



Proceedings

2-4 September 2021 - Virtual Conference

2021 – the 8th Burapha University International Conference on Interdisciplinary Research Co-Conference with The 11th International Conference of Sports and Exercise Science

Keynote: Prof. Jennifer Cumming, Ph.D.



School of Sport, Exercise and Rehabilitation Sciences
University of Birmingham, United Kingdom

Title: In the Mind's Eye: Effective Ways of Developing and Measuring Imagery Ability in Youth Athletes

Keynote: Prof. Mark Lin, Ph.D.



National Taiwan Sport University, Taiwan

Title: Sport tourism: Trends and Perspectives



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Organized by: Wattana.P@burapha.ac.th, Joseph S. Choi, @joseph-choi

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11th International confer



ICSES 2021 Information

1. Virtual Venue by Zoom host by

Faculty of Sport Science,
169 Long Haad Bang Saen Road
Saen Sook, Muang, Chon Buri, THAILAND 20131

2. Registration & Register Counter



Virtual Conference
ICSES 2021 The 11th International conference of sports and exercise science

การประชุมวิชาการระดับนานาชาติ มหาวิทยาลัยบูรพา พ.ศ.2564 จัดร่วมกับ
การประชุมวิชาการนานาชาติด้านวิทยาศาสตร์การกีฬาและการออกกำลังกาย ครั้งที่ 11

ในวันศุกร์ที่ 3 กันยายน พ.ศ.2564 เวลา 08.30-17.00 น. ผ่านช่องทางออนไลน์

กำหนดลดผ่านช่องทาง **FACEBOOK LIVE**

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QR Code: 

Facebook: **Buusportsci**

Keynote Speaker

Prof. Jennifer Cumming, Ph.D.
University of Birmingham United Kingdom

Prof. Mark Lin, Ph.D.
National Taiwan University of Sport

INVITED SPEAKERS : Room 1

Assoc. Prof. Jeelewan M. Santos, Ph.D.
Mindanao State University, Philippines

Nur Syamsiana Binti Ahmad, Ph.D.
Universiti Sains Malaysia

Assoc. Prof. Prethorn Muangmae, Ph.D.
Bangkok University, Thailand

Chetsade Charaphongsa, M.D.
Sports Authority of Thailand

QR Code: 

ลงทะเบียนเข้าฟังบรรยาย Room 1

INVITED SPEAKERS : Room 2

Ayu Suci Ramli Muhsamad, Ph.D.
Universiti Sains Malaysia

Prof. Young Ha Kim, Ph.D.
Sungul National University of Science and Technology, Korea

Asst. Prof. Naruegon Vangaturaput, Ph.D.
Bunruek University, Thailand

Asst. Prof. Suksade Boonvoranart, Ph.D.
Chulabhorn Royal Academy, Thailand

Asst. Prof. Seung Kyum Kim, Ph.D.
Sungul National University of Science and Technology, Korea

QR Code: 

ลงทะเบียนเข้าฟังบรรยาย Room 2

ลงทะเบียนเข้าฟังฟรี
ภายในวันศุกร์ที่ 20 สิงหาคม พ.ศ.2564

- ลงทะเบียนเข้าร่วมฟังบรรยายได้มากกว่า 1 ครั้งประชุม
- ช่วงเวลาเดียวกัน 1 Account สามารถเข้าฟังได้เพียง 1 การประชุม
- LINK ครั้งประชุมจะส่งไปยัง e-mail ที่ท่านลงทะเบียน (ส่วนหน้า 1 วัน)

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Virtual Conference

BUU 2021 & ICSES 2021

The 8th Burapha University International Conference 2021
Co-Conference with The 11th International conference of sports and exercise science

จัดวันเดียวจบ
ลงทะเบียนเข้าร่วมฟรี



ถ่ายทอดสดผ่านช่องทาง FACEBOOK



ในวันศุกร์ที่ 3 กันยายน พ.ศ.2564 เวลา 08.30-17.00 น. ผ่านช่องทางออนไลน์



BUU Research



(Keynote Speaker, Plenary Lecture BUU 20121)



Buusportsci



(Keynote Speaker ICSES 2021)

ลงทะเบียนเข้าฟังฟรี

ภายในวันศุกร์ที่ 20 สิงหาคม พ.ศ.2564

- ลงทะเบียนเข้าร่วมฟังบรรยายได้มากกว่า 1 ห้องประชุม
- ช่วงเวลาเดียวกัน 1 Account สามารถเข้าฟังได้เพียง 1 การประชุม
- LINK ห้องประชุมจะส่งไปยัง e-mail ที่ท่านลงทะเบียน (ล่วงหน้า 1 วัน)

QR code ตารางการบรรยาย



Program BUU 2021



Program ICSES 2021

CONFERENCE TOPIC :



13.00-16.40 น.

Agriculture and food technology
Computer Center 1



16.00-16.20 น.

Agriculture and food technology
Computer Center 3



13.00-16.40 น.

Energy and smart materials & Applied
engineering and industrial 4.0
Computer Center 2



13.00-14.30 น.

Energy and smart materials & Applied
engineering and industrial 4.0
Computer Center 3



14.30-16.00 น.

Health and wellness
Computer Center 3



13.00-16.20 น.

Health and wellness
Computer Center 4



15.20-15.40 น.

Tourism and creative economy
Computer Center 5

15.00-15.20 น.

Agriculture and food technology
Computer Center 2



13.00-15.20 น.

Humanities, Social sciences,
Arts, and Culture
Computer Center 5



13.00-16.00 น.

Humanities, Social sciences,
Arts, and Culture
Computer Center 6



11.05-16.40 น.

Sport Science
Room 1



11.05-16.40 น.

Sport Science
Room 2



15.05-16.40 น.

Sport Science
Room 3



buuconference



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http://www.buuconference.buu.ac.th

Welcome Address

From Asst. Professor Dr. Naruepon Vongjaturapat
Chair of the ICSES 2021

On behalf of the International Conference in Sport and Exercise Science (ICSES) organizing committee, it is my great pleasure to welcome you to participate our 11th International Conference in Sport and Exercise Science (ICSES 2021), jointly organized by BUIC (Burapha University International Conference) in Thailand on the 3rd of September, 2021.

This annual international conference in sport and exercise science is founded by 5 members of sport science and a physical education faculty in Thailand aiming to promote professionals and students in educational, scientific and research institutions. In particular, the sport science faculties have agreed to promote and facilitate communication among young researchers and students in Thailand with other international scholars around the world.

Due to the COVID-19 pandemic, this annual international conference has to firstly organize through a virtual conference format. The pandemic impact papers of presentation both oral and poster. In addition, cultural and site visit to the university and Thailand has also been affected.

Annually, ICSES provide an opportunity to interact and share research findings and a platform for future co-operation in exercise and sports science among institutions of higher education, sports and research institutes throughout the world in our profession. The theme of ICSES 2021 is “**Multidisciplinary Approaches in Long Term Development**”. A panel of distinguished international scholars (2 keynote and 9 invited speakers) has been invited to speak on various inter-disciplinary areas in sport and exercise science. The paper of various disciplines will be presented in oral (22) and poster (14) formats.

Your participation is no doubt an invaluable asset for the success of the conference.

We look forward to welcoming you to ICSES 2021.

Scientific Review Board

Asst.Prof. Naruepon Vongjaturapat	Burapha Uniuersity, Thailand
Assoc. Prof. Tanida Julvanichpong	Burapha Uniuersity, Thailand
Asst.Prof. Sukanya Charoenwattana	Burapha Uniuersity, Thailand
Asst.Prof. Kawiya Sintara Burapha	Uniuersity, Thailand
Asst.Prof. Saaralee Sonchan	Burapha Uniuersity, Thailand
Asst.Prof. Wirat Sonchan	Burapha Uniuersity, Thailand
Asst.Prof. Rangsarit Jamrern	Burapha Uniuersity, Thailand
Asst.Prof. Chatkamon Singnoy	Burapha Uniuersity, Thailand
Asst.Prof. Onwaree Ingatecha	Burapha Uniuersity, Thailand
Phornpot Chainok	Burapha Uniuersity, Thailand
Panya Intacharoen	Burapha Uniuersity, Thailand
Watcharin Padungratchadakit	Burapha Uniuersity, Thailand
Somporn Songtrakul	Burapha Uniuersity, Thailand
Austtasit Chainarong	Burapha Uniuersity, Thailand
Pairot Sawangpai	Burapha Uniuersity, Thailand
Nakin Kumsree	Burapha Uniuersity, Thailand
Chirapa Nakhanakhup	Burapha Uniuersity, Thailand
Prof. Youngho Kim	Seoul National University of Science and Technology, Korea
Assist. Prof. Seung Kyum Kim	Seoul National University of Science and Technology, Korea
Prof. Eni Harmayani	Seoul National University of Science and Technology, Korea
Prof. Yu Kai Chang	National Taiwan Sport University, Taiwan
Prof. Frank Jin Hong Lu	Chinese Culture University, Taiwan
Prof. Antonio Fonseca	Faculty of Sport, University of Porto, Portugal
Assoc. Prof. Garry Kuan	Universiti Sains Malaysia, Malaysia
Asst. Prof. Maria Luisa Guinto-Adviento	University of the Philippines Diliman, Philippines
Assoc. Prof. Reteer Ruangthai	Kasetsart Univetsity, Thailand
Asst.Prof. Nilomlee Makaje	Kasetsart Univetsity, Thailand
Asst.Prof. Wimonmas Prachakul	Kasetsart Univetsity, Thailand
Asst.Prof. Pornpol Pimpakorn	Kasetsart Univetsity, Thailand
Asst.Prof. Jatuporn permsaptawee	Kasetsart Univetsity, Thailand
Asst.Prof. Itsadee kudin	Kasetsart Univetsity, Thailand
Asst.Prof. Tharin Kanleung	Kasetsart Univetsity, Thailand
Asst.Prof. Teranun Tanpanich	Kasetsart Univetsity, Thailand
Asst.Prof. Supawan Vongsangsap	Kasetsart Univetsity, Thailand
Mr. An Uesugi	Kasetsart Univetsity, Thailand

Information at Glance

History of Burapha University



Burapha University originated from Bangsaen Educational College which was the first regional tertiary educational institute, established on July 8, 1955. Subsequently, it became a campus of Srinakharinwirot University and was renamed Srinakharinwirot Univeristy,

Bangsaen Campus on June 29, 1974. On July 29, 1990, it was again renamed Burapha University and later became autonomous on January 9, 2008.

Philosophy

Cultivate wisdom, seek knowledge, moral partner, lead society

Slogan

Sukho Panyapatilapho - Gaining wisdom brings happiness

Vision

Burapha University Eastern wisdom
WE (Wisdom of the East) BUURAPHA

Mission

1. Conducting equitable education management along with the promotion of freedom academic and lifelong learning on the basis of morality, ethics and professional ethics.
2. Carry out the development of research quality to create and develop a body of knowledge in various fields and to provide academic services and knowledge transfer. for the development of the potential of the agency public and private sectors as well as community society to be able to support changes and development in politics, economy and society with high dynamics effectively.
3. To promote and support various forms of public activities, covering the preservation of arts, culture, religion and sports, as well as playing a leading role in continual social, community and environmental development.

Faculty of Sport Science



The Faculty of Sports Science originated from an agency named of "health and physical education department" under Bangsaen College of Education in 1974, and was upgraded to Srinakharinwirot University Bangsaen campus. The "health and physical education department" was under the foundational education department.

Later in 1980, the health education and physical education department was upgraded to "Faculty of Physical Education" was the establish Bachelor of Science program in physical education (B.Sc.) was opened in 1982.

In 1990, Srinakharinwirot University Bangsaen Campus was upgraded to "Burapha University". The University Council resolved to dissolve and reorganize the structure of the university departments according to the "health education" work under the Faculty of Public Health. "Faculty of Physical Education" changed the status to the Department of Physical Education and Recreation under the Faculty of Education. In 1999 opened the first doctoral degree in sports science program.

In 2002, Department of Physical Education and Recreation was approved by Burapha University Council on March 8 to establish as "College of Sports Science".

On April 10, 2008, the Burapha University Council announced the College of Sports Science to "Faculty of Sports Science".

Faculty of Sports Science, Burapha University is poised to be the country's leading sports organization in producing sports personnel. Health Fitness Specialist and sports journalism with high potential to improve the quality of life of the people and develop the nation's sports industry to step on the international stage as well as focusing on research towards excellence in science, exercise and sports by focusing on becoming a happy organization based on knowledge and wisdom under the slogan "Better Faculty Better Education."

Time Table Program of ICSES 2021

Time	Program		Time	Poster Presentation
				Room 3
08.30 - 09.00	Welcome Message by BUU President			
09.00 - 09.10	Welcome Message by Dean of Faculty of Sport Science, BUU			
09.10 - 10.05	Keynote 1			
10.05 - 11.00	Keynote 2			
11.00 - 11.05	Session Break (5 minutes)			
	Room 1	Room 2		
11.05 - 11.35	Invited Speaker 1	Invited Speaker 4		
11.35 - 12.05	Invited Speaker 2	Invited Speaker 5		
12.05 - 12.10	Session Break (5 minutes)			
12.10 - 13.10	Panel Discussion on Sport Physiology	Panel Discussion on Sport Psychology		
13.10 - 13.40	Invited Speaker 3	Invited Speaker 6	15.00	Open Poster Session
13.40 - 13.50	Session Break (10 minutes)		15.05 - 15.11	SSP1
	Oral Presentation Session		15.11 - 15.17	SSP2
13.50 - 14.05	SSO1	SSO12	15.17 - 15.23	SSP3
14.05 - 14.20	SSO2	SSO13	15.23 - 15.29	SSP4
14.20 - 14.35	SSO3	SSO14	15.29 - 15.35	SSP5
14.35 - 14.50	SSO4	SSO15	15.35 - 15.41	SSP6
14.50 - 15.05	SSO5	SSO16	15.41 - 15.47	SSP7
15.05 - 15.20	SSO6	SSO17	15.47 - 15.57	Session Break (10 minutes)
15.20 - 15.25	Session Break (5 minutes)		15.57 - 16.04	SSP8
15.25 - 15.40	SSO7	SSO18	16.04 - 16.10	SSP9
15.40 - 15.55	SSO8	SSO19	16.10 - 16.16	SSP10
15.55 - 16.10	SSO9	SSO20	16.16 - 16.22	SSP11
16.10 - 16.25	SSO10	SSO21	16.22 - 16.28	SSP12
16.25 - 16.40	SSO11	SSO22	16.28 - 16.33	SSP13
16.40 - 17.00	Closing Ceremony		16.34 - 16.40	SSP14

Time Table Program of ICSES 2021

Time	Oral Presentation		Time	Poster Presentation
	Room 1	Room 2		Room 3
08.30-09.00	Welcome Message by BUU President			
09.00-09.10	Welcome Message by Dean of Sport Science			
09.10-10.05	In the Mind's Eye :Effective Ways of Developing and Measuring Imagery Ability in Youth Athletes Jennifer Cumming			
10.05-11.00	Sport tourism :Trends and Perspectives Mark Lin			
11.00-11.05	Session Break (5 minutes)			
	Room 1	Room 2		
11.05-11.35	Long-Term Development in Sport and Physical Activity Jewelson M .Santos	Exercise and Immune: Effects of Certain Nutrition on Exercise induced Immune Suppression Ayu SuzailianaMuhamad		
11.35-12.05	Influence of Nutritional Supplementation and Exercise on Antioxidant and Oxidative Stress Markers Nur Syamsina Binti Ahmad	Physical Activity and Transtheoretical Model-From Basic Knowledge to Application Young Ho Kim		
12.05-12.10	Session Break (5 minutes)			
12.10-13.10	Panel Discussion on Sport Physiology: Past, Presents and Future of Sport Physiology Pratoom Muongmee	Panel Discussion on Sport Psychology: The Past, Present and Future of Exercise/Sport Psychology Knowledge and Implementation Naruepon Vongjaturapat, Suebsai Boonverabut		
13.10-13.40	Sport Bubble in case of SAT Best Practice Chedsada Charuphongsa	Genetic Influence on Physiological Responses to Exercise Seung Kyum Kim	15.00	Open Poster Session

13.40-13.50	Session Break)10 minutes(15.05 - 15.11	SSP1 Heart Rate Variability and Cardiorespiratory Fitness in Relation with Visceral Adiposity in Obese Adults Jatuporn Phoemsaphawee, Piyaporn Tumnak, Ratre Ruangthai, Andaman Klomklorm, Pilanee Vaithanomsat and Piyapong Prasertsri
	Oral Presentation Session		15.11 - 15.17	SSP2 The Creation of Physical Education Instructional Innovation in the Serve and Drop Badminton Skills Learning Management for Upper Secondary School Students Natchapat Yurahan, Pimpa Muangsiritham and Sunanta Srisiri
13.50-14.05	SSO1 Mental Toughness of Professional Football League Players in Eastern Region of Thailand Narongrid Nimmark	SSO12 The Effects of Exercise by Swinging the Arms on the Feet in Combination with Massage to Relax the Muscles on Physical Performance in the Elderly Nutdanai Jaronsukwimon	15.17 - 15.23	SSP3 The Creation of Physical Education Instructional Innovation in the Thai-Krabikraborting Beating Skills for Lower Secondary School Students in the Western Region Demonstration School of Rajabhat University Kanyarat Khamwichai, Pimpa Muangsiritham and Sunanta Srisiri

14.05-14.20	<p>SSO2 Foreign Spectators 'Satisfaction towards Service Quality of Thai Boxing Stadium in Bangkok Kanoknan Suchao-In, Pongsagon Chueairam, Chatchawan Chaimart and Thee Trongjitpituk</p>	<p>SSO13 Effect of Eri Silkworm Supplementation on Physical Performance of Male Athletes Jittima Monglaykang, Orachorn Boonla and Piyapong Prasertsri</p>	15.23 - 15.29	<p>SSP4 Effects of Co-operative Physical Education Learning Management with the Peer -Assisted Learning Technique)PALT (and Student Teams-Achievement Division Techniques)STADT (upon Taekwondo Skills of Upper Secondary School Students Sivanan Atijantararat, Phanu Kusolwong and Pimpa Moungsirithum</p>
14.20-14.35	<p>SSO3 The Construction of the Ladder Training Combined with the Training of Returning Serves Effecting Performance of Returning Serves with Forehand and Backhand of Students in Thailand National Sports University Haruesanunt Janthong, Anuchit Thaesusngnern and Sathin Prachanban</p>	<p>SSO14 Design of a Novel Conical-PEP Mask to Be Used during Exercise in Young Adulthoods :A Randomized Cross-Over Trail Orachron Boonla, Piyapong Prasertsri and Tadsawiya Padkao</p>	15.29 - 15.35	<p>SSP5 Attitude and Behavior of Food Consumption in Thai National Physical Disabilities Athletes Thawichai Khaothin and Pornthep Rachnavy</p>
14.35-14.50	<p>SSO4 Exploratory Factors Analysis of ICT Factors in Parental Decision on Selecting Game and Sports Activities for Primary Home School Student in Bangkok Province Tatchai Nussaya, Sumonratree Nimnatipun and Sathin Prachanban</p>	<p>SSO15 Effect of a 4-week Blood Flow Restriction Training Combined with Rehabilitation Program on Muscle Strength in Athletes with Chronic Ankle Instability :A Randomized Placebo Controlled Pilot Trial Phurichaya Werasingrat and Tossaporn Yimlamai</p>	15.35 - 15.41	<p>SSP6 Superstition in Sports in Thailand : Literature Review Chatkamon Singnoy and Frank Jin Hong Lu</p>

14.50-15.05	<p>SSO5 An Investigation of IGF-I Level and Macronutrient Predictors Energy Intake in Young Swimmers Natthida Bangmek and Sukanya Charoenwattana</p>	<p>SSO16 Stress Levels of Thai National Team Athletes with Disabilities during Training Camp for Participating in Qualifier Events of the Tokyo 2020 Paralympics Games Thawichai Khaothin, Pornthep Rachnavy, and Charee Jansupom</p>	15.41 - 15.47	<p>SSP7 Decision Factors and Marketing Behaviors for Exercise in Mobile Fitness Chatkamon Singnoy, Onwaree Ingkatacha and Sugree Supawariku</p>
15.05-15.20	<p>SSO6 The Impact of Sports Tourism and Digital Integrated Marketing Communication on Sports Tourism Management in the Eastern Economic Corridor)EEC (of Thailand Kamonmarl Polyotha, , Phatharawadee Makmee Sukanya Buranadechachai and Chatkamon Singnoy</p>	<p>SSO17 The Construction of S M Z Running Patterns on the Agility of Table Tennis at the Primary School Level Chanoknat Rattanachaloemwong, Luxsamee Chimwong and Pimpa Moungsirithum</p>	15.47 - 15.53	<p>Session Break(5 minutes)</p>
15.20-15.25	<p>Session Break (5 minutes)</p>		15.53 - 16.04	<p>SSP8 Attitude Toward Exercise Affects Health Behaviors of Burapha University Students in 2017 Titinun Auamnoy, Yutthapoom Meepradist, Phatsakorn Onnim, Pongpan Suriyong, Phakdee Sukpornsawan, Krittaphas Kangwanrattanakul, and Yu Yu Win</p>

