oncology, Vol. 2. Biology of thermal potentiation of radiotherapy*, VSP Utrecht, The Netherlands.

Yatvin, M.B., Kreutz, W., Horwitz, B.A., & Shinitzky, M. (1980) PH-sensitive liposomes: possible clinical implications, *Science*, 210, 1253-1255.

Severin, Th., Müller, B., Giese, G., Uhl, B., Wolf, B ., Hanschild, S., & Kreutz, W. (1994). pH-dependent LAK Cell Cytotoxicity. *Tumor Biol.*, 15, 304-310.

Heun, J., Müller, B., Fischer, B., Etzkorn, M., & Kreutz, W. (1999). A biophysical approach to cancer treatment: Selective pH-dependent membrane poration and inhibition of energy supply by salicylates in human tumor cells. Suppl. Clinic Cancer Res. 205, AACR-NCI-EORTC International Conference.

Burger, A.M., Heun, J., Steidle, C., Fiebig, H.H., Frick, E., Schölmerich, J., & Kreutz, W. (1999). Activity of pH-sensitive salicylic acid derivatives against human tumors in vivo. Suppl. Clinic Cancer Res. 206, AACR-NCI-EORTC International Conference.

Müller, B., Fischer, B., Kreutz, W. (2000). An acidic microenvironment impairs the generation of non-major histocompatibility complex-restricted killer cells. *Immunology*, 99, 375-384.

Fischer, B., Müller, B., Fisch, P., & Kreutz, W. (2000). An acidic microenvironment inhibits antitumoral non-major histocompatibility complex-restricted cytotoxicity: Implication for Cancer Immunotherapy. *Journal of Immunotherapy*, 23(2), 196-207.

Fischer, B., Müller, B., Fischer, K.G., Bauer, N., & Kreutz, W. (2000). Acidic pH inhibits Non-MHC-restricted killer cell functions. *Clinical Immunology*, 96(3), 252-263.

Drevs, J., Spangenberger, H., Jenny, M., Mueller-Huebenthal, J., Kamijo, I., & Kreutz, W. (2012). Pilot study on anti-tumor efficacy of intravenously applied synergistic combinations of salicylic acids in patients with advanced solid tumors. ASCO 2012.

Drevs, J., D'Urso, S., Martinez, L., Mueller-Huebenthal, J., Kamijo, I., & Kreutz, W. (2013). Update on pilot study on anti-tumor efficacy of intravenously applied synergistic combinations of diflunisal, PAS and aspirin in patients with advanced solid tumors. ASCO 2013.

Enrichment of Eggs with Functional Ingredients and Strategies for Enhancing Safety of Fresh Eggs

Panitee Suwanamornlert*[a] and Mary Joy P. Paico[b]

[a] College of Integrative Medicine, Dhurakij Pundit University,
Thailand, panitee.su@gmail.com

[b] Industrial Technology Development Institute- Department of Science and Technology,
Philippines, maryjoy.paico@yahoo.com

Abstract

Eggs are an excellent source of protein. Consumers are advised to limit their consumption due to its high cholesterol and saturated fat content. Health concern increased the desire of the public to consume functional foods. Because eggs are frequently consumed food, enriching them with omega-3 fatty acids would be an excellent way to alleviate the existing concerns. Omega-3 polyunsaturated fatty acids (omega-3 PUFA) are divided into three groups: alpha-linolenic acid (ALA), eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). Fish oil, DHA gold and microalgae are major source of EPA and DHA, while flaxseed and flaxseed oil contain a particular ALA. A significant deposition of omega-3 PUFA in eggs was observed when the diet of laying hens was enhanced with the above-mentioned sources of fatty acids. Eggs are possible source of *Salmonella* foodborne illnesses. *Salmonella* can survive and grow on the eggshell and can further penetrate into its interior. Therefore, the application of coating materials such as chitosan or pectin-alginate incorporated with laurolyl alginate ethyl to prevent the cross-contamination of *Salmonella* to eggshells was evaluated. This review will focus on egg enrichment for health-promoting functions and the recent studies on enhancing the safety of fresh eggs.

Keywords: egg, functional food, human health, *Salmonella* sp., edible coating

1. Introduction

Eggs are easily accessible source of nutrient-rich food. They are not only full of high quality proteins, vitamins and minerals but they are also inexpensive sources of animal protein (Bertechini, 2017). The basic compositions of eggs are albumin and yolk, which are approximately 57 and 43 %, respectively of the total protein content. In terms of essential amino acid, eggs are abundant in glutamine, leucine and asparagine/aspartic acid (Fernandez et al., 2016). A small proportion of an egg protein can also be found in the eggshell and shell membrane (Mine, 2002). Apart from protein, the major constituents of egg yolk are lipids mostly in the form of lipoproteins. Additionally, egg yolk also contains a small amount of minerals and carbohydrates (Kovacs-Nolan et al., 2005). Functional foods are foods with health benefits that exceeded the nutritional value (Galland, 2013). Nowadays, enriched or designer eggs are the new technology for the production of functional eggs. They are continuously expanded for improving human health and are easily accessible to consumers throughout the world. Omega-3 fatty acids are common ingredients in enriched eggs. The health benefits associated with omega-3 fatty acids are generally accepted. Omega-3 fatty acids have a significant role in preventing and treating hypertension, arthritis and autoimmune disorders. Furthermore, they are also essential for fetal brain, visual development and cancer inhibition (Kovacs-Nolan et al., 2005). In order to provide a primary protection against cardiovascular diseases, a 250 mg per day intake of omega-3 long chain polyunsaturated fatty acids (LC-PUFA) was recommended. But a lower value than the required was reported in most countries worldwide. The enrichment of fresh eggs by mixing the different sources of omega-3 PUFA

such as flaxseed, fish oil, DHA gold and microalgae into the diet of layers mainly to increase the level of omega-3 PUFA in egg yolk has received an increasing attention (Lemahieu et al., 2015). Nutritional value, which can be improved by adding health-promoting compounds to foods, and food safety are important elements in consumer perceptions of food consumption. Foodborne diseases not only significantly affect consumer health but also have an impact on economic loss in food industry. *Salmonella* Enteritidis and *Salmonella* Typhimurium are gram-negative bacteria and are frequently reported as the main causes of foodborne outbreak (De Leo et al., 2018). *Salmonella* Enteritidis is more commonly related to laying hens and contaminated eggs. Hence, the consumption of contaminated eggs and egg products is the most frequent source of Salmonella infection (Salmonellosis) for human (Li et al., 2019). *Salmonella* contamination is not only through penetration into the eggshell, but also by direct contamination of the hen's or layer's intestinal and reproductive tract before egg laying (Gantois et al., 2009). The concept of edible coatings has gained considerable attention from researchers and the industry. These may act as a carrier of an antimicrobial agent aimed at preventing the egg contamination from bacteria especially *Salmonella*. Coating materials incorporated with or without antimicrobial agent are able to reduce the numbers of microbes found on the eggshell surface. Thus, can be used to improve the safety of fresh eggs (Upadhyaya et al., 2016).

2. Nutritional enrichment of Eggs for human health

An egg basically consist of three parts including an approximate value of 9.5% shell and shell membrane, 63% egg albumin and 27.5% egg yolk (Kovacs-Nolan et al., 2005). The main components of a whole egg are water (75%), protein (12%) and lipid (12%), as well as carbohydrates and minerals (1%) (Abeyrahne et al., 2013). Eggs are an excellent source of high-quality protein. Because of their significant level of bioactive components, eggs are considered in biomedical and nutraceutical applications (Lesnierowski and Stangierski, 2018). The percent distribution of various composition in egg albumin and egg yolk is summarized in Table 1.

Table 1: Percent distribution of different compositions in egg (not including eggshell)

Composition (% of total)	Albumin	Yolk
Water	64.7	35.3
Protein	57	43
Fat	0.6	99.4
Cholesterol	0	100
Vitamin A	0	100
Vitamin E	0	100
Vitamin D	0	100
Riboflavin	66.6	33.3
Folate	4	96
Choline	0.4	99.6
Selenium	40	60
Iron	0	100
Lutein	0	100
Zeaxanthin	0	100

Source: Adapted from Fernandez et al. (2016)

In the food industry, eggs are consumed in high demand both domestically and internationally. These could either be served or cooked alone or as an ingredient to other food products (Lesnierowski and Stangierski, 2018). However, it is recommended to limit the consumption due to its high cholesterol and saturated fat content. Omega-3 fatty acids are one of the most common components of functional foods. Generally, the omega-3 fatty acids in a person's diet comes from fish and fish oil. However, most people do not get enough omega-3 fatty acids from their foods (Khan et al., 2017). Therefore, enrichment of eggs with omega-3 fatty acid is

one of the initiatives done to solve the problem on nutrient deficiency in human diet. The publications related to enriched eggs, so-called "designer eggs", are presented in Table 2. The literature reviews showed that the composition of an egg can be readily modified by adding supplements to the diet of laying hens or layers.