15.25-15.40	<p>SSO7 The Effects of Kayak Seat Types on : Power Output, Trunk and Pelvis Kinematics Punyavee Nuchyou, Parunchaya Jamkrajang and Weerawat Limroongreungrat</p>	<p>SSO18 Comparisons of Pacing Strategy on 500 m, 1000m, 1500m, and 2000m Rowing Ergometer Performance in Thai National Para Rowers Pornthep Rachnavy and Thawichai Khaothin</p>	16.04 - 16.10	<p>SSP9 Examining Grip Strength in Table Tennis Players Suttirak Nasome, Supon Yapapha, Watcharapon Boonkro, Chanwit Intarak, and Krissanat Putthithanasomba</p>
15.40-15.55	<p>SSO8 The Development of Physical Fitness Assessment System for Young Athlete on Internet Network Sarawut Kusump, Wanurug Deeniwong, Chairat Chiaosakul, Nattapon Moodchantuk, Jeerapong Naksri and Sura Wannasaeng</p>	<p>SSO19 Biomechanics Analysis of Lower Leg during Golf Swing in Different Slope Lie Pornthep Rachnavy and Thawichai Khaothin</p>	16.10 - 16.16	<p>SSP10 Effect of Circuit Training on Lean Body Mass and Body Fat in College Students Watcharakorn Wanghunklang, Chanwit Intarak, Tevet Junhom, Nattasit Suwannawat, and Dollapa Pasokchat</p>
			16.16 - 16.22	<p>SSP11 Study of Somatic Anxiety and Cognitive Anxiety of Male Football Players Supattra Raksarson, Tuenjai Yubolwat, Nattaya Yubolwat, Sophonwit Chapukdee, Chayanon Awikunprasert, and Naruepon Vongjaturapat</p>

15.55.16.10	<p>SSO9 Mindfulness in Sports of Thai Paralympic Athletes Sarawut Kusump, Jirayus Eiumsuwannachai, Dollapha Pasokchat, Wanee Jermuravong, Chatkamon Singnoy and Nathasit Suwannawat</p>	<p>SSO20 The Level of Study Physical Fitness for Physical Education Students and Sport Science students before Professional Experience at Buriram Rajabhat University Pruchaya Chumvangvapee, Piyawat Luesopha, Cherdsak Kaewkamada, Widsarut Sekaew, Wareerat Nokittipong, Sarawuth Thassanawiwath, Ban Chabairam, Noppadon Imsud, Pornpimon Rungruangsinn Kornruch Markjaroen, Apirom Artitang, and Kittikoon Boonkate</p>	16.22 - 16.28	<p>SSP12 Effects of Exercise with Elastic on Physical Performance in the Elderly Laddawan Kaewsai, Orathai Anurakwattana, Bhumsit Satjattayasom, Nuntiya Silachai, and Kultida Tienphati</p>
16.10-16.25	<p>SSO10 The Integration Causal Relationship of Developing Model in Thai Young Elite Swimmers Radomyos Martjeur, Poonpong Suksawang Sakchai Pitakwong and Chatkamon Singnoy</p>	<p>SSO21 Physical Fitness and Anthropometric Characteristics of the Blind National 5-a-side Football Players Amornrat Hemthanont, Weerawat Limroongruengrat, Parunchaya Jamkrajang, Alisa Nana, and Metta Pinthong</p>	16.28 - 16.33	<p>SSP13 Open and Close Skills on the Basic Psychological Needs of Thai Paralympic Athletes Kultida Tienphati, Laddawan Kaewsai, Manatsiri Khongrassame, and Dollapa Pasokchat</p>

16.25-16.40	<p>SSO11 Effects of Caffeinated Drinks on Brain Waves Responses during Isokinetic Exercise in Healthy Males Prapan Noppongsakit, Amornpan Ajjimaporn, Rungchai Chaunchaiyakul and Papatsorn Ramyarangsi</p>	<p>SSO22 The Effect of Augmented Reality Technology on Mobile Application in Physical Fitness for Falls Prevention in Elderly Praphinvit Pokard, Nikorn Seelae, Sakdarin Thammawong, Chatpong Rattanaverapradit, and Piyapong Saisawad</p>	16.34 - 16.40	<p>SSP14 Physiological Variables and Energy System during Muay Thai Exercise in Thai Males Jirasit Jindamorakod</p>
16.40-17.00	Closing Ceremony			

The 11th International conference of sports and exercise science

Oral Presentation, Room no. 1

Time 13.50-15.20

Chair: Asst. Prof. Supaporn Silalertdetkul, Ph.D
Faculty of Physical Education,
Srinakharinwirot University

13.50-14.05	SSO1 Mental Toughness of Professional Football League Players in Eastern Region of Thailand Narongrid Nimmark
14.05-14.20	SSO2 Foreign Spectators 'Satisfaction towards Service Quality of Thai Boxing Stadium in Bangkok Kanoknan Suchao-In, Pongsagon Chueairam, Chatchawan Chaimart and Thee Trongjitpituk
14.20-14.35	SSO3 The Construction of the Ladder Training Combined with the Training of Returning Serves Effecting Performance of Returning Serves with Forehand and Backhand of Students in Thailand National Sports University Haruesanunt Janthong, Anuchit Thaesusngnern and Sathin Prachanban
14.35-14.50	SSO4 Exploratory Factors Analysis of ICT Factors in Parental Decision on Selecting Game and Sports Activities for Primary Home School Student in Bangkok Province Tatchai Nussaya, Sumonratree Nimnatipun and Sathin Prachanban
14.50-15.05	SSO5 An Investigation of IGF-I Level and Macronutrient Predictors Energy Intake in Young Swimmers Natthida Bangmek and Sukanya Charoenwattana
15.05-15.20	SSO6 The Impact of Sports Tourism and Digital Integrated Marketing Communication on Sports Tourism Management in the Eastern Economic Corridor of Thailand (EEC) Kamonmarl Polyotha, Phatharawadee Makmee Sukanya Buranadechachai and Chatkamon Singnoy

Oral Presentation, Room no. 2

Time 13.50-15.20

Chair: Assoc. Prof. Amornpan Ajjimaporn, Ph.d.
College of Sports Science and Technology, Mahidol University

13.50-14.05	SSO12 The Effects of Exercise by Swinging the Arms on the Feet in Combination with Massage to Relax the Muscles on Physical Performance in the Elderly Nutdanai Jaronsukwimon
14.05-14.20	SSO13 Effect of Eri Silkworm Supplementation on Physical Performance of Male Athletes Jittima Monglaykang, Orachorn Boonla and Piyapong Prasertsri
14.20-14.35	SSO14 Design of a Novel Conical-PEP Mask to Be Used during Exercise in Young Adulthoods :A Randomized Cross-Over Trail Orachorn Boonla, Piyapong Prasertsri and Tadsawiya Padkao
14.35-14.50	SSO15 Effect of a 4-week Blood Flow Restriction Training Combined with Rehabilitation Program on Muscle Strength in Athletes with Chronic Ankle Instability :A Randomized Placebo Controlled Pilot Trial Phurichaya Werasingrat and Tossaporn Yimlamai
14.50-15.05	SSO16 Stress Levels of Thai National Team Athletes with Disabilities during Training Camp for Participating in Qualifier Events of the Tokyo 2020 Paralympics Games Thawichai Khaothin, Pornthep Rachnavy and Charee Jansupom
15.05-15.20	SSO17 The Construction of S M Z Running Patterns on the Agility of Table Tennis at the Primary School Level. Chanoknat Rattanachaloemwong, Luxsamee Chimwong and Pimpamoungsirithum

Oral Presentation, Room no. 1

Time 15.25-16.40

Chair: Chanawat Sanpasitt

Faculty of Sports Science, Chulalongkorn University

15.25 -15.40	SSO7 The Effects of Kayak Seat Types on :Power Output, Trunk and Pelvis Kinematics Punyavee Nuchyou, Parunchaya Jamkrajang and WeerawatLimroongreungrat
15.40 - 15.55	SSO8 The Development of Physical Fitness Assessment System for Young Athlete on Internet Network Sarawut Kusump, Wanurug Deeniwong, Chairat Chiaosakul, Nattapon Moodchantuk, Jeerapong Naksri and Sura Wannasaeng
15.55 - 16.10	SSO9 Mindfulness in Sports of Thai Paralympic Athletes Sarawut Kusump, Jirayus Eiumsuwannachai, Dollapha Pasokchat, Wanee Jermuravong, Chatkamon Singnoy and Nathasit Suwannawat
16.10 -16.25	SSO10 The Integration Causal Relationship of Developing Model in Thai Young Elite Swimmers Radomyos Martjeur, Poonpong Suksawang Sakchai Pitakwong and Chatkamon Singnoy
16.25 -16.40	SSO11 Effects of Caffeinated Drinks on Brain Waves Responses during Isokinetic Exercise in Healthy Males Prapan Noppongsakit, Amornpan Ajjimaporn, Rungchai Chaunchaiyakul and Papatsorn Ramyarangsi

Oral Presentation, Room no. 2

Time 15.25-16.40

Chair: Asst. Prof. Wimonmas Prachakul, Ph.D
Faculty of Sports Science, Kasetsart University

15.25 -15.40	SSO18 Comparisons of Pacing Strategy on 500 m, 1000m, 1500m, and 2000m Rowing Ergometer Performance in Thai National Para Rowers Pornthep Rachnavy and Thawichai Khaothin
15.40 - 15.55	SSO19 Biomechanics Analysis of Lower Leg during Golf Swing in Different Slope Lie Pornthep Rachnavy and Thawichai Khaothin
15.55 - 16.10	SSO20 The Level of Study Physical Fitness for Physical Education Students and Sport Science students before Professional Experience at Buriram Rajabhat University Pruchaya Chumvangvapee, Piyawat Luesopha, Cherdasak Kaewkamada, Widsarut Sekaew, Wareerat Nokittipong, Sarawuth Thassanawiwath, BanChabairam, Noppadon Insud, Pornpimon Rungruangsin Kornruch Markjaroen, Apirom Artitang and Kittikoon Boonkate
16.10 - 16.25	SSO21 Physical Fitness and Anthropometric Characteristics of the Blind National 5-a-side Football Players Amornrat Hemthanont, Weerawat Limroongruengrat, Parunchaya Jamkrajang, Alisa Nana and Metta Pinthong
16.25 -16.40	SSO22 The Effect of Augmented Reality Technology on Mobile Application in Physical Fitness for Falls Prevention in Elderly Praphinwit Pokard, Nikorn Seelae, Sakdarin Thammawong, Chatpong Rattanaverapradit and Piyapong Saisawad

Poster Presentation, Room no. 3

Time 15.05-15.47

Chair: Dr. Praphinvit Pokard

Faculty of Sport Science and Health Thailand National Sport

University

15.05 - 15.11	SSP1 Heart Rate Variability and Cardiorespiratory Fitness in Relation with Visceral Adiposity in Obese Adults Jatuporn Phoemsapthawee, Piyaporn Tumnak, Ratreer Ruangthai, Andaman Klomklorm, Pilanee Vaithanomsat and Piyapong Prasertsri
15.11 - 15.17	SSP2 The Creation of Physical Education Instructional Innovation in the Serve and Drop Badminton Skills Learning Management for Upper Secondary School Students Natchapat Yurahan, Pimpa Moungsiritham and Sunanta Srisiri
15.17 - 15.23	SSP3 The Creation of Physical Education Instructional Innovation in the Thai-Krabikrabong Beating Skills for Lower Secondary School Students in the Western Region Demonstration School of Rajabhat University Kanyarat Khamwichai, Pimpa Moungsiritham and Sunanta Srisiri
15.23 - 15.29	SSP4 Effects of Co-operative Physical Education Learning Management with the Peer -Assisted Learning Technique)PALT (and Student Teams-Achievement Division Techniques)STADT (upon Taekwondo Skills of Upper Secondary School Students Sivanan Anjantararat, Phanu Kusolwong and Pimpa Moungsiritham
15.29 - 15.35	SSP5 Attitude and Behavior of Food Consumption in Thai National Physical Disabilities Athletes Thawichai Khaothin and Pornthep Rachnavy
15.35 - 15.41	SSP6 Superstition in Sports in Thailand :Literature Review Chatkamon Singnoy and Frank Jin Hong Lu
15.41 - 15.47	SSP7 Decision Factors and Marketing Behaviors for Exercise in Mobile Fitness Chatkamon Singnoy, Onwaree Ingkatacha and Sugree Supawariku

Poster Presentation, Room no. 3

Time 15.25-16.40

Chair: Assoc. Prof. Tanida Julvanichpong, Ph.D
Faculty of Sports Science, Burapha University

15.53 - 16.04	SSP8 Attitude Toward Exercise Affects Health Behaviors of Burapha University Students in 2017 Titinun Auamnoy, Yutthapoom Meepradist, Phatsakorn Onniam, Pongpan Suriyong, Phakdee Sukpornasawan, Kritthapas Kangwanrattanukul and Yu Yu Win
16.04 - 16.10	SSP9 Examining Grip Strength in Table Tennis Players Suttirak Nasome, Supon Yapapha, Watcharapon Boonkro, Chanwit Intarak and Krissanat Putthithanasomba
16.10 - 16.16	SSP10 Effect of Circuit Training on Lean Body Mass and Body Fat in College Students Watcharakorn Wanghunklang, Chanwit Intarak, Tevet Junhom, Nattasit Suwannawat and Dollapa Pasokchat
16.16 - 16.22	SSP11 Study of Somatic Anxiety and Cognitive Anxiety of Male Football Players Supattra Raksarson, Tuenjai Yubolwat, Nattaya Yubolwat, Sophonwit Chapukdee, Chayanon Awikunprasert and Naruepon Vongjaturapat
16.22 - 16.28	SSP12 Effects of Exercise with Elastic on Physical Performance in the Elderly Laddawan Kaewsai, Orathai Anurakwattana, Bhumsit Satjahattayasom, Nuntiya Silachai and Kultida Tienphati
16.28 - 16.33	SSP13 Open and Close Skills on the Basic Psychological Needs of Thai Paralympic Athletes Kultida Tienphati, Laddawan Kaewsai, Manatsiri Khongrassame and Dollapa Pasokchat
16.34 - 16.40	SSP14 Physiological Variables and Energy System during Muay Thai Exercise in Thai Males Jirasin Jindamorakod

The 11th International Conference of sports and exercise science

Keynote

1. Prof. Jennifer Cumming, Ph.D.

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Journal Publications:

- Cooley, S. J., Quinton, M. L., Holland, M. J. G., Parry, B. J., & **Cumming, J.** (2019). The Experiences of Homeless Youth when using Strengths Profiling to Identify their Character Strengths. *Frontiers in Psychology: Psychology for Clinical Settings*.
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- Quinton, M. L., van Zanten, J. V., Trotman, G. P., **Cumming, J.**, & Williams, S. E. (2019). Investigating the protective role of mastery imagery ability in buffering debilitating stress responses. *Frontiers in Psychology - Movement Science and Sport Psychology (Special Topic “Adaptation to Psychological Stress in Sport”)*. <https://doi.org/10.3389/fpsyg.2019.01657>
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- Cumming, J.** & Eaves, D. L. (2018). The nature, measurement, and development of imagery ability. *Imagination, Cognition and Personality*. <https://doi.org/10.1177/0276236617752439>
- Cumming, J.,** Weibuill, F., & Newell, E. (2018). Golfer's imagery use. In M. R. Toms (Ed), *The Routledge International Handbook of Golf Science*. Oxfordshire, UK: Routledge.
- Holland, M. J. G., Cooley, S. J., & **Cumming, J.** (2018). Identifying, measuring, and facilitating psychological skill development. In C. Knight, C. Harwood, & D. Gould (Eds.), *Sport Psychology for Young Athletes* (p. 43-54). Oxfordshire, UK: Routledge.
- Kosteli, M., **Cumming, J.,** & Williams, S. E. (2018). Self-Regulatory Imagery and Physical Activity in Middle-Aged and Older Adults: A Social-Cognitive Perspective. *Journal of Aging and Physical Activity*, 26, 14-24. <https://doi.org/10.1123/japa.2016-0024>
- Quinton, M. L., **Cumming, J.,** & Williams, S. E. (2018). Investigating the mediating role of positive and negative mastery imagery ability. *Psychology of Sport and Exercise*, 35, 1-9. <https://doi.org/10.1016/j.psychsport.2017.10.011>
- Quinton, M., **Cumming, J.,** Allsop, J., Gray, R., & Williams, S. E.

- (2018). Imagery meaning and content in golf: effects on performance, anxiety, and confidence. *International Journal of Sport and Exercise Psychology*, 16, 382-397. doi: 10.1080/1612197X.2016.1242150
- Anuar, N., Williams, S. E., & **Cumming, J.** (2017). Do the Physical and Environment PESTLE Elements Predict Sport Imagery Ability? *European Journal of Sports Science*, 17, 1319-1327. <http://dx.doi.org/10.1080/17461391.2017.1377290>
- Burns, V., **Cumming, J.**, Cooley, S., Holland, M., & Beech, N. (2017). "Skills don't transfer themselves: Translating training courses into lasting behaviour change. *Education in Practice*, 3, 8-12.
- Cumming, J.**, Cooley, S. J., Anuar, N., Kosteli, M., Quinton, M. L., Weibull, F., & Williams, S. E. (2017). Developing Imagery Ability Effectively: A Guide to Layered Stimulus Response Training. *Journal of Sport Psychology in Action*, 8, 22-33. doi: 10.1080/21520704.2016.1205698
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- Cooley, S. J., Holland, M. J. G., Cumming, J., Novakovic, E. G., Burns, V. E. (2013). Introducing the use of a semi-structured video diary room to investigate students' learning experiences during an outdoor adventure education groupwork skills course. *Higher Education*. doi:10.1007/s10734-013-9645-5
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- Cumming, J., & Anderson, G. M. (2013). Guided imagery. In Gellman, M. D. & Turner, J. R. (Eds), *Encyclopedia of Behavioral Medicine* (p. 881-883). New York: Springer. ISBN = 978-1-4419-1005-9_1341.
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- Stanley, D. M., Cumming, J., Standage, M., & Duda, J. L. (2012). Images of exercising: Exploring the imagery use and cognitions of exercisers from a self-determination perspective. *Psychology of Sport and Exercise*, 13, 133-141.
- Thøgersen-Ntoumani, C., Cumming, J., Ntoumanis, N., & Nikitaras, N. (2012). Exercise imagery and its correlates in older adults. *Psychology of Sport and Exercise*, 13, 19-25.
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- Woodcock, C., Duda, J. L., Cumming, J., Sharp, L., & Holland, M. J. G. (2012). Assessing Mental Skill Use in Applied Interventions: Recognizing and Minimizing Threats to the Psychometric Properties of the TOPS. *The Sport Psychologist*, 26, 1-15.
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In the Mind's Eye: Effective Ways of Developing and Measuring Imagery Ability in Youth Athletes

Abstract

Imagery is an important mental technique for athletes and coaches to develop and master because of its many benefits for learning and performance. However, while most people can image, imagery ability does vary and not every athlete uses imagery effectively. In this presentation, I will explain why imagery ability is a skill that can be improved with practice and outline evidence-based ways for how to make this practice more effective by: (1) having a better understanding of the multidimensional nature of imagery ability and the processes involved with imagining; (2) using valid, reliable, and developmentally appropriate measures of imagery ability such as the Movement Imagery Questionnaire-Children (MIQ-C; Martini et al., 2016); and (3) developing imagery ability with layered stimulus response training (LSRT; Cumming et al., 2016). This presentation will be underpinned by the Model of Imagery Ability in Sport, Exercise and Dance (MIASED; Cumming & Eaves, 2018; Cumming et al. 2012), which explains that imagery is a process involving the deliberate and conscious generation, inspection, transformation, and maintenance of images. Images can be internally generated from stored memories or triggered from sensory cues external to the person (e.g., watching a video of oneself performing). The imagery process can then result in one or more outcomes, including those that are affective (e.g., reaching optimal arousal levels), cognitive (e.g., self-confidence), and behavioural (e.g., refining the performance of a motor skill) in nature. In turn, these outcomes will influence the athlete's performance, personal development, and well-being.