Table 2: Egg enrichment with sources of functional ingredients for improving human health

Dietary supplementation	Sources	References
omega-3 fatty acids	*Phaeodactylum tricornutum* *Nannochloropsis oculata* *Isochrysis galbana* *Chlorella fusca*	Lemahieu et al. (2013)
	flaxseed *Isochrysis galbana* fish oil DHA Gold	Lemahieu et al. (2015)
	Spirulina maxima enriched with Cu (II) and Fe (II)	Saeid et al. (2016)
	flaxseed oil full-fatted *Staurosira* sp. defatted *Desmodesmus* sp. defatted *Nannochloropsis oceanica* fish oil	Kim et al. (2016)
	flaxseed fish oil	Khan et al. (2017)
Vitamin D	Vitamin D_3 25-hydroxyvitamin D_3	Browning et al. (2014)

The development of omega-3 enriched eggs was reported in several previous studies. As shown in Table 3, the types of omega-3 polyunsaturated fatty acids (omega-3 PUFA) can be classified depending on the length of hydrocarbon chain in the fatty acid molecule (Lemahieu et al., 2013). The biological role of alpha-linolenic acid (ALA) is to serve as a substrate for synthesis of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) which are related to the health benefits rather than ALA (Fraeye et al., 2012). The relationship of omega-3 long LC-PUFA (EPA and DHA) and the reduction or prevention of cardiovascular diseases has been reported. EPA and DHA, not only play an important role in the prevention and treatment of several chronic diseases, e.g. neurological disorders, cancer, obesity, inflammatory diseases, and diabetes mellitus, but also reduce the risk of preterm birth and low birth weight in pregnant woman. In addition, DHA is important for fetal growth and the development of visual and cognitive functions of fetus and children (Gogus and Smith, 2010).

Table 3: Classification of omega-3 fatty acids

Type of n-3 polyunsaturated fatty acids	Fatty acids
short chain and medium chain PUFA ($\leq C_{18}$)	alpha-linolenic acid (ALA, C18:3 n-3) stearidonic acid (SDA, C18:4 n-3)
long chain PUFA ($\geq C_{20}$)	eicosapentaenoic acid (EPA, C20:5 n-3) docosapentaenoic acid (DPA, C22:5 n-3) docosahexaenoic acid (DHA, C22:6 n-3)

Source: Lemahieu et al. (2013)

Flaxseed, a source of ALA, enhanced the ALA in the egg yolk. Due to the inefficient conversion of ALA to EPA and DHA, a slight increase of these omega-3 LC-PUFA was observed. Fish oil can also be added to the hens' feeds to provide an enriched egg, which contain EPA and particularly DHA in the egg yolk. However, an off-flavor in eggs was observed when the inclusion level of fish oil in the diet of laying hen is above 1.5%. The fishy off-flavor occurring in eggs leads to an unacceptable level and unfit for human consumption

(Lemahieu et al., 2015). Microalgae was added to the feeds to increase the level of omega-3 fatty acid in the egg yolk. Lemahieu et al. (2013) investigated the enrichment efficiency of the four different autotrophic microalgae (*Phaeodactylum tricornutum*, *Isochrysis galbana*, *Nannochloropsis oculate* and *Chlorella fusca*). They reported that the highest enrichment of omega-3 LC-PUFA, especially DHA, was achieved by addition of *Phaeodactylum tricornutum* and *Isochrysis galbana*, while ALA enrichment was obtained from *Chlorella fusca* supplementation. Lemahieu et al. (2015) determined the effects of different omega-3 PUFA sources (flaxseed, *Isochrysis galbana*, fish oil and DHA gold) on the enrichment of omega-3 LC-PUFA in the egg yolk. As expected, the lowest omega-3 LC-PUFA enrichment efficiency was observed in flaxseed. The highest enrichment efficiency (55%) was obtained from fish oil followed by DHA gold and *Isochrysis galbana* with an efficiency of 45 and 30%, respectively. This can be explained that the bio-accessibility of omega-3 LC-PUFA from different sources has an impact on the enrichment efficiency obtained in the egg yolk. Additionally, eggs supplemented with DHA Gold of up to 4.8% had increased the DHA level in egg yolk and still found acceptable in taste sensory (Lemahieu et al., 2015). Overall, these findings are in accordance with the results reported by Khan et al. (2017). The combination effect of flaxseed oil and microalgae, full-fatted *Staurosira* sp., added in the diet of hens on the omega-3 fatty acids components in enriched eggs was studied (Kim et al.,2016). They reported that consumption of these enriched eggs was sufficient to meet the 31-51% of recommended daily intake for omega-3 fatty acids in human.

3. Strategies for enhancing safety of Fresh Eggs

Egg contamination by *Salmonella* has been identified as one of the most important causes of foodborne gastroenteritis in humans worldwide . Since the mid-1980s, *Salmonella* Enteritidis was the major stereotype food-borne outbreaks of salmonellosis. *Salmonella* Enteritidis and *Salmonella* Typhimurium were as the cause of infection cases at 62.5 and 12.9%, respectively. Generally, *Salmonella* contamination in egg has two possible ways (Figure 1). During or after egg laying, eggs can be contaminated through penetration into the eggshell from the colon gut or from feces. Another way is the direct contamination of the yolk, albumin, eggshell membranes or eggshells before egg laying initiating from the infection of reproductive organs with *Salmonella* Enteritidis (Gantois et al., 2009).

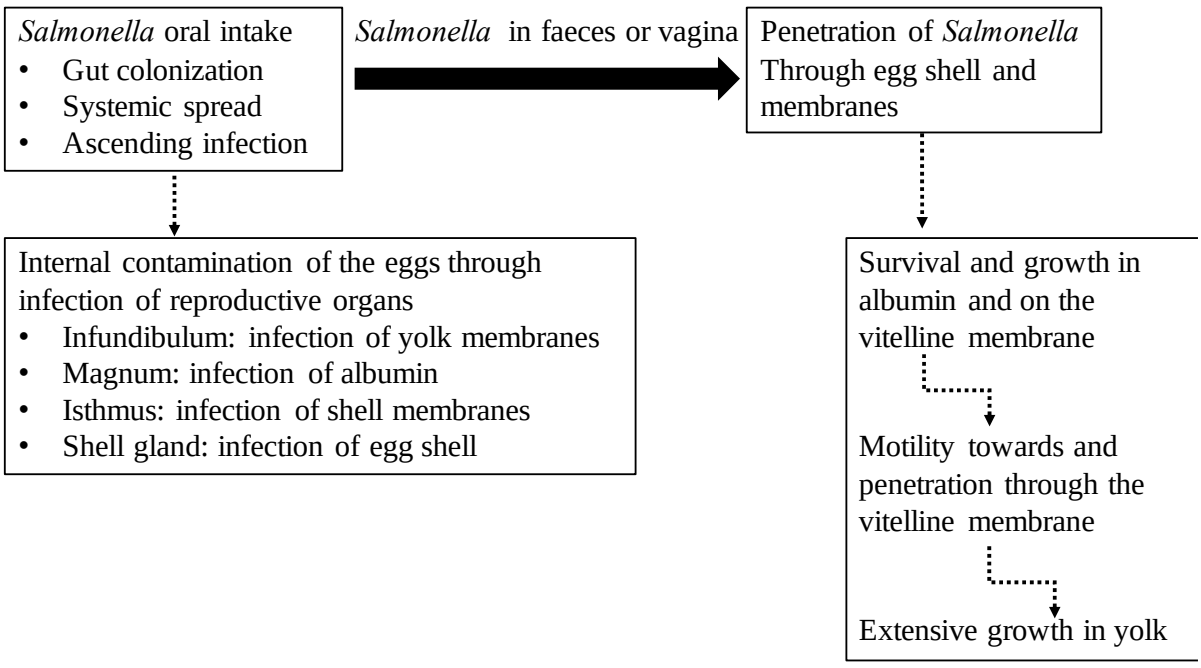


Figure 1: Egg contamination by *Salmonella* sp.
Source: Gantois et al. (2009)

Salmonella can survive and grow on the eggshells at low temperature and relative humidity. Washing and disinfecting eggs cannot eliminate the bacteria (Gantois et al., 2009). Strategies on edible coating with or without an antimicrobial agent, to protect the eggshells against *Salmonella* contamination have been demonstrated. Coating material proved to preserve the internal quality and prolong the shelf life of fresh eggs. Leleu et al. (2011) reported that chitosan coating was effective in reducing the *Salmonella* Enteritidis contamination through trans-shell penetration. Moreover, the application of pectin-alginate edible coating incorporated with antimicrobial agent, laurolyl alginate ethyl, to eliminate the same bacteria was evaluated by De Leo et al. (2018). The results showed that eggshells treated with antimicrobial edible coating had a significant lower microbial growth compared to the uncoated group. In addition, pectin-alginate-laurolyl alginate ethyl coating did not show a significant effect on the physico-chemical properties of treated eggs.

4. Conclusion

Among the functional ingredients in the fortified feed of laying hens, a growing interest to enrich egg yolk with omega-3 PUFA was realized. The enrichment of eggs by stimulating the functional ingredients, e.g. fish oil, DHA Gold, microalgae, flaxseed or flaxseed oil, in layers' feeds or diet is a potential way to increase the omega-3 PUFA content in eggs and also, human diet. Consumption of eggs contaminated with *Salmonella* is the major cause of foodborne illnesses. Strategies, such as application of antimicrobial coatings are an effective and an alternative way to protect the eggs and egg products from bacteria and other contaminants.