2. Prof. Mark Lin, Ph.D.

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Journal Publications:

Hsueh-Kuan Lu , Yu-Yawn Chen , Chinagwen Yeh, Chih-Lin Chuang , Li-Ming Chiang , Chung-Liang Lai , Kevin M. Casebolt, Ai-Chun Huang , **Wen-Long Lin** , Kuen-Chang Hsieh (2017). Discrepancies between Leg-to-leg Bioelectrical Impedance Analysis and Computerized Tomography in Abdominal Visceral Fat Measurement. Scientific Reports, 7 (9102) , pDOI:10.1038/s41598-017-08991-y-DOI:10.1038/s41598-017-08991-y .

Cheng, M.F., Chen, Y.Y., Jang T.R., **LIN, W. L.**, Chen, J, Hsieh, K.C.(2016). Total body composition estimated by standing-posture 8-electrode bioelectrical impedance analysis in male wrestlers. *Biology of Sport* 33(4):399-405.

Lin, W. L., Yen, K.T., & Chang C. K. (2005). High prevalence of hyperuricemia in Taiwanese professional and college baseball players, *Journal of Clinical Rheumatology*, 12(3), 159-160 .

W.L. Lin, K. T. Yen, C. Y. Doris Lu, Y. H. Huang, C. K. Chang 2006) . Anaerobic capacity of elite Taiwanese Taekwondo athletes. *Sience & Sport*, 21, 291-293.

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Huang, C. H., Huang, Y. H., **Lin, W. L.**, Hsiao, P. H. (2011). Estimating recreational benefits and environmental effects for the Amenities of Flowers Industry. **Advance in Management**, 4(3), 60-65.

The 11th International conference of sports and exercise science

Invited Speaker

1. Assoc. Prof. Jewelson M. Santos, Ph.D.

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Graduate School, PanPacific University,
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Arts, Physical Education and Health Master in
Physical Education and Sports Master of Arts in
Education major in Curriculum and Instructions
Master in Distance Education Doctor of Education
specialized in Educational Administration and
Supervision



“LONG-TERM DEVELOPMENT IN SPORT AND PHYSICAL ACTIVITY”

Sport and physical exercise continue to be primary determinants for individual and societal improvement. Physical activity's health and well-being advantages are well acknowledged, and it may be represented in a variety of ways, including organized and unstructured sport, recreation, active living, and play. At the same time, they are undervalued in terms of their contribution to total human growth and social-economic advancement. Fortunately, there is a rising understanding of the positive effects that sport and physical exercise can have on society. The Sustainable Development Objectives of the United Nations recognize sport's distinctive and beneficial influence on the 17 goals and highlight specific areas where sport may have the greatest impact. Sport and physical exercise have the potential to promote health and wellness, as well as inclusiveness, gender equality, and other social issues. Countries that recognize the importance of sport and physical exercise and execute well-coordinated development plans gain advantages for their individuals and communities, such as increased social cohesion, lower healthcare costs, improved mental health, and other economic benefits. Long-Term Development in Sport and Physical Activity is a strategy for every child, adolescent, and adult's development in order to maximize involvement in sport

and physical activity. It considers growth, maturity, and development, as well as highly trainable and alignment with the athletic system. The strategy defines the art of coaching and program design, and it extrapolates from currently available scientific research for coaches who must make many day-to-day coaching decisions. To acknowledge the danger of being incorrect in doing so, but we also recognize that in order to be world leaders, we must "push the envelope." Only by evaluating published research, which takes years to collect, can evidence-based judgments be formed. Athlete development can't be both evidence-based and cutting-edge at the same time. The paradigm emphasizes that children's cognitive, emotional, moral, and psychosocial development are key aspects of maturity and have a substantial role in their advancement in sport, from beginner play to world-class performances. Long-Term Development in Sport and Physical Activity (LTDSPA)-based quality sport is safe and inclusive, well-run, and developmentally suitable for individual excellence and optimal health. We need to use a reasonable, progressive Long-Term Development paradigm to help people enjoy and realize their full potential in sport and physical exercise. They work on three levels: at the individual level (Personal Factors), at the level of each sport and physical activity-supporting organization (Organizational Factors), and at the level of all participants (System Factors). Parents and caregivers, teachers, instructors, and coaches should think about the Personal Factors while planning excellent programs for young participants and athletes. Physical Literacy, Quality Environments, Developmental Age, Sensitive Periods, Predisposition, Excellence Takes Time, and For Life are some of the topics covered. The way sport, recreation, education, and other organizations design and implement programs for its members and players is influenced by organizational factors. This is why sports organizations must update their Long-Term Development framework to guarantee that they are embracing the most recent sport, social, and scientific advancements. Long-Term Development is most effective when it is completely integrated within a sport organization. Awareness and First Involvement, Different Activities, Appropriate Specialization, Periodization, Competition, and Transition are all part of it. System factors are essential for policymakers and organization leaders because they guide how organizations cooperate and collaborate to

create the best system possible. Collaboration, system alignment, safe and welcoming environments, diversification, long-term development, continuous improvement, and evidence-based practices are all included. Foundations for Long-Term Sport and Physical Activity Development deals greatly on Physical literacy is defined as the desire, confidence, physical skill, knowledge, and understanding to appreciate and accept responsibility for lifelong participation in physical activities.

The 11th International conference of sports and exercise science

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Research Area: Sport Medicine

- Disease Control Officer in Honda LPGA
Thailand 2021

- Chief of Disease Control Officer in AFC
Champions League 2021 Group J

- Chief of Disease Control Officer in Continental Futsal Championship
Thailand 2021

Journal Publications:

Tayfur, B., Charuphongsa, C., Morrissey, D. et al. Neuromuscular Function of
the Knee Joint

Following Knee Injuries: Does It Ever Get Back to Normal? A Systematic
Review with

Meta-Analyses. Sports Med (2020). <https://doi.org/10.1007/s40279-020-01386-6>



The 11th International

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Research Area: Natural Supplement on Bone Metabolism and Antioxidant, and Natural Product Chemistry (Compound analysis, Bioactivity)

Journal Publications:

- Nur Syamsina Binti Ahmad, Mohd Rahimi Bin Che Jusoh, Rosniwati Ghafar, 2021, Low Bone Mineral Density and Associated Risk Factors in Malaysian Adults, Nova Book (Accepted).
- Nurul Hidayah Abd Hadi, Ooi Foong Kiew, Azidah Bt Abdul Kadir, Nur Syamsina Binti Ahmad, 2021, Effects of Channa Striatus on Human and Animal In Vivo 1 studies: A Systematic Review, International Food Research Journal, (Accepted) .
- Nur Syamsina Binti Ahmad, Mohamed Saat Bin Hj Ismail, Mahaneem Binti Mohamed, Ooi Foong Kiew, 2020, Blood Glucose Metabolism, Serum, and Urine Osmolality in Response to Sodium-Enriched Acacia Honey Drink Consumption During Rehydration After Exercise in Hot and Humid Environment, Journal of Sustainability Science and Management, 15(5): 72-83
- Nur Syamimi Izzaty Ariffin, Farah Izzazaya Mohd Fariq, Nurul Azuar Bin Hamzah, Nur Syamsina Binti Ahmad, 2020, Effects of Circuit Training on Muscular Strength and Power, Jumping Height and Body Composition in Intellectual Disabilities Individuals, Journal of Social Science and Humanities, 3, 14-24
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“Influence of Nutritional Supplementation and Exercise on Antioxidant and Oxidative Stress Markers”

Strenuous and intense training could cause overproduction of reactive oxygen species (ROS) and the inability of endogenous antioxidants to remove ROS could lead to high oxidative stress. As a result of high oxidative stress and uncontrolled free radical activities, muscular injuries and cell inflammation will increase. Dietary ergogenic aids are necessary for enhancing antioxidants and suppressing oxidative stress in human body. This will result long term health benefits for both athletes and exercisers after intense exercise. Honey has been shown to have antioxidant properties that could protect against oxidative stress, however the recommended dosage based on body weight of honey for optimal effects in female athletes is crucial. This lecture will firstly focus on a study on the antioxidant activities and oxidative stress biomarkers after acute consumption of honey with two different dosages. Research findings of this study were subsequently applied in an extension study. This lecture will discuss on this extension study, i.e. whether oxidative stress are influenced by the consumption of honey combined with countermovement jumping exercise after 8 weeks in female athletes. The comparison between acute and chronic effects of honey on oxidative stress will also be presented. In addition, this lecture will also cover another nutritional supplement study regarding the effects of *Channa striatus* (snakehead fish) supplementation on antioxidant markers and stress hormone after one hour running in hot and humid environment.

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Journal Publications:

Muhamad, A.S., Nurul Fatin Raihan Mohd Puad, Garry, Kuan Pei, Ern (2020). Effects of carbohydrate mouth rinsing on salivary lysozyme, mood states and running performance among recreational runners, *Malaysian Journal of Medical Sciences*, 27: 1-10.

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“Exercise and Immune: Effects of Certain Nutrition on Exercise induced Immune Suppression”

It is well known that regular exercise at moderate intensity is good for health. However, athletes involved in heavy training schedule and competitions are always at risk for infection, especially the upper respiratory tract infection (URTI). This is due to suppressed immune function induced by the prolonged and intense exercise. In addition, numerous research has shown that inadequate nutrition may leads to immunodepression. Two available mechanisms (direct and indirect) may clearly explain this effect. Inadequate diets may induce a direct negative effect on immune function by altering the availability of nutrients, coenzymes, or cofactors involved in immune cells' metabolism and protein synthesis. It is called direct negative effects because the nutritional factor being considered has primary activity within the immune system. Otherwise, inadequate nutrition may cause an indirect negative effect on immune function through immunoregulatory effects of stress hormones and altered hormonal responses to stress (e.g. exercise), thereby decreasing immune function. It is called indirect negative effect because the nutritional factor being considered has primary activity that affects all cellular material or another organ system that acts as an immune regulator. This inadequate nutrition-induced immunodepression may be associated to increased risk of URTI in athletes. Inadequate nutrition may occur among athletes as their requirement increased due to heavy training. In addition, it also occurs due to the type of diet practiced by the athletes. Thus, the nutritional strategy is proposed to overcome this issue. This strategy stressed on having adequate macro and micro-nutrients intake, as well as consuming nutritional supplements. In this lecture, several nutritional supplements used in previous research studies that are believed could enhance immune function will be discussed. These nutritional supplements include probiotics, *Eurycoma longifolia* Jack, *Moringa oleifera*, and bee propolis. The objectives, methods, main findings, and conclusion of each study will be discussed during the lecture.

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Journal Publications:

Lee, J.H., Kang, S.J., and Kim, Y.H. (2021). A Meta-

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“Physical Activity and Transtheoretical Model-From basic Knowledge to Application”

This presentation introduces the transtheoretical model (TTM) and identifies practical evidences of the TTM research in exercise psychology. Based on a broad range of literature review and a practical field studies carried out in Korea, the meaning and the sub-constructs of the TTM have been widely reviewed. In addition, various studies in a cross-sectional survey design and longitudinal intervention design have been introduced. From a broad searching of literature review and practical studies, it is indicated that physical activity has been significantly classified into the five stages of change. Except cons, most of the TTM's constructs such as self-efficacy, pros, cognitive processes of change, and behavioral processes of change gradually increase with advancing the stages of physical activity. In the longitudinal study, physical activity and the TTM constructs were significantly changed after the intervention. These findings are supported by the TTM's assumption. The current presentation offers further cross-sectional support for the internal validity of TTM. Overall, the results are in general agreement with the previous findings reported by western countries and therefore, the external validation of TTM is supported. In addition, the longitudinal application has resulted in preliminary support for this intervention modality within a non-western sample, provided further support for the construct validity of the transtheoretical model, and opened new lines of future inquiry.

Key words: TTM, longitudinal intervention, Physical activity

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Journal Publications:

Menon, D.P., Qi, G., **Kim, S.K.**, Moss, M.E.,

Penumatsa, K.C., Warburton, R.R., Toksoz, D.,

Wilson J., Hill, N.S., Jaffe I.Z., Preston, I.R.

Vascular Cell-Specific Roles of Mineralocorticoid Receptors in

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The 11th International conference of sports and exercise science

“Genetic Influence on Physiological Responses to Exercise”

Regular exercise is widely known to lead to numerous health benefits, such as reduced all-cause mortality, enhanced cardiovascular health and improved metabolic function. However, accumulating evidence suggest that responses to exercise are highly variable, including some individuals having minimal or no benefits from regular exercise. This raises the genetic predisposition of individual exercise responses. Due to the difficulty in conducting exercise intervention studies and collecting organs/tissues in humans, genetically defined organisms such as inbred or selectively bred strains of rodents are being utilized to investigate the genetic basis for the certain phenotype.

Using mouse models, we have identified that 1) intrinsic exercise capacity and changes in exercise capacity in response to exercise training are genetically influenced; 2) several genomic loci are associated with such phenotypic variations; 2) intrinsic vascular function is genetically determined and a few genomic loci are associated with the variation in intrinsic vascular function; 3) there is an interaction between genetic background and exercise training intensity (mode) on vascular function.

Our findings provide evidence for the significant genetic regulation of physiological system and its responses to exercise. Along with accumulated data from human studies and incorporating larger scale studies in the future, our results can help expand our understanding of the molecular mechanisms underlying physiological responses to exercise and contribute to developing the optimized personal exercise prescription.

Invited Speaker for Panel Discussion

The 11th International conference

Sport Physiology

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The Past, Present and Future of Exercise/Sport Physiology

This presentation reviews the emerging field of exercise physiology; its present status and contribution to the study of exercise/sport science in general; and future of the field

The past covers reviews of exercise physiology in modern era – post WW1 in the United Kingdom and other European, especially the Scandinavian, countries and on to the U.S. especially at the Harvard Fatigue Laboratory with some notable researchers and authors of standard textbooks and books in the field.

The present reviews status of the field under the umbrella of sport science; modern definitions of exercise vs. sport physiology; types of exercise physiology; popular areas of exercise/sport physiology; current research areas of interest; popular sources to find research in exercise/sport physiology.

The future has a focus on the opinion of the presenter on the future of exercise/sport physiology.

Sport Psychology

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The Past, Present and Future of Exercise/Sport Psychology: Knowledge and Implementation

When studying the history of the development of exercise and sport psychology, it is often best to examine the start of competition among humans, or the competition between humans and animals which started in the 1st or 2nd century AD. In Thailand, there is evidence which asserts that Thai boxing is considered the first and oldest sport for competition. The sport started its development hundreds of years ago. Researchers have established that Thai boxing was developed from fighting or survival skills and gradually evolved into the competition support which we see today.

In Thailand, the contemporary sports psychology field commenced when the first Thai student, who specialized in sport psychology, graduated from Florida State University, USA, in the area of motor control and movement science in 1985. In the following years, there was a rapid growth of Thai sport psychology. From 1992 to 1996, four scholars, who completed their PhDs in a combination of exercise and sport from the United States and Australia, were considered as the most influential in developing the field of .

The professional associations, teaching courses and degree programs have all progressed rapidly since then. Currently, there are two societies related to sport psychology: Sport Psychology Association of Thailand (SPAT) and the Thailand Applied Sport Psychology Association (TASPA). In addition, degree programs and research in exercise and sport psychology are offered by national public universities.

Although people are excited about the psychological aspects of sport performance, doubts remain about its effectiveness and there are also concerns about the quality of the service provided. Sport psychologists in Thailand have

therefore worked very hard in providing education about sport psychology to people through degree programs, seminars and workshops. Applied sport psychology services are not yet a regular inclusion in most Thailand sports programs even though there is an increasing need for help in performance enhancement. In practice, many of our sport psychologists have worked with a variety of clients, for example with athletes, coaches or parents. The clients range from beginners up to professional and world class athletes. The next and most challenging steps for Thai sport psychologists are developing the quality of service provision and standards as well as the application of new and advanced technology in sport psychology. This equipment is starting to be developed, used and applied to field work more frequently. This new technology has played a very important role in helping sport psychologists to work with more trust and higher credibility.

The 11th International conference of sports and exercise science

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The Past, Present and Future of Exercise/Sport and Exercise Consulting and Implementation

Since Dr. Coleman Griffith found the first USA sport psychology lab in 1932, and he went on consult with professional teams. Then the development and advancement of practice of sport psychology started, and other countries declared the same in each region around the world. Multidisciplinary for academic, research, and training leading to Jobs opportunity for practice in national, international and professional teams has been recognized. The counselling certification has been offered and required for completing this profession.

In Thailand sport psychological consulting started in 1992 and gradually developed. The 4 decades of the contents and consulting **implementations** procedure are classified in to 3 phases. 1) The past: during 1991-2000, Present: during 2001-2010, and 2011-2020, Future: during 2021-2030.

The past era: introduction of sport psychology era: documents and contents with few on PST (Psychological Skills Training), to coaches, athletes, parents, administrators, media to get and gain information as well as misconceptions of sport psychology.

The present era: 2 different decades distinctively divided. During 2001-2010: MST were aversively trained and practiced toward mental toughness development. The dominant techniques were goal setting, relaxation, PMR, imagery, thought stopping and positive self- talk. The target groups remained elite athletes and national teams. Many researches, training and practice were implied.

The second era (2011-2020): sport psychology had been well recognition, in some extended private counselling and job opportunities

opened but still limited. The SAT Sport authority of Thailand, sport associations and private consultant, travelled with the team expansively.

The future era: (from 2021 – 2030) the mental health of long term elite and professional athletes was consciously caution in mental concern. Refers to Simone Bile 's withdrawn from the final competition in Tokyo Olympic Games, due to mental breakdown. She was not the only one. Tangibly, ones with high ability of mental toughness will carry mental health automatically. It should be one main concern to adjust contents of consulting.

Consulting and implementation in sport and exercise in the future will be modified. Especially, a long term success elite and professional athletes compare to young elite ones. The life balance between working (training and competing) and playing (awareness of stress), the holistic should be deployed.

Key words: Mental Health, Past, Present and Future of consulting, Thailand

Oral Presentation Session

The 11th International conference of sports and exercise science

The 11th International conference of sports and exercise science

Abstract



The 11th International conference of sports and exercise science (ICSES 2021)

“Multidisciplinary approaches in long term development”



An Investigation of IGF-I Level and Macronutrient Predictors Energy Intake in Young Swimmers

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Abstract

The purposes were: 1) to cross-sectional study the multiple correlations between energy intake, hormone IGF-I level, and macronutrient: carbohydrate, plant-based protein, animal protein, 2) to construct a multiple regression equation of energy intake. The participants consisted of 11 male swimmers of the Assumption College Sriracha swimming club, whose ages were 9-15 years old, were experienced swimming for at least 1 year. Nutritional records for energy intake and macronutrients were conducted 3 days/week for 4 weeks in the TAPER phase of training periodization. Blood samples were obtained for a vein for IGF-I. The data of nutritional analyzed with the nutritional program from Inmucal (V.3). The statistics employed were descriptive data, multiple correlation, and multiple regression.

The result indicated that the variance of carbohydrate, plant-based protein, animal protein correlate with energy intake. Multiple correlation coefficients equal to 0.99 (p 0.5) and predicted energy intake in 97.5 percent. The regression equation of raw scores was

$$\text{Energy Intake} = -63.442 + 8.962(\text{CHO}) + 7.537(\text{Pro A}) - 24.666(\text{Pro V})$$

and the regression equation of standard scores was

$$Z \text{ Energy Intake} = 1.111(\text{CHO}) + 0.329(\text{Pro A}) - 0.365(\text{Pro V}).$$

Keywords: IGF-I level; macronutrient; predictors; energy intake

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**The Impact of Sports Tourism and Digital Integrated
Marketing Communication on Sports Tourism Management
in the Eastern Economic Corridor (EEC) of Thailand**

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Abstract

The purpose of this study was to determine the causal relationships and of causal models on sports tourism management in the Eastern Economic Corridor of Thailand and verify their consistency. This was accomplished using a mixed research method comprised of two parts: 1) a quantitative method sampling 340 peoples living in the Eastern Economic Corridor and 2) a qualitative method comprised of in-depth interviews with fifteen specialists, including five community leaders; five people working in sports organizations or tourism; and five people with experience in sport tourism, mass media, and sport tourism entrepreneurship. The data-collection tool was a questionnaire and interview form. The data analysis was conducted using structural equation analysis (SEM) and in-depth interviews.

The results were as follows: 1) The quantitative method revealed a relationship among the latent variables of the sports tourism management model in the Eastern Economic Corridor and that the impact of sports tourism has a direct effect on the sports tourism management model at 0.48, and Digital integrated marketing communication has a direct effect on the sports tourism management model at 0.37 with statistical significance at the level of 0.01 when considering the results of the empirical data (chi-square = 0.08, df value, 1, p value = 0.78, RMSEA = 0.00, CFI = 1.00, GFI = 1.00 and the SRMR = 0.01 and χ^2/df = less than .08). 2) The qualitative methods found that the added value of sports tourism management model in the Eastern Economic Corridor has follow POIC plan to implement strategies and use information systems, including branding a variety of activities and community involvement as sports tourism within the Eastern Economic Corridor.

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Keywords: Sports Tourism / Digital Integrated Marketing Communication / Tourism Management /

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"Multidisciplinary approaches in long term development"

The Development of Physical Fitness Assessment System for Young Athlete on Internet Network

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Abstract

The purpose of this study was to develop an internet-based system for assessing the physical fitness of young athletes and to investigate the system effectiveness and user satisfaction. The data was collected using the effectiveness and satisfaction questionnaires. There was a total of 30 participants (20 Males and 10 Females). They were purposively selected as research project participants. The program development was the following steps: problem definition, problem analysis, computer program design, computer language selection and program writing, program testing, and a user manual. The internet network technologies and computer applications were used to create this system during its development. The PHP language program (PHP Hypertext Preprocessor) version 7 was used to create a database and displayed and the MySQL (Mysql) version 5.7 application also used for display. The results of the evaluation of the effectiveness of the assessment system revealed that the physical fitness assessment system of youth athletes on the internet network (<http://fitnesstest.sat.or.th/capacity/index.php>) was easy to use, convenient, fast, and accurate in processing, reporting results, able to store data and systematically searching for information. The user manual was easy to read and understandable. The satisfaction among users of overall scores was a high level. This finding confirms that the assessment system was effective and can be used to evaluate the physical fitness of a young athlete.

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Keywords: Physical Fitness Assessment System, Youth Athlete, Internet Network

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Mindfulness in Sports of Thai Paralympic Athletes

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Abstract

Sports mindfulness was important in helping athletes in staying aware of their current situation, and have an effect on the development of mental abilities in order to achieve higher potential. The purpose of this research was to study mindfulness in sports of Thai Paralympic Athletes. And to compare sex, age, experience, and sport type differences in Sports Mindfulness. The athletes were divided into two groups: vigorous sports (5 rowers, 6 swimmers, and 6 athletics) and moderate to low sports (13 table tennis players, 14 shooters and 8 wheelchair tennis players). The research instrument was a Mindfulness Inventory for Sport in Thai version (MIS_t) that including 15 sub - questions was divided into three main factors 1) Awareness 2) Non judgment and 3) Refocusing. The data were analysed by descriptive statistics and comparative analysis with statistics Three-Way MANOVA and Two-Way MANOVA. The results showed that mindfulness sports of disabilities athletes had good awareness (3.82 ± 0.91), moderate non-judgment (3.32 ± 1.10) and good Refocusing (4.18 ± 1.0). The results of comparison of the difference of mindfulness in sports between sex, age, and experience and sport type were not significantly different at the .05 level. Therefore, Thai Paralympic athletes should improve their mindfulness in sports to a higher level of non-judgment, and they should practice mindfulness in sports on a regular and consistent routine.

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Keywords: Mindfulness in Sports, Thai Paralympic Athletes, Mental Abilities

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The Integration Causal Relationship of Developing Model in Thai Young Elite Swimmers

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Abstract

The purpose of this research were to 1) study the causal relationship of developing model and 2) to developing the integration causal relationship model in Thai young elite swimmers. Mixed methods a research design was used including two steps. The first step was studied the causal relationship by using five rating scale questionnaire with 53 items, collected from 75 clubs, five subjects each club and totally 375 subjects. The LISREL was used to analyze the confirmatory factor analysis and path flow analysis. The second step was developing the integration causal relationship model by using focus group discussion technique from the seven of knowledgeable peoples to develop handbook of integration causal relationship model in Thai young elite swimmers. The results showed that:

(1) the causal relationship of developing model in Thai young elite swimmers were including nine descending order factors of the development and involvement of stakeholders; management structure and policy; equipment, location and facilities; budget and budget management; welfare and morale of athletes and coaches; coach development program; selection of swimmer to be members and representing clubs for competitive; national and international competitions and sport science and research. The effectiveness factors of the development of the Thai young swimmers including in order of importance as follows; member satisfaction; club's adaptability; club's efficacy; club's subsistence; club's performance and club's development.

(2) The developing of an integration causal relationship model in Thai young elite swimmers should be done by the collaboration between club's manager, coaches, swimmers, parents and any other stakeholders in a process manner from top to bottom and from bottom to top by integrating of the nine factors that affecting to the development of Thai young elite swimmers.

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Keywords: The Integration Causal Relationship /Developing Model /Thai Young Elite Swimmers

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Effect of Eri Silkworm Supplementation on Physical Performance of Male Athletes

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Abstract

This study evaluated physical performance of athletes after supplementation with protein from Eri silkworm. Participants were 18 male athletes at Burapha University aged 19 to 21 years. They randomly underwent either supplementation condition or control condition for 4 weeks with a 4-week washout between conditions in a cross-over design. In the supplementation condition, participants supplemented with protein from the Eri silkworm in the form of crisp rice at 0.20 g protein/kg body mass/day. Whereas in the control condition, participants executed routine activities without Eri silkworm supplementation. Physical performance including muscle strength, endurance, and flexibility, maximum oxygen consumption, and blood flow were evaluated before and after each condition and compared between the two conditions. Results show that muscle strength, endurance, flexibility, maximum oxygen consumption, and blood flow were not significantly altered within either supplementation condition or control condition. There were no significant differences between the two conditions. However, leg muscle strength was significantly higher in the supplementation condition than the control condition ($p < 0.05$). This study suggests that 4-week supplementation with protein from the Eri silkworm may enhance muscle strength in male athletes.

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Keywords: Protein, Muscle Strength, Dietary Supplementation, Sports

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Design of a Novel Conical-PEP Mask to Be Used during Exercise in Young Adulthoods: A Randomized Cross-Over Trial

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Abstract

Expiratory airflow limitation is the pathophysiological hallmark of obstructive lung disease and elderly that leads to air trapping and increases in dynamic hyperinflation and consequently causes dyspnea during exercise. Pursed lips breathing is a simple technique that provides a positive expiratory pressure which may retard the airway collapse but previous studies have shown this to be unsuccessful in reducing dynamic hyperinflation. A conical positive expiratory pressure mask (Conical-PEP mask) has been developed in our laboratory that generates a higher positive expiratory pressure than probably obtained by pursed lips breathing. However, the problem of using a positive pressure device is that if the airflow rate is low, the pressure will not only to expand the airway. It may be necessary to pay attention to the size of the orifice. Therefore, the objective was to study the effect of different aperture sizes of novel Conical-PEP masks on resting positive pressure and the effect of positive pressure masks on changes in physiological values, pulmonary and circulatory system, safety, and satisfaction during exercise in healthy young adults. We have carried out randomized cross-over trial in fifteen participants age 20-25 years and the study was conducted after approval by the University Ethics Committee and with written informed consent. Participants performed 6-minute static cycling, and exhaled through a mouthpiece without (Control condition) and with Conical-PEP masks (Conical-PEP mask condition). Inspiratory capacity (the variable that indicate lung dynamic hyperinflation), mouth pressure, heart rate and respiratory rate were measured at pre- and post-exercise. The results of this study showed that both conditions increased of heart function by an average of 66% of maximum heart rate, indicating that the exercise method selected in the study could increase cardiopulmonary function. There was no difference of heart rate change of the two conditions. The Conical-PEP mask with orifices of 4 and 6 millimeters were accepted and tolerated by the participants and could generate positive of, mean \pm SD, 10.96 \pm 5.0 cmH₂O and 6.95 \pm 2.82 cmH₂O, respectively. Breathing with both orifices reduced respiratory rate during exercise when compare to normal (-1.73 \pm 3.39 times/minute) ($p=0.048$). There was no change in inspiratory capacity in Control condition whereas the variable was increased by 130 \pm 190 ml ($p=0.018$) immediately post-exercise with Conical-PEP mask. It is concluded that the Conical-PEP mask with 4- and 6-millimeters orifices were safe and diminished dynamic hyperinflation in adulthood. Further studies

are indicated to determine how useful Conical-PEP mask can be for an elderly and patients with obstructive lung diseases.

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Keywords: Positive expiratory pressure; Inspiratory capacity; Exercise

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Stress Levels of Thai National Team Athletes with Disabilities during Training Camp for Participating in Qualifier Events of the Tokyo 2020 Paralympics Games

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Abstract

Purpose: The purpose of this cross-sectional descriptive study was to assess the stress levels of Thai national team athletes with disabilities during training camp for participating in qualifier events of the Tokyo 2020 Paralympics Games. **Methods:** The subjects were 53 disabilities athletes from Thai national team athletes with disabilities during training camp (9 females and 44 males) from 6 sports-type include para-table tennis ($n = 13$), para-athletics ($n = 6$), para-rowing ($n = 5$), wheelchair tennis ($n = 9$), para-shooting ($n = 14$), and para-swimming ($n = 6$) in National Sports Training Center for the Disabilities, His Majesty the King's 80th Birthday Anniversary Stadium (5th December 2007), Nakhon Ratchasima, Thailand. The instruments were a self-administered questionnaire; 1) personal data and 2) Suanprung Stress Test (SPST-20) (20 items) of the Department of Psychiatric Health, Ministry of Public Health, Thailand. Data were analyzed using descriptive statistics by percentage, mean and standard deviation. Statistical analysis used to examine between stress levels of males and females was using an independent sample t-test. **Results:** The average stress levels for 20 items of Thai national team athletes with disabilities were 2.64 ± 0.60 during training camp. Average stress levels are a significant difference between female and male athletes (2.86 ± 0.49 and 2.42 ± 0.71) ($p < 0.05$). Females have significantly different average stress levels for some of the items higher than male athletes in feel about competing or comparing (3.22 ± 0.44 and 2.55 ± 1.15) ($p < 0.05$) and feeling angry or irritable (3.11 ± 0.78 and 2.25 ± 1.12) ($p < 0.05$). **Conclusion:** From the interpretation of overall stress levels, this study showed that the stress levels of Thai national team athletes with disabilities are at high

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levels. And females have stress levels higher than male athletes but no difference in stress levels at high levels during training camp for participating in qualifier events of the Tokyo 2020 Paralympics Games.

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Keywords: stress; disabilities athletes; training, paralympics



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Comparisons of Pacing Strategy on 500 m, 1000m, 1500m, and 2000m Rowing Ergometer Performance in Thai National Para Rowers

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Nakhon Ratchasima 30000, Thailand*

Abstract

Introduction: The pacing strategy is to manage energy consumption during sporting events. It will affect the competitive performance of athletes. **Purpose:** The purpose of this study is to investigate rowing strategies in 500 meters, 1000 meters, 1500 meters, and 2000 meters to consider differences in rowing variables. **Methods:** Eight Thailand para rowers (male 4, Female 4) took part in the experiment. Each participant performed three 500-m (Thursday), 1000-m (Wednesday), 1500-m (Monday), and 2000-m (Friday) rowing-ergometer tests interspersed by seven days of rest to determine their power output, time, and stroke rate on each distance. **Results:** The results show that the average stroke rate for all distances did not differ. The average power output is highest in 500-m and lowest in 2000-m. Corresponds to the fastest meantime is rowing of 500 meters, the slowest average time is 2000-m. **Conclusion:** Thailand's para-rowing strategy is to row at the same pace for all distances. The acceleration of the boat is caused by increasing the power output. These strategies involve managing the energy consumption in rowing. For short distance 500-m rowing, athletes can apply power at a higher level than 2,000-m because long-distance rowing has less energy and increases fatigue in athletes.

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Keywords: pacing strategy; rowing ergometer; para rowers

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Mental Toughness of Professional Football League Players in Eastern Region of Thailand

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Abstract

This research aimed to study mental toughness of professional football league players in the eastern region of Thailand and to compare the level of mental toughness of professional football league players in the eastern region based on the number of clubs that the players have played for, the experience in professional league football, and the position of the players. The sample group consisted of 73 Thai professional football league players in the eastern in 2020 season. A questionnaire was used as a research instrument. The statistics used for data analysis were comprised of percentage, mean, standard deviation and One Way Analysis of Variance/ ANOVA. The results demonstrated that

1. The overall mental toughness of professional football players in the eastern region was at a high level. When considered individually, it was found that the mental toughness of professional football players in the eastern region in terms of attitude control and positive energy were at a high level. The mental toughness in self-confidence, motivation, control of negative energy, visualization and attention control were at a moderate level.

2. According to the comparison of the level of mental toughness of professional football league players in the eastern region based on the number of clubs that the players have played for, the experience in professional league football, and the position of the players, it was found that the overall mental toughness of professional football players was not different among players with different number of clubs they have played for and the different position of the players. The professional football league players in the eastern region with different professional football league experience had different level of mental toughness in the aspect of visualization. The professional football league players in the eastern region with 1 - 3 years of experience in professional football league competition had significantly different mental toughness level compared to those with 7 - 9 years of experience in professional football league competitions at the .05 level.

Keywords: Mental toughness; Professional football players; Professional football league

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Introduction

In Asia, football is one of the most popular sports among countries with great economic growth such as China. In China, President Xi Jinping has set a public goal for China to become a leading country in football by 2050. Chinese government also established goals that include 30 million children playing sports, 20,000 new football academies, 70,000 football fields, and the development of the Chinese Super League (CSL) which is a professional football league. The league is currently one of the most popular professional sports leagues in China (China Briefing, 2019: Online).

Football in Thailand is the most popular sport in the country and is likely to be able to sustainably become a professional sport (Sports Authority of Thailand, 2017). The Football Association of Thailand under The Patronage of His Majesty The King has launched a 20-year long-term master plan for football. The master plan consists of three main parts. The first part is about organizational management including management within the association, competition and clubs management, the management of supporters, coaches, referees, as well as physicians and sports science for football. The second part is about the development of grassroots and youth management capabilities as well as all football leagues and national teams. These include men's, women's, futsal and beach football. The third part is to create a trend in terms of marketing, masses, fans and media. The 20-year Thai football master plan has been divided into four eras: the foundation era (2017-2021), the development era (2022-2026), the stepping to the world stage era (2027-2031) and the era of sustainability (2032-2036) with the goal of increasing the number of football personnel of the country to 3.8 million and improving the performance of every Thai national team in the next 20 Next year (Football Association of Thailand under Royal Patronage, 2018).

In this regard, there are 3 components which are physical fitness, psychological toughness and sport skills leading to the success of the professional athletes. Physical fitness and athletic skills can be practiced and developed to the maximum and they can be changed more or less depending on various situations. In contrast, psychological toughness can vary more according to the situations. The problem that often arises with most athletes is that they have had good physical training and athletic skills but on the day of the race, they were not as successful as intended. Therefore, mentally preparedness should start at the youth level and gradually develop training until the higher level of competition to achieve automatic learning and implementation of sport psychology not only to increase the chances to achieve athletic success but also to develop morality, ethics and sportsmanship (Department of Physical Education, 2013).

Sport at the highest level is heavily characterized by a demand to excel at superior levels and perform under conditions that are considered extremely demanding and testing (Jones et al., 2007). For this reason, psychological attributes as well as mental skills such as self-confidence and attitude control, two characters intrinsically imbedded in the mental toughness construct, are becoming commonly accepted as major contributors to overcoming adversity and achieving performance success. Mental toughness has gained considerable attention in sport as an important factor for achieving goals in the presence of varying degrees of pressure, adversity or obstacles (Hardy et al., 2014).

According to the importance of science in sports psychology and the growth of the football industry leading to a professional football league competition in Thailand known as the Thai Football League and the studies of related documents and research, it was found that there is a lack of knowledge in relation to the mental toughness of professional football league. As the researcher himself is a staff member of the National Sports University Chon Buri Campus with a mission related to the development of the sports industry especially in the eastern region, a study on mental toughness of professional football players in the eastern region is of interest. The results from the study can be applied both in terms of planning and implementing in professional football. This will benefit the mental performance development of professional football league players in the future.

Research objectives

1. To study the mental toughness of professional football league players in the eastern region.
2. To compare the level of mental toughness of professional football league players in the eastern region based on the number of clubs that the players have played for, the experience in professional league football, and the position of the players.

Scope of the Study

This research aimed to study the mental toughness of professional football league players in the eastern region. The researcher has defined the scope of the study as follows:

1. Scope of Content

In this research, the researcher aimed to study the mental toughness of professional football league players in the eastern region. The variables to be studied are defined as follows:

1.1 The independent variables were the personal factors of professional football league players in the eastern region. The researcher used the Individual differences factors of player and questions from the study of Nicholls et al. (2009) as a guideline in the development of research tools, it can be concluded that personal factors of professional football players league consists of:

- 1) Number of clubs they have played for
- 2) Professional football league experience
- 3) Position of the players

1.2 The dependent variables were the mental toughness of professional football league players

2. Scope of Population

Population used in this research consisted of 90 Thai professional football league players in the eastern region (information as of February 1, 2021).

3. Scope of Area

The location used for data collection was the football clubs participating in professional football league with a field located in the eastern region of Thailand

4. Scope of Duration

Data collection was conducted between February 1, 2021 and February 28, 2021.

Research Conceptual Framework

This research is a quantitative research aiming to study mental toughness of professional football league players in the eastern region of Thailand. According to the review of related documents, theories and research related to mental toughness of athletes, Psychological Performance Inventory (PPI) of Siripong (1997) that was translated to Thai from the Psychological Performance Inventory of Loehr 1986 (cited in Srinonyang, 2009) was used as a guideline to develop the research instrument in this study. Thus, mental toughness consisted of 7 aspects which were self-confidence, negative energy control, concentration control, visualization, motivation, positive energy and attitude control. The conceptual framework for this research is as follows:

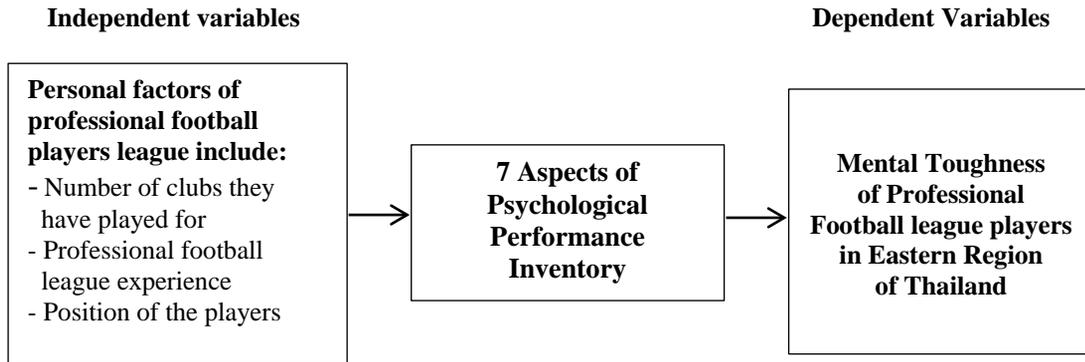


Fig 1. research conceptual framework

Benefits of the Study

Data generated from this research can be a body of knowledge that can be used by football coaches, sports psychologists or people involving with a professional football sports club. The data can be used in planning the mental toughness development of professional football league during training and matches. This will benefit the mental performance development of professional football league athletes in the future.

Research Methodology

This study was a quantitative research. The researcher studied the mental toughness of professional football players in the eastern region of Thailand by performing the following steps:

1. Population and sample

1.1 Population

Population used in this research consisted of 90 Thai professional football league players in the eastern region (information as of February 1, 2021). The data were collected with professional football club teams competing in the highest league of Thailand. (Toyota Thai League: Thai League 1)

1.2 Sample

The sample group used in this research was 73 professional football league football players in the eastern region based on the criteria of Krejcie & Morgan (1970, p. 608). The sample group was selected by stratified random sampling method.

2. Research instruments

The research instrument was Psychological Performance Inventory (PPI) of Siripong (1997) that was translated to Thai from the Psychological Performance Inventory of Loehr 1986 (cited in Srinonyang 2009)

The Psychological Performance Inventory (PPI) can be divided into 2 parts which are as follows:

Part 1 Personal characteristics of the respondents. The questionnaire was a check list and 5 open-ended questions.