5. References

Abeyrahne, E. D. N. S., Lee, H. Y., & Ahn, D. U. (2013). Egg White Proteins and Their Potential Use in Food Processing or as Nutraceutical and Pharmaceutical Agents – A Review. *Poultry Science, 92,* 3292-3299.

Bertechini, A. G. (2017). Economic and Cultural Aspects of the Table Egg as an Edible Commodity. In P. Y. Hester (Ed.), *Eggs Innovations and Strategies for Improvements* (pp. 223-232). USA: Elsevier Inc.

Browning, L. C., & Cowieson, A. J. (2013). Vitamin D Fortification of Eggs for Human Health. *Journal of The Science of Food and Agriculture, 94,* 1389-1396.

De Leo, R., Quartieri, A., Haghighi, H., Gigliano, S., Bedin, E., & Pulvirenti, A. (2018). Application of Pectin-Alginate and Pectin -Alginate-Laurolyl Arginate Ethyl Coating to Eliminate *Salmonella enteritidis* Cross Contamination in Egg Shells. *Journal of Food Safety, 38,* 1-9.

Fernandez, M. L., & Andersen, C. J. (2016). Eggs: Composition and Health Effects. In B. Caballero, P. M. Finglas, & F. Toldrá (Ed.), *Encyclopedia of Food and Health* (pp. 470-475). USA: Elsevier Ltd.

Fraeye, I., Bruneel, C., Lemahieu, C., Buyse, J., Muylaert, K., & Foubert, I. (2012). Dietary Enrichment of Eggs with Omega-3 Fatty Acids: A Review. *Food Research International, 48,* 961-969.

Galland, L. (2013). Functional Foods: Health Effects and Clinical Applications. In B. Caballero (Ed.), *Encyclopedia of Human Nutrition, 2,* (pp. 366-371). USA: Elsevier Ltd.

Gantois, I., Ducatelle, R., Pasmans, F., Haesebrouck, F., Gast, R., Humphrey, T. J., & Immerseel, F. V. (2009). Mechanisms of Egg Contamination by *Salmonella* Enteritidis. *Federation of European Microbiological Societies, 33,* 718-738.

Gogus, U., & Smith, C. (2010). N-3 Omega fatty acids: A Review of Current Knowledge. *International Journal of Food Science and Technology, 45* (3), 417-436.

Khan, S. A., Khan, A., Khan, S. A., Beg, M. A., Ali, A., & Damanhouri, G. (2017). Comparative Study of Fatty-acid Composition of Table Eggs from The Jeddah Food

Market and Effect of Value Addition in Omega-3 Bio-fortified Eggs. *Saudi Journal of Biological Science, 24,* 929-935.

Kovacs-Nolan, J., Phillips, M., & Mine, Y. (2005). Advances in The Value of Eggs and Egg Components for Human Health. *Journal of Agricultural and Food Chemistry, 53,* 8421-8431.

Leleu, S., Herman, L., Heyndrickx, M., De Reu, K., Michiels, C. W., De Baerdemaeker, J., & Messens, W. (2011). Effects on *Salmonella* Shell Contamination and Tran-shell Penetration of Coating Hens eggs with chitosan. *International Journal of Food Microbiology, 145,* 43-48.

Lemahieu, C., Bruneel, C., Ryckebosch, E., Muylaert, K., Buyse, J., & Foubert, I. (2015). Impact of Different Omega-3 Polyunsaturated Fatty Acid (n-3 PUFA) Sources (Flaxseed, *Isochrysis galbana*, fish oil and DHA Gold) on n-3 LC-PUFA Enrichment (Efficiency) in the Egg Yolk. *Journal of Functional Foods, 19,* 821-827.

Lemahieu, C., Bruneel, C., Termote-Verhalle, R., Muylaert, K., Buyse, J., & Foubert, I. (2013). Impact of Feed Supplementation with Different Omega-3 Rich Microalgae Species on Enrichment of Eggs of Laying Hens. *Food Chemistry, 141,* 4051-4059.

Lesnierowski, G., & Stangierski, J. (2018). What's New in Chicken Egg Research and Technology for Human Health Promotion? – A Review. *Trends in Food Science & Technology, 71,* 46-51.

Li, Z., Guo, R., Wang, F., Geng, S., Kang, X., Meng, C., Gu, D., Jiao, X., & Pan, Z. (2019). Inactivation of *Salmonella* Enteritidis on Eggshells by Lactic Acid Spray. *Food Control, 104,* 201-207.

Mine, Y. (2002). Recent Advances in Egg Protein Functionality in The Food System. *World's Poultry Science Journal, 58,* 31-39.

Miranda, J. M., Anton, X., Redondo-Valbuena, C., Roca-Saavedra, P., Rodriguez, J. A., Lamas, A., Franco, C. M., & Cepeda, A. (2015). Egg and Egg-Derived Foods: Effects on Human Health and Use as Functional Foods. *Nutrients, 7,* 706-729.

Saeid, A., Chojnacka, K., Opaliński, & Korczyński. (2016). Biomass of *Spirulina maxima* Enriched by Biosorption Process as A New Feed Supplement for Laying Hens. *Algal Research, 19,* 342-347.

Upadhyaya, I., Yin, H. B., Surendran, N. M., Chen, C. H., Lang, R., Darre, M. J., & Venkitanarayanan, K. (2016)., Inactivation of *Salmonella* Enteritidis on shell eggs by coating with phytochemicals. *Poultry Science, 95*(9), 2106-2111.

Homeopathic Approach for the Treatment of Ailments from PM2.5

Banchob Junhasavasdikul[a]

Venkatesan Puthur Thirusailam[b]

a. College of Integrative Medicine, Dhurakij Pundit Universitiy. dr.banchob@outlook.com

b. Drbellwin Homeopathy Foundation, India. venkibhms@gmail.com

Abstract

Ambient pollution and $PM_{2.5}$ create health effect to people all over the world and is increasing in severity. There were many homeopathic remedies for the treatment of ailments from PM2.5. This paper group up remedies to be used for each common symptom like: sneezing after dust exposure, rhinitis, throat trouble, cough or asthma. We also gave details of 11 common remedies used for PM2.5 troubles. The problem of ambient pollution is very widespread and is turning to be an important health hazard of the world, homeopathy, which is quite safe and save, should be considered as a mode of treatment for PM2.5 sicknesses by trained health personnel.

Introduction

The Magnitute of Problems

The World Health Organization announced on January 2019 (WHO, 2019) that 9 in 10 of world population were breathing polluted air. There were 7 million people all over the world died from smog in the atmosphere every year. Twenty four percent of cerebro-vascular accidents were related to polluted air, accounted as 1.4 million people annually. As for heart disease, 25% of cardia-vascular diseases (CVD) mortality was related to smog. CVD was the cause of death for 2.4 million people per year. There were 43% of pulmonary disease and lung cancer dead were also related to polluted air. They were the cause of death for 1.8 million people per year. Smog in the atmosphere also induced many other non-communicated diseases. At the present time 80% of world population are living both indoor and outdoor atmosphere which is over polluted than the Air Quality Index (AQI) of WHO. The middle and low income countries were facing this problem than those high income ones. WHO (Ghorani-Azam A., 2016) had announced 6 atmospheric toxic substances: particulate matter (PM), ozone, CO, SO, NO and lead. Short and prolong exposure to such substances led to many diseases like: respiratory diseases, CVD, neuro-psychological complication, eye irritation, skin diseases, Alzheimer, Parkinsonism, autism, retinopathy, mal-development of fetus, low birth weight or even cancers.

In the Great London Smog occurred in 1952 (Polivka, 2018), there were 12,000 people died. After that there had a mass movement quested for better breathing, the U.S. Clean Air Act was the fruitful result of such movement. In 1994 Schwartz did a retrospective study to prove whether the massive dead of London 1952 had the correlation with smog or not (Schwartz, 1994). He studied the mortality and morbidity rate of people in Philadelphia during 1973-1980 on the 5% of the most polluted days (PM level 47-141 mcg./m^3) revealed that there were increasing of the dead rate from obstructive lung diseases and pneumonitis including heart diseases and cerebro-vascular accident in the most polluted days at 1.08 ($P<0.0001$). There were dead on arrival, dead outside hospital, dead in clinic which were all increased un-proportionally on such days. The image of age group of the victims was quite similar to the Great London Smog. Therefore it confirmed the cause of dead in London was from the polluted atmosphere.

In 2011 Fann, et al. studied the effect on health of American people from PM2.5 and O_3 in 2005 showed that there were 130,000 mortality from PM2.5 and 47,000 mortality from O_3. They were died in between the age of 65-99 yrs. old which could be calculated into life year shortening. The figure was that these people had lost their life span of 1.1 million life years by the cause of dead from PM2.5 and 36,000 life year by O_3 (Fann, et al., 2012).