Part 2 Psychological Performance Inventory (PPI) consisted of 42 items covering 7 aspects of mental toughness which were self-confidence, negative energy control, attention control, imagery, motivation, positive energy and attitude control. 6 items of the questions were divided for each aspect. The details are as follows:

- 1) Self-confidence was in item number 1, 8, 15, 22, 29, 36
- 2) Negative energy control was in item number 2, 9, 16, 23, 30, 37
- 3) Attention control was in item number 3, 10, 17, 24, 31, 38
- 4) Imagery was in item number 4, 11, 18, 25, 32, 39
- 5) Motivation was in item number 5, 12, 19, 26, 33, 40
- 6) Positive energy was in item number 6, 13, 20, 27, 34, 41
- 7) Attitude control was in item number 7, 14, 21, 28, 35, 42

Rating Scale consisted of 5 levels which are

- 1) Always
- 2) Usually
- 3) Often
- 4) Seldom
- 5) Never

The research classified the questions and gave scores in two ways:

1) Positive questions were scored as 5, 4, 3, 2, and 1, respectively in the item number 4, 5, 6, 7, 8, 11, 12, 13, 15, 17, 18, 19, 21, 22, 25, 26, 27, 28, 29, 32, 34, 35, 36, 37, 39, 41, 42.

2) Negative questions were scored as 5, 4, 3, 2, and 1, respectively in the item number 1, 2, 3, 9, 10, 14, 16, 20, 23, 24, 30, 31, 33, 38, 40.

3. Constructing and Verifying the Research Instrument

3.1 Constructing the research instrument

1) Psychological Performance Inventory was adapted from Psychological Performance Inventory (PPI) of Siripong (1997) that was translated to Thai from the Psychological Performance Inventory of Loehr 1986 (cited in Srinonyang 2009). The quality of the research instrument was examined through Index of Item Objective Congruence by 5 experts. The research had adapted it to suit the context of professional football league.

2) The Psychological Performance Inventory was proposed to 3 experts to examine the validity.

3) The reliability was examined before applying the questionnaire to the respondents.

3.2 Quality examination of the research instrument

1) Validity was examined by proposing the questionnaire to the experts to examine content validity of each item. Face validity of 3 experts was used in the consideration of each item.

2) Reliability or reliability coefficient was examined by applying the questionnaires with 30 athletes of Thailand National Sports University Chon Buri Campus. The scores were then calculated for the Cronbach's Alpha Coefficient to verify the consistency of the measurement results when using this instrument.

The Index of Item Objective Congruence was 0.97 and the validity was at .090.

4. Data Collection

4.1 Data Collection

4.1.1 A letter was sent from Thailand National University Chon Buri Campus to the managers of the targeted football clubs.

4.1.2 The research assistant conducted data collection. The 73 copies of the questionnaire were distributed to the sample group and waited for the questionnaire to be returned immediately.

1) Researcher and research assistant went to the football clubs' training ground of the targeted group in the research 2 hours before the training session began.

2) Researcher and research assistant prepared the questionnaire and set up data collection area which was an empty space near the changing room.

3) Researcher and research assistant distributed the questionnaires to the football players and waited for the returned questionnaires immediately.

4.2 Data Management

4.2.1 When the questionnaires were returned, they were checked and assigned a score based on each item's weight to be analyzed by statistical method with a computer program.

4.2.2 The calculation results were analyzed according to the objectives of study.

5. Data Analysis

5.1 The data collected from the Part 1 questionnaire on the personal characteristics of the respondents were the name of the club, the number of the clubs the respondent played for, experience in professional football leagues, and the position they played. Descriptive statistics were comprised of frequency, percentage and mean.

5.2 The data collected from Part 2 of the questionnaire which was the measurement of mental toughness for professional football league in the eastern region. The data were analyzed using descriptive statistics including mean and standard deviation.

5.3 The comparison of the level of mental toughness of professional football league player in the eastern region based on the number of clubs that the players have played for, the experience in professional league football, and the position of the players was analyzed by One Way Analysis of Variance/ ANOVA. When a statistically significant difference was found at the .05 level, the double mean was compared with the LSD method.

Note: This research project was considered by the Research Ethics Committee and was licensed under the Certificate No. TNSU.063/2563.

Results

1. The sample group used in this study consisted of 73 professional football league players with the average age of 25.78 years old. 16.44 percent of the respondents used to play for one team in the professional football league. 26.03 percent of the respondents played for 2 - 3 teams in the professional football league. 26.03 percent of the respondents played for 4 - 5 teams in the professional football league. Last but not least 31.50 percent of the respondents played for more than 6 teams in the professional football league. In addition to this, 38.35 percent of the respondents had 1-3 years of experience in playing professional football. 27.40 percent of the respondents had 4-6 years of experience in playing professional football. 15.07 percent of the respondents had 7-9 years of experience in playing professional football. 19.18 percent of the respondents had more than 10 years of experience in playing professional football. In terms of position of the players, 12.33 of the respondents played as a goalkeeper. 32.88 percent of the respondents played as a defender. 42.46 percent of the respondents played as a midfielder. 12.33 percent of the respondents played as a forward.

Table 1. Mean, Standard Deviation, and Level and Mental Toughness Ranking of the Professional Football league Players in the Eastern Region of Thailand (n = 73)

Mental Toughness	Mean	SD	Level	Ranking
1. Self-confidence	3.49	1.14	Moderate	3
2. Negative energy control	3.35	1.09	Moderate	5
3. Attention control	3.29	1.10	Moderate	7
4. Imagery	3.30	1.13	Moderate	6
5. Motivation	3.48	1.15	Moderate	4
6. Positive energy	3.64	1.05	High	2
7. Attitude control	3.72	1.07	High	1
Total	3.47	1.12	Moderate	

2. According to Table 1, it was found that the overall mental toughness of professional football players in the eastern region was at a high level (Mean = 3.47, SD = 1.12). The mental toughness of professional football players in the eastern region in terms of attitude control and positive energy were at high level (Mean = 3.72, SD = 1.07) and (Mean = 3.64, SD = 1.05) respectively. Self-confidence, negative energy control, imagery and attention control aspects were at the moderate level.

3. The overall mean of the mental toughness of professional football players in the eastern region classified by the number of clubs that they players have played for was at the moderate level (Mean = 3.38, SD = 1.15). When each aspect of the mental toughness was considered, most of the aspects were in the moderate level. The mental toughness in attitude control was the highest (Mean = 3.72, SD = 1.12).

The professional football league players in the eastern region who played for 2 - 3 clubs had a moderate level of overall mental toughness (Mean = 3.43, SD = 1.08). When each aspect of the mental toughness was considered, most of the aspects were in the moderate level. The mental toughness in attitude control was the highest (Mean = 3.67, SD = 1.09).

The professional football league players in the eastern region who played for 4 - 5 clubs had a high level of overall mental toughness (Mean = 3.56, SD = 1.14). When each aspect of the mental toughness was considered, most of the aspects were in the moderate level. The mental toughness in attitude control was the highest (Mean = 3.87, SD = 0.96).

The professional football league players in the eastern region who played for more than 6 clubs had a moderate level of overall mental toughness (Mean = 3.47, SD = 1.11). When each aspect of the mental toughness was considered, most of the aspects were in the moderate level. The mental toughness in attitude control was the highest (Mean = 3.64, SD = 1.13).

According to the results of a One Way Analysis of Variance (ANOVA) analysis to compare the mental toughness of professional football league players in the eastern region classified by the number of clubs they have played for, it was discovered that the professional football league players in the eastern region with the different number of clubs they have played for did not have different mental toughness ($P = 0.660$). Moreover, the mental toughness in each aspect did not show any differences.

4. The mean of mental toughness of professional football players in the eastern region with 1 – 3 years of experience was at the moderate level (Mean = 3.42, SD = 1.08). When each aspect of the mental toughness was considered, most of the aspects were in the moderate level. The mental toughness in attitude control was the highest (Mean = 3.72, SD = 1.04).

The mean of mental toughness of professional football players in the eastern region with 4 – 6 years of experience was at the high level (M = 3.51, SD = 1.07). When each aspect of the mental toughness was considered, most of the aspects were in the moderate level. The mental toughness in attitude control was the highest (Mean = 3.81, SD = 1.01).

The mean of mental toughness of professional football players in the eastern region with 7 – 9 years of experience was at the high level (Mean = 3.52, SD = 1.19) When each aspect of the mental toughness was considered, most of the aspects were in the high level. The mental toughness in positive energy was the highest (Mean = 3.70, SD = 1.08).

The mean of mental toughness of professional football players in the eastern region with more than 10 years of experience was at the moderate level (Mean = 3.45, SD = 1.19) When each aspect of the mental toughness was considered, most of the aspects were in the high level. The mental toughness in attitude control was the highest (Mean = 3.71, SD = 1.16).

The results of a One Way Analysis of Variance (ANOVA) analysis to compare the mental toughness of professional football league players in the eastern region classified by professional football league experience demonstrated that the professional football players in the eastern region with differences in years of experience in playing for the professional football league did not have different level of mental toughness

($P = 0.841$). When each aspect of the mental toughness was considered, the difference of mental toughness in imagery was found (P -value = 0.042). The mental toughness in imagery of players with 1 – 3 years of experience in professional football league was different from those with 7 – 9 years of experience with statistical significance at the .05 level.

5. The mean of mental toughness of professional football players who played as a goalkeeper was at the moderate level (Mean = 3.36, SD = 1.02). When each aspect of the mental toughness was considered, most of the aspects were in the moderate level. The mental toughness in self-confidence was the highest (Mean = 3.63, SD = 1.17).

The mean of mental toughness of professional football players who played as a midfielder was at the moderate level (Mean = 3.47, SD = 1.13). When each aspect of the mental toughness was considered, most of the aspects were in the moderate level. The mental toughness in attitude control was the highest (Mean = 3.70, SD = 1.15).

The mean of mental toughness of professional football players who played as a forward was at the high level (Mean = 3.54, SD = 1.08). When each aspect of the mental toughness was considered, most of the aspects were in the high level. The mental toughness in positive energy was the highest (Mean = 3.76, SD = 1.04).

The results of a One Way Analysis of Variance (ANOVA) analysis to compare the mental toughness of professional football league players in the eastern region classified by the position of the players demonstrated that the professional football players in the eastern region with different position did not have different level of mental toughness ($P = 0.810$). When each aspect of the mental toughness was considered, the differences were not detected.

Discussion

Mental toughness is one of the key qualities of any successful athlete. The training for the development of mental toughness for athletes requires a period of practice. Moreover, an importance should be placed on promoting motivating atmosphere such as providing fun training activities that the athletes can do. Individual differences in areas such as skill level, age, experience from both inside and outside the professional football field as well as people involving with the athletes such as parents, brothers, friends, trainers and sports psychologist play an important role (Department of Physical Education, 2015).

Our findings showed the mental toughness in attitude control was the highest mean. We consider, it was found that the values or the perspective of the players were more professional because the football league in Thailand has become more professional. Playing football became a professional career. Thus, professional football league players are cultivated to have a positive attitude from training in the academy to competing in the professional league. Controlling their thoughts and attitude seriously and regularly allows the players to have positive attitude leading to the success. In addition to this, the athletes can reduce their fears and anxiety in competition or other situations that can cause stress.

When considering the mental toughness of professional football players in the Eastern region in term of positive energy control, the professional football players should focus on the emotion than the skill to perform and thus learn to exert control over positive energies. Benefits from having positive energy controlling, are likely to cause the result in positive competition outcomes. The findings also supported Gucciardi et al. (2009) process model of mental toughness. A winning mentality and desire was identified as a key attribute for mentally tough soccer players in addition to other previously reported qualities such as self-belief, physical toughness, work ethic/ motivation, and resilience.

According to the analysis of variance was used to compare the mental toughness of professional football league players in the eastern region of Thailand categorized by experience in professional football league, the

results revealed that the mental toughness in imagery was different. The professional football league players with 1 - 3 years of experience in professional football league had different mental toughness in imagery from those with 7 - 9 years of experience in professional football league with statistical significance at the .05 level. This is consistent with a Johns (2011) who found that professional athletes were mentally stronger than novice athletes. This showed that the difference of the athletes in terms of experience affected the mental toughness development of each athlete. Those players with more experience can better picture the competition clearer than those with less experience.

A mentally strong athlete has to meditate or stay calm. Athletes who have practiced mental toughness can compete in any competition. They also have lower level of anxiety than others. Moreover, they have a greater sense of self-confidence and are confident that they are in control of their own destiny (Clough et al., 2002). To strengthen the mentality of professional football league players, trainers must strive to encourage athletes to have two key attributes which are independence and tact through a challenging learning environment. More importantly, the attention must be paid to the psychological development of the young athlete along with the development of other elements such as technical skills or physical condition (Cook et al., 2014).

Mental toughness can be learned. They are not born or inherited. Both athletes and trainers can make it happen, so it is important to recognize and understand that mental reinforcement can happen on our own. As with physical strength and athletic skills, the players only need to know how to strengthen their mind and practice it regularly. Strengthening the mind requires five factors which are adaptation to training., consistent training, effective training, responsibility and team support (Anthony, Gordon & Gucciardi., 2020). For this reason, coaches play an important role in shaping the experience of athletes in sporting events and creating a skill training model that is consistent with the competition. It is especially important for athletes to develop the mental and physical components needed to overcome obstacles and maintain competitive standards (Hunt et al., 2014).

Suggestion for Research Application

1. According to the results, it can be seen that the lowest mental toughness of the professional football league players in the eastern region of Thailand was concentration control. Football clubs therefore need to take this information into consideration in developing a mind training program that is tailored to individual athletes. Considering the competitive context of the professional football league in Thailand, it is found that the tournament management does not compel a sports psychologist as part of the coaching team. Moreover, most of the football clubs focus on physical fitness and competitive training. Thus practicing mental skills or the mental strengthening of professional football league players is not a key component of a training plan. When an athlete's mental stamina is important and has a direct impact on physical fitness and athletic skills, football clubs need to encourage mental training for the athletes as a key mechanism in the success of professional sports and prepare the team for various football matches in the future.

2. Various football sports clubs can use the knowledge from this research as a guideline to study the mental toughness of the football players of their team to obtain specific information of the club's context. This will provide information for the planning, organizing of training programs and appropriate long-term psychological care for each athlete..

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Foreign Spectators' Satisfaction towards Service Quality of Thai Boxing Stadium in Bangkok

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Abstract

Thai boxing (Muay Thai) is the most popular cultural sport in Thailand. Thai boxing has been very popular among foreign tourists because of the Thai boxing world competition. "THAI FIGHT" occurred in 2010 both within the country and abroad making both Thai and foreigners interested in Thai boxing. This study was composed of two objectives: 1) to investigate foreign spectators' satisfaction towards service quality of Thai boxing stadium in Bangkok including Rajadamnern and Lumpinee boxing stadiums; 2) to compare foreign spectators' satisfaction towards service quality between Rajadamnern and Lumpinee boxing stadiums.

The factor of service quality consisted of five dimensions including 1) tangibility 2) reliability 3) responsiveness 4) assurance and 5) empathy. Descriptive and inferential statistics were applied by using the Mann-Whitney U Test. The survey questionnaire was used as a tool for data collection with 400 foreign spectators.

It was found that the first priority of foreign spectator's satisfaction was the responsiveness of service quality in Lumpinee and the reliability of service quality in Rajadamnern. The mean value of foreign spectators' satisfaction towards the responsiveness of service quality and assurance of service quality in Lumpinee was found to be significantly higher than those in Rajadamnern. However, the mean value of foreign spectators' satisfaction towards tangibility of service quality and reliability of service quality in Rajadamnern was found to be significantly higher than those in Lumpinee. Finally, the mean value of foreign spectators' satisfaction towards empathy of service quality in Lumpinee was the same as those in Rajadamnern.

The outcome of this study was beneficial for the stadium managers as it can help to improve their service quality in order to satisfy foreign spectators' satisfaction. Possibly, this may help them to achieve the goal of sport tourism income.

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Keywords: Thai boxing; Service quality; Satisfaction; Foreign Spectators

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1. Introduction

Tourism is an activity that has existed since ancient times to the present. Any place or city with great advancement in technology, convenient transportation, and uniqueness will make that place popular with tourists (Nikom Charumanee, 2001).

There are many objectives for the individual to travel, for example, business trip, seminar, vacation, education, visiting relatives, and cultural exchanges, etc. (Ministry of Tourism and Sports, 2006).

Nowadays, the tourism industry of Thailand plays a very important role in the national economy. In Thailand, there is a wide variety of natural resources and environments including river, sea, mountain, waterfalls, forest, and wildlife. In addition, a unique culture that has been passed down from generation to generation can be seen across the country. Many tourists come to see and get involved with various Thai arts and culture such as tasting and learning to cook Thai food, participating in traditional activities like Thai dance, learning about Thai arts and culture, especially, the art of Mae Mai Muay Thai (Thai Boxing) (Napaphat Chusuwan, 2017). This has made tourism in Thailand attracting foreigners all over the world to visit throughout the year (Ministry of Tourism and Sports, 2019).

Each year, tourism generates trillion baht in revenue for the country. In 2018, there were 38.27 million foreign tourists, and total tourism revenues reached 2 trillion baht (Ministry of Tourism and Sports, 2019). Tourism development has been a shortcut to the country's economic development in the past 4-5 years. In some years, the growth of tourism is half of the economic growth of Thailand.

Most foreign tourists come to travel to some specific provinces such as Bangkok, Phuket, Chonburi, Chiang Mai, Surat Thani and Krabi. Total tourist income generated in Bangkok and Phuket represents half of the total tourist income from Thai and foreign tourists (Tourism and Thai economy, 2018).

Most of the tourists visiting Thailand are young Chinese tourists who prioritize their experiences rather than price. Therefore, focusing on quality of service is the only choice to give these people the best experience (Tourism Authority of Thailand, 2012).

Service quality plays an important role in creating a good impression on foreign visitors. When the needs of the customer/tourist are met, satisfaction and impression will arise (Prakong Phanichakul, 2010). When tourists come to visit and get a good impression or a certain level of satisfaction, they are likely to tell others and revisit the same place/service. These will help the country build its reputation and generate huge income (Chaiwat Chaisiriporn, 2015)

Sport can greatly stimulate the tourism economy. The sports industry drives the economy and generates huge income for the country. Many countries use sports as a tool for economic development. The success of national sports can also show the potential of that country very well. The economy today is most likely to be stimulated by various advertising invitations, travel season, and sports events/news. Over the years, there have been many tourists traveling to a sporting event both as a spectator and as a player (Moneyhub, 2019).

Sports spectators, both Thai and foreigners, are the key factors for the high growth of the Spectators Sport type, resulting in high business income (Chen, Lin & Chiu, 2013). The spectator is especially important for professional sports because the decrease in the Thai and foreign spectator will affect the income of the sports team. Therefore, amidst the competition and the growth of professional sports, various sports teams, both football and basketball, strive to improve the quality of the event to attract the target audience (Byon, Zhang & Connaughton, 2010).

Muay Thai is regarded as one of the cultural tourism. Nowadays, Muay Thai is becoming more and more popular among foreign tourists since the Thai Fight is held in many countries, causing foreigners to know more about Muay Thai and lots of them coming to see the competition. In Thailand, The tournament of Max Muay happens every day to perform shows for both Thai and foreign tourists who come with/without tour companies (Napaphat Chusuwan, 2017).

According to literature review, it is found that the Muay Thai competition is of great interest to foreign tourists. There is research on the Satisfaction of organizing Muay Thai competition in the eyes of foreigners towards the management of Fairtex Thepprasit Pattaya Boxing Stadium (Chainat Hanwiset, 2011). The result

shows that satisfaction of the audience is at a moderate level, which was considered as not a very good level.

To date research shows that exploring the satisfaction of foreign spectators in terms of service quality in boxing stadiums was still limited. This research, therefore, aims to study the satisfaction of foreign spectators towards service quality of Thai boxing stadium in Bangkok in order to know the satisfaction level regarding the service quality which would be useful for the event managers in planning strategies. This can lead to the improvement of the competition and to achieve a better level of satisfaction of foreign spectators.

Hypotheses

- Hypothesis 1: There are statistically significant differences in satisfaction towards service quality between Lumpinee and Rajadamnern boxing stadiums in terms of tangibility.
- Hypothesis 2: There are statistically significant differences in satisfaction towards service quality between Lumpinee and Rajadamnern boxing stadiums in terms of reliability.
- Hypothesis 3: There are statistically significant differences in satisfaction towards service quality between Lumpinee and Rajadamnern boxing stadiums in terms of responsiveness.
- Hypothesis 4: There are statistically significant differences in satisfaction towards service quality between Lumpinee and Rajadamnern boxing stadiums in terms of assurance.
- Hypothesis 5: There are statistically significant differences in satisfaction towards service quality between Lumpinee and Rajadamnern boxing stadiums in terms of empathy.