The PM2.5 problems in Thailand appeared on the first week of January 2019 and continue till the second week of February, whereas the smog crisis in the northern and some part of north-eastern Thailand sprung up since February and persisted till May 2019. Manochanpen reported on Feb. 8, 2019 that the AQI in Bangkok shew that: the station at Klongchan area was 197 mcg./m^3, Samuthprakarn area was 167 mcg./m^3, Samuthsakorn area was 174 mcg./m^3 etc. All were in the red zone (151-200 mcg./m^3), as indicated by the World Air Quality Index Organization (Manochanpen, 2019).

The impact on health of Bangkok people were as reported by Vacharasakdivej, the exposition of Dr.Pitchaya Nackvachara, Deputy Permanent Secretary of Bangkok Metropolitan on Jan 25, 2019: there was significant increasing of respiratory patients from reports of hospitals of Bangkok Metropolitan, comparing to December. There were more than ten thousands of respiratory tract patients in 9 hospitals. It increased 54.85% from the number of cases in December (Vacharasakdivej, 2019).

Health Impact of Atmospheric Toxic Substances

The main composition of atmospheric particles was: heavy metal, carbon, sulphate, nitrate ammonia and ion of gaseous pollutant like O_3, CO, NO, SO_2. Particulate matter can be classified as course PM (PM2.5-10), fine PM (PM2.5) and ultrafine PM (PM0.1). Even though exposing to low concentration of US national standards were still had health hazard. Because of PM2.5 had markedly health hazard the World Health Organization Air Quality Guidelines had indicated PM2.5 as the index of atmospheric pollution. Numerous epidemiologic studies showed the co-relation between fine PM exposure with the increased mortality rate of many diseases: cardiac ischemia (Son JY., Lee JT., Kim KH., Jung K., Bell MI., 2012)(Brunekreef B., Beelen R., Hoek G., Schouten L, Bausch-Gold-bohm S., Fischer P., et al., 2009), chronic obstructive lung diseases(Nachman KE, Parker JD, 2012)(Ko FW, Hui DS, 2012), DM. and its complication like vascular diseases, fatty liver(Ismail MH, 2011).

Main concept

Homeopathy did some active approaches for PM2.5. Homeopathy always consider the cause and its effects. Dust and pollution was the cause. Homeopathy offered many drugs to control the effects of air pollution in health. We considered common symptoms of air pollution: 1.Upper respiratory symptoms like sneezing , itching nose, itching eyes, conjunctivitis ,sinusitis, ear infections, throat infections etc 2.Lower respiratory complaints like bronchitis, asthma, emphysema, chronic obstructive pulmonary disease, finally leads to death.

Homeopathic approach to upper respiratory disorder, sneezing after dust exposure: 1.Bromium 2. Histaminum 3.Lyssin 4.Sinapis nigra 5.Spongia tosta 6. acid benz.

Homeopathic approach to rhinitis : 1. Arsenic album 2. Aroundo 3. Kali bichromicum 4. Sinapis nigra 5.Bromium 6.Ammonium carb

Homeopathic approach to throat trouble: 1.Hepar sulph 2. Argentum nitricum 3.Spongia tosta 4.Coccus cacti 5.Causticum

Homeopathic approach to cough: 1.Arsenicum album 2.Drosera 3.pulsatila 4.Lycopodium 5.Sulphur 6.Rumex 7. Phosphorus

Homeopathic approach to asthma : 1.Arsenicum 2. Bromism 3. Hear sulpha 4. Calcaria carb 5.Silicea

Primary drugs and details:

1.Arsenicum album: air passage constricted, unable to lie down, fears suffocation, cough worse at night, expectoration scanty, frothy, darting pain through upper third of right lung, wheezing respiration, haemptysis

2.Bromium: coryza with corrosive soreness of nose ,tickling and smarting sensation from nose,nose bleeding, throat raw and hoarseness ,dry cough with hoarseness and burning pain behind sternum, rattling of mucus in the larynx, bronchial tubes feel filled with smoke, difficulty in getting air into lungs

3.Pothos foetidus: for asthmatic complaints worse from inhaling any dust, spasmodic croup, troublesome respiration, with sudden feeling of anguish and sweat.

4.Ammonium carb: discharge of watery coryza, stoppage at night, with long continued coryza, cannot breathe through nose, epistaxis, blood mucus from nose, much oppression in breathing, worse at any effort, or ascending even few steps, asthenic pneumonia. stertorous breathing, pulmonary oedema.

5.Arundo: hay fever begins with burning and itching of palate and conjunctiva ,annoying itching in the nostrils and roof of the mouth, loss of smell, sneezing.

6.Sinapis nigra: hay fever and pharyngitis, stoppage of left nostril all day, nostrils alternately stopped, cough relieved by lying down.

7.Hepar sulphurs calcareum: hoarseness with loss of voice, dry and horse cough, cough<walking, chocking cough, rattling, crocking cough, suffocative attacks, has to rise up and bend head backwards, asthma<dry cold air, dust air.

8.Argentum nitric: purulent opthalmia , inner acanthi swollen and red, great swelling of conjunctiva. chronic horsnessness, suffocative cough, as if from hair in throat, much thick mucus in throat and mouth causes hawking, raw , rough and sore, sensation of a splinter in throat on swallowing, dark redness of throat, strangulated feeling.

9.Silicea: sputum persistently mucopurulent and profuse, slow recovery after pneumonia. cough and sore throat with expectoration of little granules like shots, which when broke, smell very offensive, cough with expectoration bloody and purulent, stitches in chest, suppurative stage of expectoration.

10.Phosphorus: larynx very painful, cannot talk on account of pain in larynx, cough in tingling in throat<cold air, reading, laughing, talking. congestion of lungs, tightness across chest, great weight on chest, respiration quickened , oppressed, pneumonia with oppression,<lying on left side, bloody sputum, tuberculosis, repeated haemoptysis.

11.Spongia tosta: hoarseness , larynx dry, burns, consrticted, cough dry ,barking, croupy, croup worse, during inspiration and before midnight, respiration short, panting, difficult, feeling of a plug in larynx, cough abates after eating or drinking especially warm drinks.

Conclusion

By the principle of “Like cure Like”, homeopathy treat sicknesses from PM2.5 with many remedies. Taking history and consider the location, sensation and modalities of the patient’s complaint leads to the remedy prescription. As the problem of ambient pollution is very widespread and is turning to be an important health hazard of the world, homeopathy which is quite safe and save should be considered as a mode of treatment for PM2.5 sicknesses by trained health personnel

References

Allen.H.C. (2004). *Allen's keynotes with leading remedies of the materil medica and bowel nosodes* (10th ed.). B Jain Publishers.

Boerike, W. (2009). *Homeopathic materia medica*. B Jain Publishers.

Brunekreef, B., Beelen, R., Hoek, G., Schouten, L., Bausch-Gold-Bohm, S., Fischer, P., et al. (2019). Effects of long-term exposure to traffic-related air pollution on respiratory and cardiovascular mortality in the Netherlands: the NLCS-AIR study. *Res Rep Health Eff Inst.*, 139, 5-71.

Fann, N., Lamson, A.D., Anenberg, S.C., Wesson, K., Risley, D., & Hubell BJ. (2012). Estimating the National Public Health Burden associated with exposure to ambient PM2.5 and Ozone. *Risk Analysis*, 32 (1), 81-95.

Ghorani-Azam, A., Riahi-Zanjani, B., & Balali-Mood, M. (2016). Effects of air pollution on human health and practical measures for prevention in Iran. *J Res Med Sci*., 21, 65-75.

Ismail, M.H. (2011). Nonalcoholic fatty liver disease and type 2 diabetes mellitus: the hidden epidemic. *Am J Med Sci*., 341, 485-492.

Ko, F.W. & Hui, D.S. (2012). Air pollution and chronic obstructive pulmonary disease. *Respiratory*, 17, 395-401.

Manochanpen, N. (2018). How was PM2.5 dust in Bangkok comparing to other cities in the world? (in Thai). The standard, stand up for the people, 08.02.2018. https://thestandard.co/global-pm25-air-pollution

Morrison, R. (1993). Desktop guide to keynotes and confirmatory symptoms, Homeopathic medical publishers.

Nachman, K.E., & Parker, J.D. (2012). Exposures to fine particulate air pollution and respiratory outcomes in adults using two national datasets: a cross sectional study. *Environ Health*, 11, 25. doi: 10.1186/1476-069X-11-25.

Polivka, B.J. (2018). The Great London Smog of 1952. *Am. J. Nurs.*, 118(4), 57-61.

Schwartz, J. (1994). What are people dying of on high air pollution days?. *Environ Res.*, 64 (1), 26-35.

Son, J.Y., Lee, J.T., Kim, K.H., Jung, K., & Bell, M.I. (2012). Characterization of fine particle matter and associations between particulate chemical constituents and mortality in Seoul, Korea. *Environ Health Perspect*, 120, 872-878.

Vacharasakdivej, V. (2019). Bangkok metropolitan indicated that there were patients from smog more than ten thousands, increased from the previous month 54% (in Thai). *Real News* 2019-01-25. https:/www.benarnews.org/thai/news/TH-air-pollution-01252019161738.html

World Health Organization. (2019). *Air pollution*. Retrieved Jan 24, 2019. https://www.who.int/airpollution/en

The Effectiveness of Pranayama Breathing on Adrenal Fatigue

Paporn Thepparak[a], Pongsiri Khunngam, M.D.[b]

[a] College of Integrative Medicine, Dhurakij Bundit University, Thailand,

605159110005@dpu.ac.th

[b]Adviser, College of Integrative Medicine, Dhurakij Bundit University, Thailand,

Abstract

Low energy and tiredness are among the common symptoms of Adrenal Fatigue, which can affect anyone who leads a stressful life. Symptoms associated with Adrenal Fatigue develop after prolonged mental stress that overworks the adrenal glands, which eventually become exhausted, which pushes the symptoms to escalate into chronic disease. However, Adrenal Fatigue is still not recognised by medical science, as no scientific proof exists to support its status as a real illness. Therefore, people suffering from the condition often go without treatment.

Thousands of years ago, Indian yogic practitioners discovered deep-breathing techniques known as Pranayama, which helped balance body function and remedy underlying disorders.

This study aims to investigate the effects of Pranayama breathing on Adrenal Fatigue, stress, sleep quality, cognitive function and changes in salivary cortisol. Eight sessions were designed to practice Pranayama breathing daily, using three techniques: Abdominal Breathing, Alternate Nostril Breathing and Ujjayi Breathing. Each technique was practiced for 10 minutes, so every session lasted 30 minutes.

Tests were conducted before and after each session to assess Adrenal Fatigue symptoms, stress condition, sleep quality, cognitive function and salivary cortisol, as well as blood pressure.

Findings suggested that eight sessions of 30-minute Pranayama breathing daily significantly reduce Adrenal Fatigue symptoms, stress and blood-pressure levels, and improve sleep quality and cognitive function.

In conclusion, Pranayama breathing helps people recover from illnesses caused by prolonged stress.

Key words: Adrenal Fatigue, Pranayama Breathing, Deep Breathing, Stress

1. Background

Many studies have been conducted on the impact of stress and solutions have been sought to manage stress. But, it's quite rare to find studies specifically on Adrenal Fatigue and solutions for eliminating its related symptoms. Adrenal Fatigue describes a group of symptoms that develop from prolonged mental stress, including chronic fatigue, tiredness and low energy, which impact people's well-being and physical health in many ways. However, Adrenal Fatigue is still unrecognised by medical science, as no scientific proof exists to support its status as a real illness. Therefore, people suffering from the symptoms may not receive any treatment until the symptoms have a serious impact and develop into a chronic condition.

Pranayama is an ancient yogic breathing technique which helps balance bodily functions and remedies underlying conditions. The science of Pranayama deals with the control and enrichment of the vital force known as Prana, which results in rhythmic respiration and a calm and alert state of mind. Previous studies demonstrate that different types of Pranayama produce different physiological effects.

The aim of the present study is to reveal the impact of eight sessions of 30-minute Pranayama breathing daily – on reducing stress, blood pressure, Adrenal Fatigue and its common symptoms, and also to study improvement of sleep quality and cognitive performance, as well as changes in the level of stress hormone cortisol through a saliva test. The results should contribute to enhancing people's awareness of Pranayama deep breathing as a remedy for stress and fatigue syndromes that can improve physical health and well-being.

2. Literature

Harvard Medical School has presented a number of reports on the consequences of Adrenal Fatigue at the Harvard Health Publishing website. Eric Seaborg (2017) reported that according to endocrinologists, there is no evidence that the stress of day-to-day life can cause fatigue of the adrenal glands (1). Similarly, a review of 58 studies by Cadegiani FA (2016) concluded that there is no scientific basis to associate adrenal impairment as a cause of fatigue. The research also found a possible correlation between the Hypothalamus-Pituitary-Adrenal (HPA) axis and conditions associated with fatigue, exhaustion or burnout. However, so far, there is no proof demonstrating the existence of Adrenal Fatigue. The studies had some limitations. The research used many different biological markers as well as questionnaires to detect Adrenal Fatigue (48).

At present, there are millions of people suffering from similar symptoms, but the only treatment available consists of personalised plans which may involve counselling, medication, nutritional supplements and lifestyle change. The improvement following adoption of these programmes is slow and evidence for their effectiveness is weak (Marcelo, C. 2018).

James L. Wilson (2013) revealed the root causes of Adrenal Fatigue plus a diagnosis method and lifestyle interventions for recovery. He found that Adrenal Fatigue is a collection of signs and symptoms that result when the adrenal glands function below optimal level because of

prolonged stress. Prolonged stress causes adrenal grands to overwork and become fatigued, resulting in imbalances that can escalate from mere symptoms into chronic disease. People experiencing Adrenal Fatigue often use coffee and other stimulants to combat tiredness or mental exhaustion, which places further stress on the adrenal glands. Marcelo Campos (2018) states that Adrenal Fatigue can develop into severe symptoms involving metabolic syndrome, food intolerance, chemical sensitivities, reactive hypoglycaemia, low blood pressure, insomnia, heart palpitations and digestive issues. Physical or emotional stress play a big role in this condition. Treating Adrenal Fatigue may also be expensive, since insurance companies are unlikely to cover the costs.

These consequences led to the present study on Pranayama breathing techniques as a way of reducing Adrenal Fatigue symptoms, stress and blood pressure, as well as boosting general well-being through better sleep quality and cognitive performance. In addition, the effects of Pranayama on the stress hormone, cortisol, were measured by testing the saliva of subjects.

A growing body of research supports the belief that certain Pranayama breathing techniques may improve physical and mental health by regulating the hypothalamic-pituitary-adrenal (HPA) axis and the sympathetic nervous system. Kirkwood, G. (2005) revealed that yoga has an immediate down-regulating effect on the HPA axis responses to stress.

Critchley, HD (2015) found that controlled slow breathing at the rate of six breaths per minute can benefit cardiovascular function, including responses to hypoxia. Slow breathing was associated with increased tidal ventilatory volume. Induced hypoxia raised heart rate and suppressed heart-rate variability. Within the brain, slow breathing activates the dorsal pons (brain stem), periaqueductal grey matter, cerebellum, hypothalamus, thalamus and lateral and anterior insular cortices. Research also indicates that incidences of disorders like premature ageing, cardiovascular disease, multiple sclerosis, fibromyalgia and Alzheimer's are increasing.

Mohammad A. (2019) found that yoga Pranayama can be used as an alternative medicine for such disorders. Yoga Pranayama combines specific physical postures, breathing techniques, relaxation and meditation which can lead to improvements in cases of neurodegenerative disease. The researcher revealed that Pranayama breathing can reverse memory loss as well as reduce anxiety, depression, stress and biological indicators of disease.

However, most studies on this subject have several limitations and therefore further research into yoga Pranayama is required to validate these findings (14).

Maheshkumar K. (2017) found that Pranayama breathing affects parasympathetic predominance in the reduction of heart rate, blood pressure, improvement of cognitive performance, reduction of tinnitus, favourable EEG changes and reduction in stress levels. At a deeper level, the study found Pranayama breathing helps reduce stress markers such as cortisol, alpha amylase, MDA, etc (11-16). Similarly, Pandey, PT. (2016) found levels of salivary cortisol decreased significantly after practicing yoga Pranayama for 90 minutes daily for three months.

Kocjan J. (2017) confirmed that the diaphragm is the primary muscle involved in active respiration and also serves as an important anatomical landmark that separates the thoracic and abdominal cavity. The study also found that the diaphragm muscle has more than one function, and displays many anatomical links throughout the body, thereby forming a "network of breathing" (224-232).

Martarelli D. (2011) discovered that 10-minute sessions of diaphragmatic breathing for 40 minutes after a meal impacted metabolism – likely through the activation of the parasympathetic nervous system – by increasing insulin, reducing glycemia and reducing reactive oxygen species production (623-628).

Chang RB (2015) studied relationship between breathing and vagus nerve. The vagus nerve exists from medulla oblongata (medulla oblongata, part of the brain is center for respiration and circulation). Each a few hundred neurons, that exert powerful and opposing effects on breathing. Breathing stimulate autonomic functions is under vagal control. Thus, the vagus nerve links with sensory neurons, different anatomical connections and physiological roles. Vagus nerve has an important role in the regulation of metabolic homeostasis and plays a key role in the neuroendocrine-immune axis to maintain homeostasis through its afferent and efferent pathways (622-633).

This study aims to investigate the effects of Pranayama breathing on Adrenal Fatigue, stress, sleep quality, cognitive function and changes in stress hormone - cortisol.

3. Methods

Subjects

27 women participants met the selection criteria. These were women aged between 45 and 55 who have Adrenal Fatigue symptoms at severity index levels of above one, evaluated using the Adrenal Fatigue Questionnaire developed by James L Wilson ("Adrenal Fatigue – 21st Century Syndrome", p.59-72). They also passed a physical test ensuring that they were ready to join the session.