2. Literature review

2.1 Service quality

Service quality is defined as service provided that exceeds or meets the expectations of the customer, which is an assessment or opinion about the service excellence in the overall perception dimension (Parasuraman, Zeithaml & Berry, 1985). Moreover, Service quality is referred to as the difference between a customer's expectations of service and perception towards the actual service (Parasuraman, Zeithaml & Berry, 1988). Service quality is defined in this study as the ability to respond to tourists needs to effectively meet the expectations of the tourists, at the same level or higher when they visit boxing stadium.

The quality of service is a complex issue that depends on the perception of consumers that is commonly called "customers" (Buzzell & Gale, 1987). The quality of the service is based on the expectations of the customer, which may have different criteria of expectation and may result in different preferences. The quality of service can be measured using a measuring tool called SERVQUAL by dividing the service quality into 5 dimensions: 1) Tangibility 2) Reliability 3) Responsiveness 4) Assurance and 5) Empathy (Parasuraman, Zeithaml & Berry, 1985). This is consistent with Ladda Vatjanasaregagul (2007) who explains that service quality, in aspect of marketing, is an important issue because service quality is a key factor for service success. The quality service is the customer's perception of service in comparison with the customer's expectations for that particular service. If the customer's perception is greater than or equal to the customer's expectations, the quality of the service will be recognized. However, if the perception of the customer is lower than the customer's expectations, the quality of that service will be unacceptable. To measure the quality of service, SERVQUAL is commonly used as a measurement tool.

Many scholars have explore the linkage between service quality and satisfaction. First, Jittapat Prompong (2015) studied the factors affecting customer satisfaction at Suvarnabhumi Airport in terms of service quality with 200 foreigners. It was found that most of the respondents were from Europe, Asia, ASEAN and Australia. The research revealed that most of them were highly satisfied with hotels, restaurants and shopping malls, indicating that these services had a high quality standard. In contrast, trains, buses, and taxis received a low level of satisfaction indicating that these services are substandard. The results also showed that large-scale businesses that provided a good standard of service and work assessment received a high level of

satisfaction, but businesses with substandard service and without work assessment received a low level of satisfaction. Second, Apiwut Tangjitkaroon (2004) examined service quality affecting satisfaction and decision to use the service of True Internet Co., Ltd customers in Bangkok. The results showed that quality of service in terms of tangibility, reliability, speed (of the internet), warranty, and individual customer care (empathy) influenced satisfaction and decision-making in using the Internet service. Besides, the most essential factor was reliability. Last, Pornprapa Chaianukool (2014) investigated service quality of tourist attractions affecting satisfaction of Thai tourists in Suan Phueng District, Ratchaburi province. It was found that the respondents were very satisfied with overall service quality factors. The factors with the highest level of satisfaction were found in responsiveness, empathy, reliability, and assurance respectively.

2.2 Satisfaction

Satisfaction is defined as a concept of human feelings that has two types of feelings: positive feelings and negative feelings. Positive feelings induce happiness. Happiness is a feeling of complex mystery. It affects a person more than other positive feelings (Shelly, 1975). This is similar to Tayaramon Jirapisaisuk (2015) who defines satisfaction as a person's attitude or feelings about the mind, the emotion that a person has intangible about something. Satisfaction is also a positive feeling of a person, arising from the anticipation of what has been experienced or has already been able to satisfy that person's needs. Satisfaction is the level of feeling of a person. This is the result of a comparison between the expectations of the person and the perception receiving from the service. Satisfied can be divided into three levels: dissatisfied, satisfied, and highly satisfied (Kotler (1997). The incentives that can be used as a means to stimulate a person's satisfaction include: material inducement, desirable physical condition, ideal benefaction, and social attractiveness (Kanit Duanghasdee, 1995). It can be concluded that the individual's satisfaction arises from the mind and emotions of the individual with their expectations of something that which may change over time. Feelings can change according to various situations they are encountered. In the field of sports management, regardless of the type, it is the organizers' duty to satisfy the participants/spectators.

Phawadee Boontham (2014) investigates the users' satisfaction with the indoor fitness center of the Sports Authority of Thailand in 3 aspects: personnel, exercise equipment, and management with 400 samples. The results indicated that the overall satisfaction of the users of is at a high level, accounting for 43.03 %, followed by the highest level, representing 39.95 %. When considered separately, it was found that satisfaction of users towards the service, including personnel, exercise equipment, and management were at the high level, accounting for 41.87 %, 44.11 %, and 43.20 %, respectively.

2.3 Muay Thai (Thai boxing) Principle

The word boxing is defined as a fight with a fist, but “Muay Thai” is a boxing sport where the rules allow a partner to punch their feet, elbows and knees (Royal Institute, 1982). Similarly, Charin Thaneerat & Prasart Sa-nga-silpa (1979) describes that “Muay Thai” is a martial art and self-defense which is different from boxing. In addition to punching an opponent, it can also be used for other parts of the body such as feet, knees and elbows.

Muay Thai has evolved from a form of fighting art in the face of war foes in the past until it became an amateur and professional sport. In Thailand, there are two major organizations governing this sport, namely the Amateur Muay Thai Association of Thailand and the Professional Boxing Association of Thailand. There are three main objectives for hosting Muay Thai competition: 1) for excellence 2) for business in terms of art and 3) for entertainment.

In the field of education, Muay Thai has been an activity for teaching and learning both secondary and tertiary levels, especially in institutions producing physical education teachers.

Muay Thai has now become an international sport when Japan has adapted it to kickboxing. Moreover, many countries in Europe and North America have a Muay Thai training bureau taught by Thai trainers and organize competitions among Muay Thai athletes; and among Muay Thai and other types of fights in different countries of those regions (Mongkol Kammuang, 1989).

Chainat Hanwiset, (2011) who explored the satisfaction of foreign visitors towards management in Fairtex Thepprasit, Pattaya boxing stadium found that the factor with the most satisfactory level was facilities and safety, while the least satisfactory factor was personnel. The satisfaction of foreign visitors with stadium management was not significantly different in terms of gender, age, occupation, and ethnicity.

3. Research methodology

3.1 Population and Samples

The population was foreign spectators who visited Lumpinee boxing stadium and Rajadamnern boxing stadium to see the competition of Thai boxing in 2019. The samples of the study was 400 foreign spectators aged 20 years and older who visited Lumpinee boxing stadium (n=200) and Rajadamnern boxing stadium (n=200) in 2019. The respondents were required to be fluent in English.

3.2 Item development

The research tool of this research was a questionnaire that was applied from the theoretical concepts and related research papers (Parasuraman, Ziethaml & Berry, 1985; Kouthouris & Alexandris, 2005). The questionnaire is consisted of two sections. The first section was about demographics including gender, education, occupation and country of residences. The second section was about the satisfaction of foreign spectators towards service quality of Thai boxing stadiums including five dimensions: 1) Tangibility 2) Reliability 3) Responsiveness 4) Assurance 5) Empathy. A 5-Point Likert scale was used to rate satisfaction (agreement) level. The scores meanings were represented ranging from (5) 'strongly agree' (4) 'Agree' (3) 'Neither agree nor disagree' (2) 'Disagree' to (1) 'Strongly disagree'.

In order to investigate the content validity of the questionnaire, all items of the questionnaire were assessed by three experts using the index of item objective congruence (IOC). If the IOC score ranges from 0.5 to 1.00, meaning that the item has good content validity (Hair, Black, Babin, & Anderson, 2014). The IOC score result appeared at 0.80 which met the criteria.

Then, the revised questionnaire was incorporated and transformed into the pilot instrument in order to measure the reliability (internal consistency). The pilot study involved two steps. First, the questionnaire was conducted from 30 representatives, who were not the actual samples. Second, the data collecting from preliminary samples were taken to the Cronbach's Alpha Coefficient calculation (Hair et al., 2014). The Cronbach's Alpha Coefficient score turned out at 0.968 which met the criteria of the reliability (≥ 0.70).

3.3 Data collection

The questionnaire was distributed to 400 foreign spectators who visited Lumpinee boxing stadium (n=200) and Rajadamnern boxing stadium (n = 200) in 2019. The technique of convenience sampling was applied in this study. The process of screening question was used to test whether they can speak English or not before collecting the data (Arunee Viriyajittra et al., 2012). The process of data collection took a total of one month.

3.4 Data Analysis

After data collection, the researcher carefully checked the completeness of all data. First, all data of demographics were analyzed by frequency and percentage. Second, all data of the satisfaction of foreign

spectators towards service quality were analyzed by Mean (\bar{X}) and Standard Deviation (S.D.), Moreover, independent t-test was used to test the differences of the satisfaction towards service quality between Lumpinee boxing stadium and Rajadamnern boxing stadium of all five hypotheses. The results were presented in a tabular format with messages.

4. Results

4.1 Demographics

It appeared that 73.75 % of respondents were male (n=295), and 26.25 % were female (n=105). It was also found that 30.25 % of respondents were aged 26 – 30 years (n=112), 28.00 % were aged 31 – 35 years (n=112), and 21.50 % of were aged 21 – 25 years (n=86). Most of the spectators work as government officials (42.50 %, n=170), 28.00 % were office workers (n=112), and 17.50 % were business owners/freelancers (n=70) respectively. As for the education, 65.00 % of them had the bachelor's degree (n=260), 20.5 % had the master's degree (n=81), and 10.75 % were undergraduates (n=43). As for the country of residences, most of them came from England (31.25 %, n=125), 17.50 % came from France (n=70), and 14.25 % came from Germany (n=57).

Most of the respondents received Thai Boxing information from Radio/ Television (38 %), followed by internet (27.00 %), and friends (13.00%) respectively. The majority of them thought that the most benefits they gained from Thai boxing was entertainment (52.00 %), followed by learning martial arts of Thailand (23.00 %), and learning about Thai culture (17.00 %) respectively. Furthermore, the results showed that 86.00 % of tourists traveled to the boxing stadiums using public transportation, like bus, electronic train, and taxi, followed by car (14 %).

4.1 Service Quality

Table 1 The results of Mean (\bar{x}) and standard deviation (S.D.) regarding satisfaction towards tangibility of service quality

Tangibility of Service Quality	Lumpinee (n = 200)		Rajadamnern (n = 200)		F	p-value
	\bar{x}	S.D.	\bar{x}	S.D.		
1. Boxing Stadium equipment and facilities.	4.15	0.82	4.01	0.81	2.91	0.7
2. Communication ability and English language proficiency of the intendants and the ring announcer.	3.9	0.74	3.89	0.78	0.03	0.93
3. Parking area is convenient and secure.	3.85	0.78	3.63	0.86	7.05	0.02*
4. The performance of staff at the entrance and the exit.	3.94	0.75	4.13	0.75	6	0.01*
5. Security system in attending in the boxing.	3.92	0.81	4.14	0.77	7.68	0.00*
6. A location with easy access.	3.87	0.82	4.18	0.75	14.84	0.00*

Note: * Significant at $p \leq 0.05$ (Mann - Whitney U test)

Table 1 shows that there are statistically significant differences (p -value ≤ 0.05) between both boxing stadiums in four items including No.3 Parking area is convenient and secure (p -value=0.02; Lumpinee \bar{x} =3.85, SD=0.78; Rajadamnern \bar{x} =3.63, SD=0.86), No4. The performance of staff at the entrance and the exit (p -value=0.01; Rajadamnern \bar{x} =4.13, SD=0.75; Lumpinee \bar{x} =3.94, SD=0.75), No.5 Security system in attending in the boxing (p -value=0.00; Rajadamnern \bar{x} =4.14, SD=0.77; Lumpinee \bar{x} =3.92, SD=0.81), and No.6 A location with easy access (p -value=0.00; Rajadamnern \bar{x} =4.18, SD=0.75; Lumpinee \bar{x} =3.87,

SD=0.82). However, there are no statistically significant differences ($p\text{-value}>0.05$) between both boxing stadiums in two items including No.1 Boxing Stadium equipment and facilities, and No.2 Communication ability and English language proficiency of the intendants and the ring announcer.

Table 2 The results of Mean (\bar{x}) and standard deviation (S.D.) regarding satisfaction towards reliability of service quality

Reliability of Service Quality	Lumpinee (n = 200)		Rajadamnern (n = 200)		F	p-value
	\bar{x}	S.D.	\bar{x}	S.D.		
1. Staff inspect weapons and hazardous materials before enter the stadium.	3.94	0.77	4.08	0.84	3.18	0.05*
2. There is a sufficient amount of medical team.	3.96	0.82	4.01	0.75	0.32	0.58
3. Seats are comfortable and reasonably spacious.	3.99	0.75	3.97	0.82	0.06	0.99
4. Properties are safety and convenience.	3.99	0.78	4.02	0.7	9.47	0.00*
5. There are signs that clearly indicate the	4.09	0.76	4.21	0.8	2.13	0.09

Note: * Significant at $p \leq 0.05$ (Mann - Whitney U test)

Table 2 shows that there are statistically significant differences ($p\text{-value} \leq 0.05$) between both boxing stadiums in two items including No.1 Staff inspect weapons and hazardous materials before enter the stadium ($p\text{-value}=0.05$; Rajadamnern $\bar{x}=4.08$, $SD=0.84$; Lumpinee $\bar{x}=3.94$, $SD=0.77$), and No.4 Properties are safety and convenience ($p\text{-value}=0.00$; Rajadamnern $\bar{x}=4.02$, $SD=0.70$; Lumpinee $\bar{x}=3.99$, $SD=0.78$).

The other three items are found to have no statistically significant differences ($p\text{-value}>0.05$) between both boxing stadiums including No.2 There is a sufficient amount of medical team, No.3 Seats are comfortable and reasonably spacious, and No.5 There are signs that clearly indicate the location, such as toilets, emergency exit, etc.

Table 3 The results of Mean (\bar{x}) and standard deviation (S.D.) regarding satisfaction towards responsiveness of service quality

Responsiveness of Service Quality	Lumpinee (n = 200)		Rajadamnern (n = 200)		F	p-value
	\bar{x}	S.D.	\bar{x}	S.D.		
1. Staff response your request promptly.	4.06	0.7	4.03	0.66	0.19	0.59
2. Staff response your request for food and beverage.	4.03	0.82	3.9	0.77	2.84	0.05*
3. Staff response your request for ticket sale.	4.16	0.75	3.93	0.74	9.32	0.00*
4. Staff response your request with kind and neat.	4.02	0.75	3.98	0.79	0.33	0.68
5. Staff in boxing stadium willing to help you	4.05	0.79	3.96	0.78	1.29	0.26

Note: * Significant at $p \leq 0.05$ (Mann - Whitney U test)

Table 3 shows that there are statistically significant differences ($p\text{-value} \leq 0.05$) between both boxing stadiums in two items including No.2 Staff response your request for food and beverage ($p\text{-value}=0.05$; Lumpinee $\bar{x}=4.03$, $SD=0.82$; Rajadamnern $\bar{x}=3.90$, $SD=0.82$) and No.3 Staff response your request for ticket sale ($p\text{-value}=0.00$; ($p\text{-value}=0.05$; Lumpinee $\bar{x}=4.61$, $SD=0.75$; Rajadamnern $\bar{x}=3.93$, $SD=0.74$).

The other three items are found to have no statistically significant differences ($p\text{-value}>0.05$) between both boxing stadiums including No.1 Staff response your request promptly, No.4 Staff response your request with kind and neat, and No.5 Staff in boxing stadium willing to help you.

Table 4 The results of Mean (\bar{x}) and standard deviation (S.D.) regarding satisfaction towards assurance of service quality

Assurance of Service Quality	Lumpinee (n = 200)		Rajadamnern (n = 200)		F	p-value
	\bar{x}	S.D.	\bar{x}	S.D.		
1. Staff communicate English effectively language.	4.00	0.74	3.83	0.8	4.78	0.03*
2. Boxer bound is suitable matching and exciting for you.	3.92	0.77	4.03	0.86	1.62	0.07
3. The boxing stadium meet international standard.	3.93	0.8	4.00	0.85	0.71	0.25
4. Food service is adequate and clean.	3.97	0.79	3.46	0.87	36.88	0.00*
5. Staff for information have knowledge and ability to answer your question.	4.04	0.79	3.98	0.78	0.57	0.47

Note: * Significant at $p \leq 0.05$ (Mann - Whitney U test)

Table 4 shows that there are statistically significant differences ($p\text{-value} \leq 0.05$) between both boxing stadiums in two items including No.1 Staff communicate English effectively language ($p\text{-value}=0.03$; Lumpinee $\bar{x}=4.00$, $SD=0.74$; Rajadamnern $\bar{x}=3.83$, $SD=0.80$) and No.4 Food service is adequate and clean. ($p\text{-value}=0.00$; ($p\text{-value}=0.00$; Lumpinee $\bar{x}=3.79$, $SD=0.79$; Rajadamnern $\bar{x}=3.43$, $SD=0.87$).

The other three items are found to have no statistically significant differences ($p\text{-value}>0.05$) between both boxing stadiums including No.2 Boxer bound is suitable matching and exciting for you, No.3 The boxing stadium meet international standard, and No.5 Staff for information have knowledge and ability to answer your question.

Table 5 The results of Mean (\bar{x}) and standard deviation (S.D.) regarding satisfaction towards empathy of service quality

Empathy of Service Quality	Lumpinee (n = 200)		Rajadamnern (n = 200)		F	p-value
	\bar{x}	S.D.	\bar{x}	S.D.		
1. Staff service with individual attentiveness.	4.09	0.76	4.07	0.77	0.1	0.81
2. Staff service with care.	4.02	0.75	4.01	0.71	0.01	0.92
3. Staff understand spectators' needs.	4.05	0.85	4.07	0.75	0.06	0.94
4. Internal service of the boxing stadium.	4.03	0.77	3.93	0.81	1.57	0.25
5. Participation in the boxing stadium.	4.01	0.77	4.11	0.78	1.64	0.12

Note: * Significant at $p \leq 0.05$ (Mann - Whitney U test)

Table 5 shows that there are no statistically significant differences (p -value >0.05) between both boxing stadiums of all five items including No.1 Staff service with individual attentiveness, No.2 Staff service with care, No.3 Staff understand spectators' needs, No.4 Internal service of the boxing stadium, and No.5 Participation in the boxing stadium.

Table 6 The results of Mean (\bar{x}) and standard deviation (S.D.) regarding satisfaction towards service quality between Lumpinee and Rajadamnern boxing stadiums

Service Quality	Lumpinee (n = 200)		Rajadamnern (n = 200)		F	p-value
	\bar{x}	S.D.	\bar{x}	S.D.		
1. Tangibility	3.94	0.57	4	0.49	1.08	0.5
2. Reliability	3.99	0.55	4.1	0.55	3.44	0.12
3. Responsiveness	4.06	0.58	3.96	0.56	3.41	0.03*
4. Assurance	3.97	0.59	3.86	0.6	3.54	0.06
5. Empathy	4.04	0.6	4.04	0.53	0	0.69

Note: * Significant at $p \leq 0.05$ (Mann - Whitney U test)

Table 6 shows that that there are statistically significant differences (p -value ≤ 0.05) only in the dimension of responsiveness (p -value=0.03). The mean value of satisfaction towards service quality of Lumpinee boxing stadium was higher than Rajadamnern boxing stadium ($\bar{x}=4.06$, SD=0.58).

Furthermore, there are no statistically significant differences (p -value >0.05) in the other four dimensions which comprised tangibility, reliability, assurance, and empathy.

5. Discussion

The comparison results in satisfaction towards service quality between Lumpinee boxing stadium and Rajadamnern boxing stadium found that there were statistically significant differences (p -value ≤ 0.05) only in the dimension of responsiveness (p -value=0.03). The mean value of satisfaction towards service quality of Lumpinee boxing stadium was higher than Rajadamnern boxing stadium ($\bar{x}=4.06$, SD=0.58). This finding was in alignment with the study of Techita Chai-on (2014) who found that the personnel factor influenced the service quality. This indicates that human resource development in every organization is very important to the quality of service.

Besides, the comparison results in satisfaction towards service quality between Lumpinee boxing stadium and Rajadamnern boxing stadium were found to have no statistically significant differences (p -value >0.05) in the other four dimensions which comprised tangibility, reliability, assurance, and empathy.

The first priority of foreign spectator's satisfaction was the responsiveness of service quality in Lumpinee and the reliability of service quality in Rajadamnern. The outcome of this study was beneficial for the stadium managers as it can help to improve their service quality in order to satisfy foreign spectators' satisfaction. Possibly, this may help them to achieve the goal of sport tourism income.