Table 1. Demographic data

Lifestyle of subjects reflecting characteristics of people with fatigue symptoms (James L. Wilson, 2013, p.27). Subjects were given scores of 0 to 3 based on daily lifestyle choices, with 0 for never and 3 for often or always. The questionnaire found that most of the subjects need stimulants such as coffee, soft drinks, experienced craving for sweet or salty foods, exercised just a little and may have problems with sleep quality.

	Mean
age	51.11 ± 3.83
Lifestyle:	
Drinking coffee	2.00 ± 1.07
Soft drinks	1.89 ± 0.89
Craving for sweet & salty	1.7 ± 0.59
Exercise	1.48 ± 1.09
Deep sleep	1.93 ± 0.96

Study design

Participants were instructed to attend eight daily sessions of Pranayama breathing from Monday to Friday with a break for the weekend before resuming from Monday to Wednesday. The practice followed three basic techniques of Pranayama – Abdominal breathing, Alternate Nostril Breathing and Ujjayi Breathing – and was led by a certified professional yoga trainer. Each technique was practiced for 10 minutes, so every session lasted 30 minutes.

Measurement tools:

Pre- and post-session tests assessed symptoms of Adrenal Fatigue, stress level, sleep quality, cognitive function and cortisol level. Blood pressure was also measured before and after each session. Participants were asked to take a 10-minute rest before blood-pressure measurement.

Tools for pre- and post-session tests comprised Adrenal Fatigue Questionnaires, Stress Test (ST5), the Pittsburgh Sleep Quality Index (PSQI), Montreal Cognitive Assessment Test (MOCA Test) and salivary cortisol test.

The questionnaire evaluating the level of Adrenal Fatigue featured 89 questions. These were divided into six groups covering common symptoms, comprising key signs and symptoms, energy patterns, frequently observed events, food patterns, aggravation patterns and relief factors. The level of Adrenal Fatigue, or "severity index", was calculated by dividing the total score by the total number of questions answered. A resulting score of less than 1 indicates no Adrenal Fatigue; 1 to 1.6 mild Adrenal Fatigue; 1.7 to 2.3 moderate; and more than 2.4 high.

The Stress test (ST5) questionnaire established by the Public Health Ministry's Department of Mental Health. Stress was evaluated on four levels: scores from 0 to 4 indicate low levels of stress; 5 to 7 moderate stress; 8 to 9 high stress; and 10 to 15 very high stress.

The Pittsburgh Sleep Quality Index (PSQI), a self-assessment questionnaire, was used to evaluate the quality of sleep, with scores of less than 5 or equal 5 (≤5) showing good-quality sleep and more than 5 (>5) showing poor-quality sleep.

Cognitive function was assessed using the Montreal Cognitive Assessment (MOCA) Test, which has 30 items assessing multiple cognitive domains, namely short-term memory; executive function; attention; concentration; and working memory. Scores of less than 25 indicate mild cognitive performance.

The salivary cortisol pre- and post-session tests were conducted in the laboratory using an Electrochemiluminescence Immunoassay Analyzer (ECLIA) with a limit reference range of normal late-night cortisol at <0.41 ug/dl. Therefore, all participants were asked to collect saliva between 10 p.m. and 12 a.m.

Statistical analysis

The Paired t-Test was used to analyse outcomes from the practice of Pranayama breathing, by comparing the results pre- and post-session tests.

Approval

This study was approved by the Ethics Committee and the informed consent was obtained from the participants.

4. Findings

Findings after eight sessions of 30-minute Pranayama breathing: a significant reduction in the common symptoms of Adrenal Fatigue and lower levels in the severity index ($P<0.001$). Moderate levels of Adrenal Fatigue registered before the Pranayama session fell to low levels. One participant with a high level on the severity index showed a moderate level of Adrenal Fatigue post session. The results of an Adrenal Fatigue questionnaire filled post session showed that the practice of Pranayama breathing had reduced a group of Adrenal Fatigue symptoms, including included energy patterns, food patterns, frequency observed events and the need of relieved factors.

Systolic and diastolic blood pressure were significant decreased ($P=0.003$ and $P=0.016$). The volunteers who had systolic and diastolic blood pressure stage 1,2 after complete joining 8 sessions of pranayama breathing, systolic and diastolic blood pressure decreased to normal level.

The completion of all eight Pranayama breathing sessions also showed a significant reduction in stress levels ($P=0.001$) among volunteers with high levels of stress.

A test on cognitive performance conducted after the last session of breathing exercises showed a significant improvement among volunteers with mild cognitive performance ($P<0.001$).

The post-session PSQI test on sleep quality detected a significant improvement among participants ($P < 0.001$).

However, the saliva cortisol test showed no significant changes.

Table 2. Illustration of the outcomes before and after Pranayama breathing sessions as reported on the finding results of this study.

Pre/Post-session Tests	$\bar{D}$	S.D.	t	P.value (one-tailed)
Adrenal Fatigue				
Level of Severity Index	.356	.444	4.161	0.000
Common Symptoms				
key sign and symptoms	11.69	6.37	6.619	0.000
Energy Pattern	14.26	4.76	16.675	0.000
Frequency Observe Event	8.73	4.42	9.260	0.000
Food Pattern	9.33	3.74	7.483	0.000
Agravation Patterns	11.20	4.18	8.464	0.000
Relieved factors	13.25	1.71	15.517	0.001
Systolic Blood Pressure	10.19	17.68	2.994	0.003
Diastolic Blood Pressure	3.67	8.38	2.275	0.016
Stress	2.41	3.39	3.692	0.001
Sleep Quality	2.56	2.93	4.538	0.000
Cognitive Performance	3.11	2.41	6.715	0.000
Cortisol level	0.00	0.05	0.032	0.975

5. Discussion

Pranayama and Adrenal Fatigue

The present study revealed that eight sessions of 30-minute Pranayama breathing can reduce symptoms of Adrenal Fatigue. Data gathered from the post-session questionnaire revealed the practice of Pranayama breathing significantly reduced levels of severity in the symptoms of Adrenal Fatigue, including energy patterns, food patterns, frequency observed events and the need of relieved factors.

The result of the present study was consistent with a previous report by James L. Wilson (2013) that deep breathing for five to 10 minutes relaxed the body, relieving it from stress, while the adrenal glands have the time to reset their mechanism and recover from the overload in trying to maintain the body's homeostasis during a stressful event. Deep breathing is clearly a way of putting the brakes on stress. Low-level stress keeps the HPA axis balanced, contributing to a reduction in symptoms caused by Adrenal Fatigue (118-119).

Herbert Benson (2013) studied physiological changes during deep breathing, and learned that the changes did not just affect brain waves, but also engaged with the immune response and circulatory patterns. Pallav Sengupta (2012) study showed that a combination of Hatha yoga and Pranayama breathing enabled an improvement in physical and mental health through the down-regulation of the HPA axis and the sympathetic nervous system in order to normalise adrenaline and cortisol levels that influence physical health. Since the adrenal gland generates cortisol in times of stress to maintain homeostasis in the body, an imbalance of cortisol levels can cause several symptoms that can escalate into illness.

All these studies have presented similar findings, that deep-breathing techniques can reduce fatigue symptoms caused by mental stress. Further study on Adrenal Fatigue and its treatment would be useful in treating illnesses associated with stress.

Pranayama and Blood Pressure

This study found that after participating in eight 30-minute sessions of Pranayama breathing, participants' systolic and diastolic blood pressure decreased significantly. This result was found to be consistent with Dinesh T. (2013) studied Kapalabhati pranayama breathing started with 30 times for 5 minutes/day for 12 weeks, was significantly decreased resting heart rate (HR), systolic blood pressure (SBP) and diastolic blood pressure measured after 10 minutes of supine rest (111). Dandekar Deepak (2013) study indicated that, short-term training of Anuloma-Viloma (nostril Pranayama breathing technique), a 25 minutes training daily, 6 days a week, for 4 weeks was significant decreased in systolic blood pressure, but the change was not observed to be significant in diastolic blood pressure and pulse. The study identified that diastolic blood pressure is mainly varies with the degree of peripheral resistance and heart rate, that may need prolong practice of Anuloma-Viloma Pranayama (253). Jain Sharad (2016), found the effect of 6 weeks training of alternate nostril breathing on cardiac output and systemic peripheral resistance in pre hypertensive obese young adults. Results showed significant decrease in all cardiovascular parameters after 6 weeks practice of ANB for 15 minutes daily. Decrease in Diastolic blood pressure, Systemic Peripheral Resistance and Systemic Vascular Resistance Index was highly significant, while decrease in Systolic blood pressure, Heart rate, Cardiac Output, Stroke volume, Cardiac Index and Stroke volume Index was less significant (1).

Saravanan P. (2018). studies on hypertensives found that after 30 min alternate nostril breathing exercises reduce sympathetic activity by decreasing systolic and diastolic pressure. The study was done to confirm the sympathetic lowering effect of ANB on vessel wall parameters immediately after 30 min of ANB exercises. This case reported that ANB has immediate effect on the left brachial artery diameter, peak systolic velocity, and resistive index in hypertensive subjects.

Pramanik, T. (2010). studied the practice of 5 minutes of Pranayama breathing, had a significant effect on the blood pressure and heart rate. Both the systolic and diastolic blood pressure were found to be decreased. Sandra S. (1984) studied by clinical trial using a six month of Shavasana therapy (a combination of yoga and pranayama breathing) for patients with hypertension, while another group was taken a dose of antihypertensive drug, found that 65% of patients with hypertension who performed yoga for 6 months were able to control their blood pressure with Shavasana without using of medication, but the high blood pressure returned after yoga was stopped.

All the studies confirmed Pranayama practice enables reduction of blood pressure, whatever the duration of breathing practice. Effective treatment of hypertensive cases, though, may require long-term and regular practice along with medical approaches. In future, Pranayama breathing may be used to prevent the development of long-term complications of hypertension, though this may require further study.

Pranayama to reduce stress levels

This present study found a significant reduction in stress levels after the practice of pranayama breathing. The results were consistent with Naik GS (2013) found that slow breathing exercise training for 30 min a day, 5 times/week for 12 weeks significantly decreased stress, measured by Perceived Stress Scale using Cohen's questionnaire. In addition, breathing exercise also reduced heart rate, systolic and diastolic blood pressure (53). Valentina Perciavalle et al (2017) studied deep breathing technique which was designed into 10 treatment's sessions programme of Anti-stress Protocol, each lasting 90 min, whereas subjects need to join the session once a week. The psychological state of mood and stress was evaluated using Measurement of Psychological Stress and Profile of Mood State, while the biological profile of the stress was detected by measuring the heart rate and the salivary cortisol. The results obtained from these studies support the possibility that deep breathing techniques enable to induce an effective improvement in mood and stress both in terms of self-reported evaluations and of objective parameters, such as heart rate and salivary cortisol levels. Some research reported no statistically significant difference was found between men and women (451). Further study may benefit from the development of standard tools that could immediately detect the effect of deep breathing on stress reduction.

Pranayama to improve sleep quality

The present study revealed that undertaking eight 30-minute sessions of Pranayama led to significantly improved sleep quality, measured by the Pittsburgh Sleep Quality Index (PSQI). PSQI showed significantly improved sleep quality compared to the pre-session scores ($P < 0.001$). The result obtained from the present study was consistent with Mangesh, A. (2013). studied the effect of yoga pranayama to improve sleep quality, using PSQI questionnaire to evaluate sleep quality before and after yoga sessions. But from this research used long-term practice of yoga for 6 months, finding that Yoga group participants had better sleep quality and less sleeping disturbances when compared with the control group. The participants in the Yoga group had improved sleep quality, the total PSQI score was below the cut off level of five, had less sleeping disturbances, shorter sleep latency, and decreased use of sleep medications (28). Similarly, in a study reported by Chen KM (2010) found that the practice of yoga three times per week at 70 min per practice session for 24 weeks, measuring of sleep quality by Pittsburgh Sleep Quality Index and depression state (Taiwanese Depression Questionnaire) (53). After 6 months of performing yoga exercises, participants' overall sleep quality was significantly improved, whereas depression, sleep disturbances, and daytime dysfunction was decreased significantly.

All the studies confirmed that deep-breathing yoga pranayama techniques could improve sleep quality. They confirmed that regular practice is beneficial. Duration of sessions, though, may depend on individual preference. The present study, however, also revealed that short-term practice of Pranayama breathing in 30-minute daily session for eight days could contribute to sleep-quality improvement.

Pranayama for cognitive performance

The present study found significant improvement in cognitive performance of subjects. The post-session MOCA indicated that subjects showing mild cognitive performance significantly improved to normal levels ($P<0.001$). The result was consistent with Ambareesha Kondam (2017) studied the efficacy of pranayama in increasing the cognitive performance in medical students after practicing yoga pranayama and suryanamaskar a 60-min session, for 6 months. Cognitive performance test was measured before and after pranayama sessions by using the Addenbrooke's Cognitive Examination-Revised questionnaire and finding that Pranayama breathing with suryanamaskar posture has a significant effect on the reduction of anxiety level and improvement in cognitive functions of medical students (4). Vivek Kumar Sharma (2014), study on the effect of fast and slow pranayama practice on cognitive functions In healthy volunteers, found that fast and slow pranayama training for 35 minutes, three times per week, for a duration of 12 weeks, are beneficial for cognitive functions, but fast pranayama has additional effects on executive function of manipulation in auditory working memory, central neural processing and sensory-motor performance. Karen Lidzba (2017) studied that a 60 minutes of 6 sessions yoga program enables to improve Working Memory maintenance, Working Memory manipulation and attentive mindfulness However, research is needed to understand the extent of yoga-related cognitive enhancement and mechanisms by which yoga may enhance cognition.

The studies proved that Pranayama breathing improves cognitive performance, especially in terms of working memory and attentiveness. Further study on this aspect and assessment are worthy.

Pranayama and change of cortisol levels

The present study found that saliva tests showed no significant change in cortisol levels after the completion of eight sessions of 30-minute Pranayama practice compared to the pre-session test. As Xiao Ma et al (2017) had studied that 20-sessions of breath-controlling intervention, involved a 15-min resting breathing session and a 15-min diaphragmatic breathing session consequently shown a significant lower cortisol level after training, comparing with the control group that showed no significant change in cortisol levels. Salivary cortisol was collected four times, by separating at two time points: before and after diaphragmatic breathing at baseline, and before and after the diaphragmatic breathing at the final test. The saliva sample was collected between 11:00 and 12:00 to control for the variation in cortisol levels over the circadian rhythm. Salivary cortisol was analyzed, using a competitive enzyme immunoassay (ELISA, DiaMetra®, Perugia, Italy)

Pandey PT et al (2016) studied the change of saliva cortisol level, after practice yogasanas pranayama and meditation 60 minutes daily on 3 months period. Collecting saliva sample immediately upon awakening on two different mornings for pre-yoga test, and post yoga test was proceeded after 3 months. Using Cortisol Saliva ELISA kit for the measurement.
From the result of this study, it observed that healthy control group which was not practicing yoga had higher levels of salivary cortisol than the healthy yoga group. It is due to regular practices of yoga, mean salivary cortisol decreased.

Stefanie Mayer (2015) did the research on the measurement of saliva cortisol, provided the evidence on links between salivary cortisol with emotional and physical stress. The assessment of salivary cortisol level reflects snapshot of HPA axis activity, capturing short-term cortisol

production over the past 15-20 minutes. The change of cortisol level within a day and across days are strongly influenced by a host of stress or awakening factors (1). Based on this research, assessment of changes in saliva cortisol may need to be conducted immediately after breathing practice. However, in the present study, limited availability of lab tests made it impossible to proceed with cortisol tests immediately after breathing practice – something. Similar to some previous studies also did not clearly state whether samples were collected immediately after breathing practice. Changes in cortisol level may be influenced by long durations of breathing practice. However, multiple studies have proved that Pranayama deep-breathing techniques help reduce stress, which further reduces pressure on the HPA axis mechanism as shown in cortisol level reduction.

6. Recommendation

Evidently, all studies cited have revealed that Pranayama breathing can help reduce Adrenal Fatigue symptoms, stress conditions, blood-pressure levels while also improving sleep quality and cognitive performance.

Future studies could benefit from investigating specific durations, frequencies and characteristics of breathing practice in the treatment of specific symptoms of Adrenal Fatigue. The limitations on related aspects may need to consider for further study.

7. Reference

Ambareesha, K. (2017). The effect of yoga in improved cognitive functions in medical students. 7(1), 1-4. doi: 10.5455/njppp.2016.6.0718414072016. Retrieved from https://www.researchgate.net/publication/305878132

Cadegiani, F. A. (2016). Adrenal fatigue does not exist: a systematic review. Pubmed. Gov. 16(1):48. doi: 10.1186/s12902-016-0128-4. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/27557747

Chang, R. B. (2015). Vagal Sensory Neuron Subtypes that Differentially Control Breathing. Pubmed.Gov. 161(3), 622-633. doi: 10.1016/j.cell.2015.03.022 Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/25892222

Chen, K.M. (2010). Effects of yoga on sleep quality and depression in elders in assisted living facilities. Pubmed.Gov. 18(1), 53-61. doi: 10.1097/JNR.0b013e3181ce5189 Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/20220611

Critchley, H.D. (2015). Slow breathing and hypoxic challenge: cardiorespiratory consequences and their central neural substrates. 10(5), 14. Doi: 10.1371/journal.pone.0127082. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/25973923

Dinesh, T. (2013). Effect of 6 Weeks of Kapalabhati Pranayama Training on Peak Expiratory Flow Rate in Young, Healthy, Volunteers. Scholars Academic Journal of Biosciences. 1(4), 111-114 Retrieved from https://www.researchgate.net/publication/264553454

Danderkar, D. (2013). Impact of short-term training of anulom vilom pranayam on blood pressure and pulse rate in healthy volunteers. International Journal of Research in Ayurveda and Pharmacy 4(2), 253-256 Retrieved from https://www.researchgate.net/publication/272770961

Eric Seaborg. (2017). The Myth of Adrenal Fatigue. Endocrine Society. https://endocrinenews.endocrine.org/myth-adrenal-fatigue

Jain, S. (2016). Effect of Six Week Training of Alternate Nostril Breathing on Cardiac Output and Systemic Peripheral Resistance in Prehypertensive Obese Young Adults. 7(1), 1. DOI: 10.5958/0976-5506.2016.00001.2 Retrieved from https://www.researchgate.net/publication/290781024

James, L. W. (2013). Adrenal Fatigue – the 21st Century Stress Syndrome. 118-119.