6. Limitations of the study

1. A non-probability sampling was used in this study (i.e. convenience sampling technique) due to the fact that the exact number of the foreign spectators who visited the selected boxing stadiums was unable to know. Hence, the samples could not be used as a representative.

2. Only two main factors (i.e. satisfaction and service quality) were examined in this study, other factors in terms of marketing such as loyalty, perceived value, and destination image should be involved.

3. The data collection process was taken only within 1 month and was not conducted in a high season of tourism. This leads to some difficulties in finding the respondents.

7. Recommendations for Future Research

1. As for demographics, the factor of income was not included in the study. It might be great for future research to take it into consideration since the income of the tourist is worth knowing and is useful for the marketing aspect.

2. The comparison in satisfaction towards service quality between countries/regions should be studied in order to understand and satisfy different groups of people.

3. The number of samples of this study was only 400, having a larger number of samples might be useful for generalizability.

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The Construction of S M Z Running Patterns on the Agility of Table Tennis at the Primary School Level

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Abstract

The purpose of this research was to study construction of S M Z running patterns on the agility of table tennis at the primary school level. The samples used in this study were ten table tennis players aged 10-12 years under the Pak Phanang Municipality School. Data were analyzed by using mean, standard deviation and dependent t-test. The findings revealed that: the quality of instrument of the construction of S M Z running patterns on the agility of table tennis at the primary school level. It was found that the index of item-objective congruence: IOC = 1.00 from 5 experts and included warm up, agility training and cool down. The training program used three days per weeks, training in four weeks and ninety minutes in each times. Then pilot study found that the mean and standard division of after attending 4-week program were higher 20.10 (.87) than before 21.05 (1.22) and when comparing the average of agility between before and after 4-week program found that there were significant differences at the 0.05 level. The conclusion was the construction of S M Z running patterns on the agility of table tennis at the primary school level to use in the sampling group in the future. The suggested that should be studied several other running patterns forms of agility training. S M Z running patterns should be adapted to be a game for fun. S M Z running patterns should be implemented and performed with elementary school students to develop agility physical fitness.

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Keyword: S M Z running patterns, agility, table tennis

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1. Introduction

Nowadays, table tennis is widely popular both domestically and internationally attracting attention at the youth level and people of all ages. This can be observed from various competitions such as international competitions, including the Olympics, the World Championships, the Asian Games, and the SEA Games. Provincial competitions, national sports, national youth games Student sports and the championship of Thailand, etc., many educational institutions offer table tennis lessons. Because table tennis is a game to play for fun and enjoy. In addition to using specific skills of the sport Physical fitness is very important in table tennis. Table tennis is a sport that requires agility. Because there is movement and change direction all the time. Athletes with high agility will result in movement to hit the ball in various positions quickly and accurately. Theprasit Kunthawatvichai (2012) the principle of movement can be analyzed from the composition of physical condition or physical performance leading to use for the movement of table tennis includes agility, balance, strength and muscle power and reaction. Table tennis is a short movement sport. Requires a lot of speed to play. A good player must have the agility of movement and movement and fast response including the decision to act immediately. So whether it's an offensive or defensive. Athletes need to be trained and develop their agility abilities in order to enable athletes to compete effectively and successfully.

Agility is the ability to change the position or the direction. The rapid and efficient movement of the body is due to the ability of the different muscles to work together in harmony, such as the ability to sit down and stand up alternately quickly. To slide forward and then slide in reverse direction quickly. or running zigzag to the left The right can alternate with speed. Worasak Pianchob (2018) Therefore, agility is the body's ability to change direction of movement quickly and accurately. This is very necessary for sports that rely on the rhythm of speed. Consistent with the research of Atchara Chuaychan (2007), the effect of M-pattern running training on the development of agility of tennis players. Added ability to change position and direction of movement. which has a movement pattern that resembles the movement in tennis by training the M-pattern running, there is a short-distance running training pattern. The direction of running moves forward and ran to run back with a bend to pick up the tennis ball in the specified position and direction. Consistent with the research of Wisan Maiwijit (2006) conducted a study. The effect of Z and S running training on the agility of female futsal players like the M-pattern. It is intended to increase the ability to quickly change position and direction of movement. This form of running training is effective for both speed training. The results showed that athletes were more effective at developing better agility. Especially for table tennis sports that rely on the rhythm of speed especially for sudden changes in direction in table tennis. In table tennis

players with high agility tend to be more successful than those with low agility. in the race to win which requires agility movement accuracy changing the position and direction of movement of the body training formats can be organized in many different ways. But the most effective form is station exercise that is most effective for programming.

As Howley and Franks (1992) Station training is a very effective way to create an exercise program. The important point is that the most diverse on the body and can cause muscle memory rather than using a single workout. And also inserted a loop with Jiraporn Giangang (2013), said Station training is a continuous aerobic and anaerobic exercise using all parts of the body. Many athletes use this form of training to improve their physical skills and work on specific muscles. Station training is a well-planned form of training that develops elements of fitness such as agility. muscle strength muscle endurance and flexibility. Each station has a specific type of exercises that are developed according to the trainer's style, which aims to develop the trainers in different ways. Therefore, agility training is very important for table tennis athletes. To increase the ability of table tennis athletes to move quickly and accurately. With continuous training, it will be able to effectively remember and perceive what is happening on the field.

One of the most common problems with table tennis players is ineffectiveness of movement. which athletes cannot move or slide their feet to receive or hit the ball in a timely manner. This was because agility was not efficient enough to move towards the target or having poor balance, unable to stop to get the posture and body ready to hit the counterattack. It will be an obstacle to playing in table tennis. The researcher as a table tennis coach was interested in applying the principles of physical fitness training in agility by creating an S M Z sprint program with the aim of improving agility in a station format and for the benefit of table tennis trainers who can choose the right training style and achieve maximum efficiency with the further development of table tennis Objectives of the Study

2. Hypotheses of Study

Program of S M Z running patterns on the agility of table tennis at the primary school level. Can develop agility.

3. Literature review concept and theory

Agility a movement based on the need for table tennis. That requires the body's ability to change position of movement or movement freely, quickly and in a precise direction. If the athlete can control the movement effectively and in relation to the step of the skill. Would produce good results for the athletes themselves because if they have good agility, they will help play or compete effectively and affect the use of skills and techniques in playing or competing as well. Training patterns to develop agility and agility In a station that has brought the concept and format of (Berns & Attaway, 1996) S pattern run, Z Pattern run and

Achara Choychan (2007) the M pattern run with a motion similar to table tennis and all three formats. This is intended to enhance the ability to change direction or position quickly. The principle of agility training in table tennis (Charoen Pratharnrat, 2014) is to use full speed in a short distance of 2-3 meters to move to hit the ball and counterattack to the opponent each time. Therefore, agility is a must. It belongs to table tennis players that need to be developed in an athlete. Training activities should therefore be training at full speed at 30-second intervals, alternating with 2-4 minutes of rest, and then training for the next run. Running 2-6 times is a training method. Anaerobic work for the athletes, the tennis. Require a change of pace and direction of the fast-moving, often athletes who have been training the muscles to do so. A very good anaerobic job will be able to run fast, repetitively, for many trips. with mild fatigue symptoms or occurs later than athletes who lack training training principles for It is important for athletes to train according to their best abilities over a distance of three to four trips, alternating with intervals of walking or jogging breaks. The format and training methods provide athletes with multiple training opportunities. How to help develop the ability of athletes to be the most effective

From the literature review, it was found that the S M Z running training program. When organized as a station, it encourages trainees to stay active throughout the course of their workout. and develop agility in table tennis athletes. By adopting the station format and providing a movement pattern that is similar to that of table tennis. It will help develop agility to be more efficient. It also affects the use of skills and techniques in playing or competing as well.

4. Methodology

The population in this study were 30 table tennis players aged 10-12 years under the Pak Phanang Municipality School Nakhon Si Thammarat Province.

Sample used in this study were 10 table tennis players aged 10-12 years under the Pak Phanang Municipality School Nakhon Si Thammarat Province. There are voluntarily used in the pilot study of the program.

5. research tools

- S M Z running program created by the researcher
- Agility Test (Ilinos Agility Test with a confidence value of .88)

6. Building and Quality Tools

1) Study the principles and theories in creating programs S M Z running pattern to improve agility from documents, articles, journals and related research.

The training program consists of 3 steps as follows:

- The process of warming up is stretching the muscles.
- The exercise process is to practice running in the form of an S M Z.
- The process of warming up is stretching the muscles.

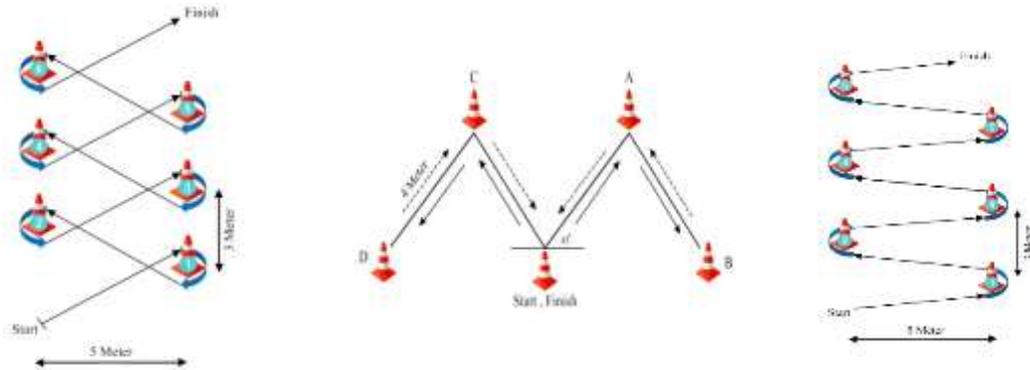
2) Consult the teacher at consult an advisor to check the program creation S M Z pattern running.

3) Lead of S M Z running patterns on the agility of table tennis at the primary school level. That the researcher created for 5 qualified persons to determine the accuracy of the content validity with expertise in physical education table tennis and program creation by using the Index of Item-Objective Congruence (IOC) method, the result showed that the conformity index was 1.00 with a suggestion.

4) Lead training program run format S M Z stratified the mend. Find the confidence value of the tool. The program led to a pilot study with groups that are similar to the sample 10 people to determine the feasibility of program resources.

5) The results obtained from the trial and various flaws to consult with advisors and experts to check and test again. Get a program for running in the form of an MMZ for table tennis athletes. A complete elementary school level ready to be put into practice. The format of the S M Z running program will be a station exercise by practicing for weeks 1-4, practice 9 stations, 3 times, 1 minute break per station. Week 5-8: Practice 9 stations, 5 trips, 1 minute break per station. The training program for running in the form of a S M Z station type consists of a stratified station. 1) runs S -pattern on the main detour station. 2) runs S -pattern with hands touching the ground at the specified point station. 3) runs S -pattern picks the ball into the basket station. 4) runs M -pattern on the main detour station. 5) runs M -pattern with hands touching the ground at the specified point station.

6) runs M -pattern picks the ball into the basket station. 7) runs Z -pattern on the main detour station. 8) runs Z -pattern with hands touching the ground at the specified point station. 9) runs Z -pattern picks the ball into the basket station.



6) Remove the results were analyzed statistically and conclusions.

7. Data analysis

- Determine the content validity of the program using the Index of Item-Objective Congruence (IOC) method.
- Compare the mean and standard deviation from the sample who took the S M Z training program that affects the speed created by the researcher in the pilot study during the pre-training and after 4 week of training t-test dependent.
- Determine the statistical significance at the 0.05 level.

8. Results

Table 1 shows the Index of Item-Objective Congruence of construction of S M Z running patterns on the agility of table tennis at the primary school level.

Program	Expert					IOC
	1	2	3	4	5	
S M Z running program						
1. Warming up	1	1	1	1	1	1.00
2. runs S -pattern on the main detour station	1	1	1	1	1	1.00
3. runs S -pattern with hands touching the ground at the specified point station	1	1	1	1	1	1.00
4. runs S -pattern picks the ball into the basket station	1	1	1	1	1	1.00
5. runs M -pattern on the main detour station	1	1	1	1	1	1.00
6. runs M -pattern with hands touching the ground at the specified point station	1	1	1	1	1	1.00
7. runs M -pattern picks the ball into the basket station	1	1	1	1	1	1.00
8. runs Z -pattern on the main detour station	1	1	1	1	1	1.00
9. runs Z -pattern with hands touching the ground at the specified point station	1	1	1	1	1	1.00
10. runs Z -pattern picks the ball into the basket station	1	1	1	1	1	1.00
11. Cool down	1	1	1	1	1	1.00
total						1.00

From Table 1, it was found that the S M Z running patterns on the agility of table tennis at the primary school level. When looking for quality by testing content validity based specialist programs designed to improve agility and 5 table tennis experts to find the Index is Index of Item-Objective Congruence. It was found that all items of conformity index were equal to 1.00. The recommendations from the experts are distance and rest time are appropriate. But should increase the intensity of training by increasing the number of trips in each training station.

Table 2. Compare the average of the program of S M Z running patterns on the agility of table tennis at the primary school level. of the samples in the pilot study during pre-training and after 4 week of training. (n=10)

particular	n	\bar{X}	S.D.	t	p
before training	10	21.05	1.22	6.48*	.00
after training	10	20.10	.87		

*p<.05

From Table 2, Compare the average of the program of S M Z running patterns on the agility of table tennis at the primary school level. of the samples in the pilot study during pre-training and after 4 week of training. The samples in the pilot study during pre-training and after 4 week of training showed a statistically significant difference at the .05 level.

9. Discussion

Content validity analysis of S M Z running program. The researchers used their discretion and recommendations from five experts in agility and table tennis experts to decide on the creation and improvement of the created program. It was found that the Index of Item-Objective Congruence (IOC) of the 11 questions created by the researcher, all 11 items were consistent with the theoretical content. This is consistent with the Peacenu Fongsri (2007) said that the question of consistency with index greater than or equal to 0.5, it is a question that has content validity. As for questions with a consistency index lower than 0.5, they can be used and need to be improved. Consistent with Thanakarn Sathianpoonsuk (2021), it was found that the agility test on sand for beach handball players which was taken to determine the quality by testing the validity (validity) by a method considered by 3 experts and finding the consistency (Index of Item-Objective Congruence: IOC) with the consistency of all items It can test the sand used in the tests were consistent with the spin her arm Shinawatra Bangkok (2016) found that test capabilities Aerosmith's City Park for basketball. When the quality of the content validity method for index consistency (Index is Of the Item-is Objective Congruence: the IOC) experts in both third person is equal to 0.87, so it can take a test to get used to. Can test Suphit Samahito (1999) said that the principle of creating a test must be the basis of that sport, meet the elements and according to the objectives, covering the content to be measured. It should be a test that is as close to the playing conditions of that sport as possible. Tests should not contain many other skills and it takes too much can cause a lack of effective procedures to see that the program runs form the S M Z's table tennis athletes. elementary school level That the researcher created was built according to the principle of training, consisting of 3 steps, namely the warm-up stage. step of training and the stage of warming Stretching was performed in the warm-up and warm-up sections (ACSM, 2014), and the program was piloted. Program to determine the feasibility of the program in real conditions for 4 weeks, 3 days per week to determine the suitability of the training program by training with table tennis athletes. Elementary school who voluntarily participates in the training It was found to be appropriate, which is consistent with Sontaya Silamad (2017) and Charoen Kraduarnrat (2014) mentioned principles for creating a training program. Must take into account the condition of the athlete's readiness is important, such as age, gender, body shape and level of physical readiness. Therefore, to determine the correct and appropriate training program, it is necessary to have a plan that meets the conditions of each type of athlete. for maximum efficiency by referring to the variables of training are one training volume is duration, distance, and repetitions. The two training loads are intensity and speed per practice. Three intensity of practice. Therefore, the S M Z running program created by the researcher can be measured according to the content. objectives and measurable behaviors can improve performance agility.

When comparing the average of S M Z running program for agility of table tennis players elementary school level of the samples in the pilot study during pre-training and after the 4th week of training, it was found that there was a statistically significant difference at the .05 level because the S M Z running training style had the ability to develop agility. After 4 weeks of training, the agility in athletes is more effective. Consistent with the concept of Charoen Prawanrat (2014), said that if the training program that has been created is correct according to the principles of training and is appropriate for the ability of the athletes, the steps in bringing such programs in order to use it, it is necessary to achieve the desired purpose of training. When practicing regularly thus resulting in the body Able to adjust to the weight of training quickly. to develop ability and physical fitness as well consistent with the concept of seniority table tennis the playoff latta dart arm, and the Minister Ariel Latta Architecture Management (2002) has said that the ability to collaborate nervous system and muscular system. Must work together effectively to achieve agility. The amount of time spent practicing allows the body part that needs to be trained in that activity to have a chance to work more than usual. and has resulted in changes in work development and also in line with Sontaya

Silamad (2017) said that the effect of practicing skills or techniques for many trips the fundamental neural processes of excitation and inhibition are more interrelated. This will result in a stable movement with a good relationship. It is effective and contributes to the improvement of mechanical skills. Therefore, if activities are organized for the body to practice frequently, the skills and proficiency of the training will eventually develop and become agile, and it is also consistent with the research of the wind. Wang Kaew (2019) has conducted a pilot study to develop the program. The movement consists of equipment, making the students' grade level. with students of the demonstration school of Kasetsart University educational research and development center who were not students in the experimental group of 10 people found that after joining the program movement of equipment. The students had better movement to assemble equipment than before joining the program with a statistical significance at the 0.05 level, consistent with the research of Kittipoom Soth (2012). The effect of agility training on the nine grid test in table tennis practice The mean of the experimental group between before and after the 6th week of training showed that agility was significantly different at the level of agility. .05 consistent with the research of Pharuny Sakulchit (2016) has been studied. Effect of Circuit Training on Agility Endurance and muscle strength of table tennis athletes by practicing an 8- value circuit training program, the results showed that the mean group mean between pre and post training weeks 4 and 6 was significantly different at the .05 level.

From the foregoing This research was to create S M Z running training program on agility in table tennis athletes Primary study of which has been distributed in the form o 's station can be developed c. According agile athletes to Table Mountain's statistics at grade level has been committed by an athlete trying to speed up the run, including the nature of the running back the switch. Focus on moving and changing direction as a result, athletes have the ability to move quickly. Fast and efficient with increased accuracy.

10. Suggestion

The suggested that should be studied several other running patterns forms of agility training. S M Z running patterns should be adapted to be a game for fun. S M Z running patterns should be implemented and performed with elementary school students to develop agility physical fitness.

11. Acknowledgments

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Exploratory Factors Analysis of ICT Factors in Parental Decision on Selecting Game and Sports Activities for Primary Home School Student in Bangkok Province

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Abstract

The recent COVID-19 pandemic created disruptions in Thailand's schools as well as in information and communication technology (ICT). Primary students in Thailand, mostly in the Bangkok Province can only play game and sports activities as part of school activities in their home. Information and communications technology (ICT) is the one of factors affecting the parental decisions on selecting which game and sport is suitable for their child to play. The purpose of this research was to study and identify ICT factors in the parental decisions on selecting game and sport activities for their primary student in the Bangkok province. The sample consisted of 50 parents and used simple random sampling. This research was survey type. The instrument used to collect the data was a questionnaire. The quality of the instrument was tested with a reliability of approximately 0.865. and the quality of instrument was tested with a content validity IOC of 0.871. The statistics were analyzed by exploratory factor analysis (EFA) The results of the study were subjected to exploratory factor analysis. As a result, we presented and thoroughly formally examined the factorial model of ICT components in the parental decisions on selecting game and sport activities. We distinguished three factors: (1) Decision Making, (2) Information Accessibility and (3) Social Media Engagement The finding suggested that ICT for education policy efforts such as promoting information through technology as guidance for homeschooling physical education from concerned government agencies and make physical education programs as learning modules to be part of the Thai curriculum in schools.

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Keywords: ICT factors, Game and Sport, Home School

1. Introduction

The recent COVID-19 pandemic created disruptions in Thailand's schools as well as in information and communication technology (ICT). Primary students in Thailand, mostly in the Bangkok Province can only play game and sports activities as part of school activities in their home. Information and communications technology (ICT) is the one of factors affecting the parental decisions on selecting which game and sport is suitable for for their child to play.