Herbert, B. (2013). Relaxation techniques: Breath control helps quell errant stress response. Harvard Publishing. Harvard Medical School. Retrieved from https://www.health.harvard.edu/mind-and-

Karen, L. (2017). A yoga program for cognitive enhancement. 12(8), doi: 10.1371/journal.pone.0182366 Retreived from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5544241

Kirkwood, G. (2005). Review Yoga for anxiety: a systematic review of the research evidence. 39(12), 884-91. DOI: 10.1136/bjsm.2005.018069 Retreived from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1725091/

Kocjan, J. (2017). Network of breathing. Multifunctional role of the diaphragm: a review. 85(4), 224-232. doi: 10.5603/ARM.2017.0037 Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/28871591

Maheshkumar, K. (2017). Effects of Bhramari Pranayama on health – A systematic review. Pubmed. Gov. 8(1), 11–16. doi: 10.1016/j.jtcme.2017.02.003 Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5755957/

Mangesh, A. (2013). Impact of long-term Yoga practice on sleep quality and quality of life in the elderly. 4(1): 28–32. doi: 10.4103/0975-9476.109548 Retreived from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3667430/

Marcelo, C. (2018). Is adrenal fatigue “real”?. Harvard Health Publishing. Harvard Health Medical School. https://www.health.harvard.edu/blog/is-adrenal-fatigue-real-2018022813344

Martarelli, D. (2011). Diaphragmatic breathing reduces postprandial oxidative stress. 17(7), 623-8. doi: 10.1089/acm.2010.0666 Retreived from https://www.ncbi.nlm.nih.gov/pubmed/21688985

Mohammad, A. (2019). Biological markers for the effects of yoga as a complementary and alternative medicine. Pubmed. Gov. 16(1), 7. doi: 10.1515/j Retreived from https://www.ncbi.nlm.nih.gov/pubmed/30735481 cim-2018-0094.

Naik, G.S. (2013). Effect of Modified Slow Breathing Exercise on Perceived Stress and Basal Cardiovascular Parameters. Pubmed. Gov. 11(1), 53–58. doi: 10.4103/ijoy.IJOY_41_16 Retreived from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5769199/

Pallav, S. (2012). Health Impacts of Yoga and Pranayama: A State-of-the-Art Review. International of Preventive Medicine. 3(7), 444–458. Retreived from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3415184/

Pandey, P.T. (2016). Effect of yoga on salivary cortisol in medical student. 4(11), 4995-4998. DOI: http://dx.doi.org/10.18203/2320-6012.ijrms20163805

Pramanik, T. (2009). Immediate effect of slow pace bhastrika pranayama on blood pressure and heart rate. 15(3), 293-5. doi: 10.1089/acm.2008.0440 Retreived from https://www.ncbi.nlm.nih.gov/pubmed/19249921

Roderik, J. S. (2018). Breath of Life: The Respiratory Vagal Stimulation Model of Contemplative Activity. 12, 397. doi: 10.3389/fnhum.2018.00397 Retreived from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6189422/

Saravanan, P. (2018). Effect of Alternate Nostril Breathing on Cardiorespiratory Variables in Healthy Young Adults. International Journal of Pharma and Bio Sciences. 6(2):1352 – 1360 Retreived from https://www.researchgate.net/publication/277018086

Sandra, S. (1984). Role of yoga in management of essential hypertension. 39(3):203-8. https://www.ncbi.nlm.nih.gov/pubmed/6331698

Valentina, P. (2017). The role of deep breathing on stress. Neurol Sci. 38(3), 451-458. doi: 10.1007/s10072-016-2790-8 Retreived from https://www.ncbi.nlm.nih.gov/pubmed/27995346

Vivek, K. (2014). Effect of Fast and Slow Pranayama Practice on Cognitive Functions In Healthy. 8(1), 10–13. doi: 10.7860/JCDR/2014/7256.3668 Retreived from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3939514/

Xiao, M. (2017). The Effect of Diaphragmatic Breathing on Attention, Negative Affect and Stress in Healthy Adults. 8(1), 874. doi: 10.3389/fpsyg.2017.00874 Retreived from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5455070/

The paradigm of using a repertory in Homoeopathy.

Gary Weaver
The Institute for Homoeopathic Medicine International.
I.H.M.
Independent Research Organisation. Founded in 1986.
Gary Weaver. I.H.M. Calle Algamitas 12, piso3, 41008 Sevilla España.

Abstract

A short oversview on the value and usage of a repertory, to ascertain key medical pathological changes in the state of a patients health.

The paradigm of using a repertory in Homoeopathy

The intent of using a repertory in the pursuit of finding a suitable medicine for a patient was ably described by Dr Boenninghausen. *'There is no doubt that a diligent and comprehensive study of the pure materia medica cannot be thoroughly accomplished by the use of any repertory whatever. I have not intended to dispense with such a study, but rather have considered all works of such intent positively injurious. Still, it is not to be denied that a homoeopathic physician can only devote himself to such studies in his leisure hours (which are, indeed, few enough) and that he needs in his practice, to aid his memory, a work which is abridged, easily consulted, and which contains the character- Characteristic symptoms and their combinations, to enable him, in any individual' case of sickness, to select from the remedies generally indicated the one suitable and homoeopathic, without a too great loss of time'*

In this 21st century, a plethora of new repertories has arisen with specific areas of investigation to be used by the practitioner, for example, repertories devoted to mental symptoms, repertories devoted to clinical symptoms. The unfortunate result of these works is a complete misapplication of the intent and usage of repertory in conjunction with the Materia Medica provings of the medicines.

A repertory, as a contextual search mechanism, either in book form (or better suited) to the computer for speed and searchability, should be limited to actual symptom expressions or limited disease conditions (in its completeness as a state expressed by symptoms) which can be reproduced by a substance in its entirety. Some modern repertories have headings in a nosological order of diseases and risk losing the actually stated expression as proved by the substance, which may be present in the patient even though the patient does not have the disease state as listed in the repertory.

Substances cannot produce viral or bacterial diseases. In their proving, the individual produced symptoms are noted in as complete a manner as possible with regard to development, times when occurred and in what order of appearance and for the duration.

In this manner, a collection of symptoms and their affinities can be collated for each medicine to produce an individual and comprehensive knowledge of the effects of taking that substance, and as such can be compared to a patients disorder, no matter what disease tag or label the patient has. This is important.

The use of repertory as a time-saving tool is predicated on the abilities of the practitioner. First, there must be knowledge of Materia Medica to differentiate between the known affinities of symptoms produced and the areas of application for the patient's disorder before us. When a patient expresses a symptom unremembered, or unknown to us, the repertory can be consulted to look at that single symptom and see if it is in the medicine under consideration. If it is not, and the symptom is a prescribing symptom, ie one that cannot be ignored, then a renewed search for a closer match in the disease and remedy similarity must ensue. If it is in the proven substance as a reproducible symptom, then the medicine can be given with confidence.

Use of grades as values.

Modern repertories give a numerical value to each medicine in a rubric. There is a common mistake that lies in the main, uncorrected by teachers. The grade value is NOT a value of the intensity of the symptom, more an indication of the relationship of the symptom under consideration as to its affinity and proven occurrence in the proving of that medicine. For example, Sepia has an affinity to produce circular eruptions in its proving and thusly is of great benefit if a patient presents ringworm as a disorder. It is NOT ringworm that is the prescription is based on, rather the physical expression of the appearance of the eruption.

It is important that the homoeopath becomes familiar with a repertory that is accurate. By familiar, it is inferred that the practitioner understands the structure, the nature of the layout and a complete comprehension of the differences between a general symptom state and a local one.

The repertory was never made or intended to take the place of the materia medica; I cannot lay too great stress on the fact that it must never replace our constant study and use of the pathogenesis of our remedies, it should be used as an index to lighten the task of memory in storing the vast symptomatology of our remedies. After the repertory has led us to the remedy which we believe covers our symptom picture, the selection of this remedy should be confirmed by reading its pathogenesis as given in one of our complete materia medicas. This not only acts as proof of the results obtained in the solving of our problems, but also acts as a check on hurried careless work and at the same time continually increases our knowledge of materia medica.[2]

References

Boenninghausen, C.F. von . (1846). *Boenninghausen Introduction to the Therapeutic Pocket Book*. Munster Germany.

Bidwell, G.I. (1915). *How To Use The Repertory with A Practical Analysis of Forty Homeopathic Remedies*, New York.

Dhurakij Pundit University
Address : 110/1-4 Prachachuen Rd., Laksi, Bangkok 10210 Thailand
Tel. 0-2954-7300 Fax 0-2589-9605 Email : contact@dpu.ac.th