Homeschooling is the provision of basic education in accordance with the rights of the law for children. Develop learners to their full potential based on their natural interests and childhood. The curriculum is independent, flexible, learner-centered, able to define the way of learning on their own. Parents or guardians are responsible for organizing the learning process directly. Which may be all self-management or cooperate between families or cooperate between schools Parents may be teachers directly. Or facilitate an initial learning process and assessment. Planning of learning activities is based on the philosophical, educational, religious, or cultural beliefs the family desires. Incorporating both formal education and informal education and alternative education. The grades can be transferred to schools or learning centers that are legally recognized. Home School Educational management goals based on the differences of children. Most of the teaching and learning activities take place in the home. Through a variety of activities such as project work, sports, language, music, housework, crafting, cooking. There are also excursions, camping, volunteer activities. Participate in traditional festival events and activities that can be sought around themselves. Therefore, activities used as learning materials are classified as recreational activities.

1.1. Recreation Activities As Learning Materials

Recreation activities used as learning materials and always enhancing learning experiences and places. The select of activities is based on the need for attention, voluntary, new knowledge, pleasure, and satisfaction of students. Parents are managers Facilitate and select activities in accordance with the learning activities that meet the learning objectives set by the parents. Recreational activities as a means of learning can develop physical, emotional, intellectual, and social development. The results of choosing to participate in activities can be used as evidence of learning, creating worksheets, educational outcomes, assessing learning outcomes, and measuring and evaluating educational results. Parents decide on recreational activities based on their knowledge, understanding, seek information, and can organize activities to assess their participation, and encourage your child to participate in at least one type of recreational activity.

1.2. Decision Factors for Selection from Previous Study

From a previous study the researcher studied the factors affecting decision-making in the selection of recreational activities by synthetic method. It was found that there were four factors, namely personal factors,

economic factors, social factors, and technology factors, which were related and influenced the decision to choose recreational activities for homeschool students in Bangkok.

The factors for participation in recreational activities to improve human quality of life are: physical health, mental health, living place, income, goal, expectation, social relationships, participation in community activities, facility management, and support services(1). Beliefs influence decisions and social actions are divided into three factors. 1) Pull factors include goals, beliefs, values, customs, and habits. 2) Push factors include expectations, commitments, and force. 3) Able factors include opportunity, ability, and support. Economic and social conditions are external factors that affect decision making (2). There are three factors to make decisions 1) Demographic factor: gender, age, income, family status, occupation. 2) Psychological factors: needs, motivation, perception, beliefs, and attitudes. And 3) Social factors: families, reference groups, and work groups (3). Selecting and participating in recreational activities It consists of two factors: 1) Individual factors: personality, perception, attitude, knowledge, skills, gender, age, life cycle, culture, influence of subcultures, religion, creed, ethnicity, shyness, admiration, imitation, language, education, occupation, money, person, economy, population, society, resources, and travel. 2) Need for recreation factors: Individuals and families, social and environmental conditions and opportunities (4). The differences of individuals and social groups affecting the decision to participate in the recreation activities. Therefore, the personal and social factors. It is a factor affecting the decision of selecting recreation activities (5). The consequences that influence a person's interest in recreational activities include: environment within the family and community, individual growth conditions, natural aptitude, skills, experience and attitude in the activity, influence of fellow teachers and leaders of the community, religion, education level, opportunity to join the community, economic status, weathering, traditions and culture (6). Information technology factors has resulted in a change in the behavior of participating in recreational activities. It reduces the cost of participation in activities as it is a source of recreational activities for entertainment and correlates with personal factors in attitudes (7). Beliefs and feelings influence a person's decisions. And the behaviors expressed have already predicted the benefits and disadvantages of that action (8). Each person's physical nature and environment result in different decisions. With a total of 4 influencing factors: 1) Cultural factors include basic culture, subcultures such as racial groups, religious groups, skin color groups, geographic areas, occupational groups, age groups and gender groups. social classes are the upper, middle, and lower classes. 2) Social factors include reference group, role, and status 3) Personal factors include age, life cycle, family, occupation, income, education, values, activities, interests, opinions. 4) Psychological factors include motivation, perception, learning, belief, attitude, personality self-concept (9). There are two types of factors that influence decision making: 1) The internal factor consists of the framework of thinking, values, and feelings about oneself. 2) The external factors comprise economic, environmental, political and legal, and technological factors (10). As the following table 1

Table 1. Factors affecting decision select recreational activities for primary home school student's parent in Bangkok province

Study (author/year)	ICT Factors affecting decision				
	ICT Source	Access to information	ICT Infrastructure	Decision Making	Social Media
Wipongchai Rongkhankaw (2013)	/	/	/	/	/
Porrathip Thongkum (2016)	/	/	/	/	/

Table 1 shows ICT factors that affect parents' decision to choose recreational activities include: information technology sources, access to information, and information selection to assist decision-making.

From the previous study that known the importance and relationship of factors affecting decision select recreational activities for primary home school student's parent in Bangkok province. So, this study the purpose of this research was to study the variables affecting the parental decisions on selecting and not selecting game and sport in recreation activities for their primary student in the Bangkok province.

Nowadays, the role of technology affects the lifestyle and leisure time of Thai students. () According to the study, it was found that Learning activities in which students participate in their study and leisure time, especially in the elementary school age, with an emphasis on the physical development of the age range. Activities should therefore encourage children to movements, enjoyment, develop physical skills for movement and exercise. When the body is developed Mind, emotion, intelligence, and society will be developed accordingly. Therefore, students should be encouraged to participate in activities that promote and develop students' quality, create attitudes and behaviors that are relevant to their objectives and in accordance with the needs of the nation. () Thai scholars have described social problems and the level of quality of life of Thai people that are still below the target according to the direction of economic and social development direction. In the educational aspect of Thai people, there was a qualitative problem because the family lacked the knowledge to spend time raising their children properly. The intellectual problem of Thai students because of the low quality of Thai education. Therefore, the emphasis should be on creating environmental factors that are conducive to lifelong learning. Learn and a variety of learning resources to comply with the application of recreational activities to develop human resources. () Improper use of free time is caused by a lack of cognition. This resulted in more social problems. This was evident from the prosecution by elementary school children. Which is reported to be found Children quarrel, assault each other, being tempted to rape, imitation, inappropriate behavior, not correct with age, aggression and violence, and suicide. () From the problems that arise, the Office of the Education Council has set educational management objectives to develop a quality and efficient educational system and process aimed at developing Thai students is a good citizen and has desirable qualities. Has skills and competencies in line with the provisions of the Constitution of the Kingdom of Thailand, The National Education Act and the National Strategy, Thai society has been developed to become a learning society with morality, ethics, knowledge, love, unity, and joint efforts towards sustainable national development according to the philosophy of sufficiency economy. Which is consistent with the research found Students should be encouraged Parental support. To build on the knowledge, skills, and basic attitudes of to live in a democratic way, knowing the rights, duties, and responsibilities of integrated citizenship. Moral, ethics, Thai language, society, mathematics, science, arts, sports, and health education. Promote and support activities to educate families, parents, and guardians to be the creator of the youth of the nation to be a good citizen. Encourage schools and parents to organize both in- and out-of-school learning activities with a variety of learning methods in line with 21st century learning methods, with a focus on the learners' learning process. () Start at the family institution first.

2. About this Paper

2.1. Purpose of this Paper

The purpose of this research was to study and identify ICT factors in the parental decisions on selecting game and sport activities for their primary student in the Bangkok province.

2.2. Methods Applied in Research

The sample consisted of 50 parents and used simple random sampling. This research was survey type. The instrument used to collect the data was a questionnaire. The quality of the instrument was tested with a reliability of approximately 0.865. and the quality of instrument was tested with a content validity IOC of 0.871. The statistics were analyzed by exploratory factor analysis (EFA)

Preliminary agreement of use Exploratory Factor analysis

1. Selected variables for composition analysis must be a continuous variable or have values in the range level scale; interval scale and ratio scale. Due to component analysis the variables selected for the composition analysis should have a relationship between the variables.
2. Selected variables for composition analysis There should be a high level of correlation between variables. ($r = .30 - .70$) The relationship model between elements and variables is linear.
3. When using Principal Component Analysis Technique (Principal component analysis) Individual variables or data do not necessarily have a normal distribution, but if some variables have a very skewed distribution and have abnormal minimums and maximums, the results may not be correct.

2.3. Steps in Data Gathering and Analysis

Data Gathering

1. Define research problems and review the variable composition from the theory.
2. Collect data and choose a method Composition analysis according to research purpose
3. Verify the analytics data for compliance and create a correlation matrix
4. Extraction Factor Analysis.
5. Select the factors rotation method. (Varimax)
6. Select an element's weight value. (Factors Score)
7. Name the analyzed component.

Data analysis

1. Analyze the primary data of the respondents. using frequency and percentage statistics
2. Analyze the suitability of the data to analyze the composition using Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) statistics ($KMO > .50$) and test the relationship of variables using Bartlett's of Sphericity ($Sig = .000$)

3. Research Outcomes

3.1. Results

This study needs to analyze about number and percentage of parental decisions on selecting game and sport in recreation activities for their primary student in the Bangkok province and meet certain requirements to ensure that this instrument is acceptable and applicable. Among the requirements needing to be met are the suitability of the item measuring the construct and the reliability of the item used. EFA and Cronbach's Alpha reliability analyses were used to measure the suitability of the constructs and items used.

Table 2. Number and percentage of parental decisions on selecting and not selecting game and sport in recreation activities for their primary student in the Bangkok province

General information		Parental decisions on selecting	
		Number	Percentage
Status	Mother	41	82.00
	Father	9	18.00
	Other	0	0.00
	Totally	50	100.00
Level of education	Under bachelor's degree	9	18.00
	Bachelor's degree	29	58.00
	Above bachelor's degree	12	24.00
	Totally	50	100.00
Average family income per year	Under 300,000 THB	15	30.00
	300,001-750,000 THB	17	34.00
	750,001-2,000,000 THB	14	28.00
	Above 2,000,001 THB	4	8.00
	Totally	50	100.00

Table 2 shows number and percentage of parental decisions on selecting game and sport in recreation activities for their primary student in the Bangkok province. In the parental decision making on selecting game and sport as recreation activity, mothers account for 82.00 percentage points, while educated at the bachelor's degree level account for 58.00 percentage points and above bachelor's degree level are at 24.00 percentage points and under bachelor's degree level comprise 18.00 percentage points. Parental decision on selecting game and sport for children have level of education comprise 29.00 percentage points of above bachelor's degree, 12.00 percentage points of under bachelor's degree, and only 9 percentage points of under bachelor's degree making decisions on selecting game and sport activities. Average annual family income is 300,001-750,000 THB comprise 34.00 percentage of parental decisions on selecting game and sport activities respectively

In this research to achieve consistent understanding, ease of analysis and presentation of data analysis results. Therefore, the researcher has defined the symbol of the component variable that is used in place of the Observed Variable as follows:

Table 3. Observed Variables

Items	Name
ICT01	Parents receive recreation activities information from various technologies media; website, Facebook, Wikipedia, Instagram, Line, etc.
ICT02	Before deciding on recreational activities for your child, you study information on interesting activities from various technologies source.

Items	Name
ICT03	Parents use various technologies sources to support your plan before deciding on a game & sport in recreation activity.
ICT04	Parents compare recreation activities information before deciding on game & sport activities with a various technologies source.
ICT05	Parents analyze data for deciding on recreation activities for your child with various technologies source.
ICT06	Various technologies source will help you assess your needs in making decisions on selecting game & sport activities for your child.
ICT07	Get expert advice from various technologies sources to make decisions on selecting game & sport activities for your child.
ICT08	Various technologies help you directly access recreational information such as Facebook, Internet, Instagram, Line, etc.
ICT09	Parents study recreation activities information resources Through online public relations media from the agency responsible directly.
ICT10	Parents sharing information on recreation resources between groups of parents through social media.
ICT11	Social media plays an important role in the sharing of recreation information.

Table 4. Mean and standard deviation of technological factors relating parental decisions on selecting game and sport in recreation activities for their primary student in the Bangkok province

Information Communication Technology factors	Parental decisions on selecting		result
	M	S.D.	
Parents receive recreation activities information from various technologies media; website, Facebook, Wikipedia, Instagram, Line, etc.	4.14	0.904	High
Before deciding on recreational activities for your child, you study information on interesting activities from various technologies source.	4.26	0.803	Very High
Parents use various technologies sources to support your plan before deciding on a game & sport in recreation activity.	3.82	1.119	High
Parents compare recreation activities information before deciding on game & sport activities with a various technologies source.	3.80	0.990	High
Parents analyze data for deciding on recreation activities for your child with various technologies source.	3.68	1.096	High
Various technologies source will help you assess your needs in making decisions on selecting game & sport activities for your child.	3.54	1.110	High
Get expert advice from various technologies sources to make decisions on selecting game & sport activities for your child.	3.74	1.026	High
Various technologies help you directly access recreational information such as Facebook, Internet, Instagram, Line, etc.	4.30	0.839	Very High
Parents study recreation activities information resources Through online public relations media from the agency responsible directly.	3.80	1.010	High
Parents sharing information on recreation resources between groups of parents through social media.	3.70	1.093	High
Social media plays an important role in the sharing of recreation information.	4.08	0.922	High
Overall technological factors	3.90	0.992	High

Table 4 shows mean and standard deviation of technological factors relating the parental decisions on selecting game and sport in recreation activities for their primary student in the Bangkok province. The data analyze are overall technological factors relating decisions on selecting is high level, mean is 3.90 and standard deviation is 0.992. Two of components of the technological factors that relating decisions on selecting game and sport in recreation activities is the very high level, are ordered as follows: *Before deciding on recreational activities for your child, you study information on interesting activities from various technologies source.*, and *Various technologies help you directly access recreational information such as Facebook, Internet, Instagram, Line, etc.* are highest level, mean of 4.26 and 4.30 respectively and standard deviation are 0.839 and 0.803 respectively. The eight (8) remaining of components of the technological factors that relating decisions on selecting game and sport in recreation activities at the high levels, are ordered as follows: 1. *Parents receive recreation activities information from various technologies media; website, Facebook, Wikipedia, Instagram, Line, etc.* Social media plays an important role in the sharing of recreation information, 2. *Parents use various technologies sources to support your plan before deciding on a game & sport in recreation activity.* 3. *Parents compare recreation activities information before deciding on game & sport activities with a various technologies source.* 4. *Get expert advice from various technologies sources to make decisions on selecting game & sport activities for your child.* 5. *Parents study recreation activities information resources through online public relations media from the agency responsible directly.* 6. *Parents analyze data for deciding on recreation activities for your child with various technologies source.* 7. *Parents sharing information on recreation resources between groups of parents through social media.* 8. *Various technologies source will help you assess your needs in making decisions on selecting game & sport activities for your child.* Mean and standard deviation are listed in Table 4 above.

3.2. Exploratory Factor Analysis (EFA)

EFA was performed to obtain constructs and items that could both measure and fit this study. In order to analyze the valid items for each component, a Kaiser–Meyer–Olkin (KMO) test and Bartlett’s test of sphericity have been carried out. Table 5 shows that the KMO test resulted in a value of 0.743. This value exceeded the recommended value of 0.6, indicating that the sample was adequate to test the factor analysis.

Table 5 KMO and Bartlett’s Test of Sphericity

KMO and Bartlett’s Test of Sphericity	
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	.743
Approx. Chi-Square	319.167
Df	55
Sig.	.000

The first step of EFA is to check whether the data are suitable for performing factor analysis. In this regard, Kaiser (1974) recommended that the KMO (Kaiser-Meyer- Olkin) measure of sampling adequacy coefficient value should be greater than at least 0.5 for performing factor analysis. The KMO value was 0.743 for our dataset. Furthermore, Bartlett’s test of Sphericity derived the significance level as 0.00. can be concluded that Information on technology factors affects parents' decision to choose games and sports activities of primary school students in family homeschooling education in Bangkok are appropriate and can be used for exploratory factor analysis.

EFA of the aspects of ICT factors in parental decision on selecting game and sports activities for primary home school student in Bangkok province with 11 items. In the process of identifying factors, two

methods have been used to determine the number of factors that are appropriate for the questionnaire constructed. First, referring to Kaiser's criteria, we found that researchers should choose factors with Eigenvalues greater than 1.0, which indicated that the items in the instrument contained more than one factor. The Varimax rotation process was then performed to discard items with a coefficient below 0.3. The total number of items with a coefficient value of over 0.3 was 11.

The analysis showed that 11 items were collected under three factors with Eigenvalues greater than 1. Next, the researchers referred to the second approach taken (principal component analysis (PCA) with Varimax with Kaiser normalization) and the appropriateness of the items selected to characterize the instrument's development. The solution of the Varimax with Kaiser normalization method revealed the presence of a simple structure (see Table 6), with all three components demonstrating a number of strong factor loadings. The test results demonstrated that there are three points before the line straightens. This shows that there are three components with Eigenvalues exceeding the corresponding criterion values for a randomly generated data matrix of the same size (11 items by 50 respondents). The decision was made to retain the first three components for further analysis.

3.3. Rotation Method: Varimax with Kaiser Normalization

Table 6 Principal component analysis (PCA) of the rotated component matrix.

Items	Name of the ICT Factors			h ²
	1 Decision Making	2 Information Accessibility	3 Social Media Engagement	
ICT05	Parents analyze data for deciding on recreation activities for your child with various technologies source.	.886		.789
ICT06	Various technologies source will help you assess your needs in making decisions on selecting game & sport activities for your child.	.880		.786
ICT04	Parents compare recreation activities information before deciding on game & sport activities with a various technologies source.	.850		.804
ICT03	Parents use various technologies sources to support your plan before deciding on a game & sport in recreation activity.	.761		.627
ICT08	Various technologies help you directly access recreational information such as Facebook, Internet, Instagram, Line, etc.	.651		.678

	Items	Name of the ICT Factors			h ²
		1 Decision Making	2 Information Accessibility	3 Social Media Engagement	
ICT07	Get expert advice from various technologies sources to make decisions on selecting game & sport activities for your child.	.561			.482
ICT09	Parents study recreation activities information resources Through online public relations media from the agency responsible directly.		.852		.759
ICT01	Parents receive recreation activities information from various technologies media; website, Facebook, Wikipedia, Instagram, Line, etc.		.795		.669
ICT02	Before deciding on recreational activities for your child, you study information on interesting activities from various technologies source.		.597		.626
ICT11	Social media plays an important role in the sharing of recreation information.			.863	.841
ICT10	Parents sharing information on recreation resources between groups of parents through social media.			.701	.698
Eigenvalues		4.909	1.740	1.112	
% of variance		35.928	19.454	15.167	
Cumulative %		35.928	55.382	70.549	

Table 6 reveals that all loading factor values for each item reach acceptable values of above 0.30. Item loading factors greater than 0.30 are considered to have good internal consistency [94,98]. Through the Varimax rotation process, the rotated tablespace matrix demonstrates that the questionnaire items are three dimensional (containing three factors). Three factors predicted 70.55%, with factor 1 with 35.92 variance, factor 2 with 19.45% variance, and factor 3 with 15.17% variance. The values in the rotated component matrix show that factor 1 contains six items (ICT03–ICT08), factor 2 contains three items (ICT01–ICT02, ICT09), and factor 3 contains two items (ICT10–ICT11). Illustrates the result of the Varimax rotation process. Thus, a three-factor solution confirms the three dimensions of ICT factors in parental decision on selecting game and sports activities for primary home school student in Bangkok province model.

By examining each factor item according to the model and literature framework, items under factor 1 can be placed under the aspect of Decision Making, factor 2 under the aspect of Information Accessibility, and

factor 3 under Social Media Engagement. Items loaded from each of the three components have strong, clear, and conceptual links.

3.4. Reliability Analysis

3.5. The Cronbach's alpha reliability value for the entire scale was 0.865. These values indicate that the resulting factor is exceptionally strong, and the reliability value is very high. *Level of ICT factors in parental decision on selecting game and sports activities for primary home school student in Bangkok province*

Subsequently, an analysis was conducted to assess parental' level of ICT factors in parental decision on selecting game and sports activities for primary home school student in Bangkok province based on the three factors identified in this study.

Table 7 illustrates the results of the mean score analysis of ICT factors in parental decision on selecting game and sports activities for primary home school student in Bangkok province by construct.

Table 7 Principal component analysis (PCA) of the rotated component matrix.

Construct	Mean Score	Standard Deviation	Level
Decision Making	3.81	1.030	High
Information Accessibility	4.07	0.906	High
Social Media Engagement	3.89	1.008	High
Total	3.92	0.981	High

The interpretation of mean scores is based on illustrated in Table 8. The overall mean score was $M = 3.92$ ($S.D. = 0.981$).

Table 8 Principal component analysis (PCA) of the rotated component matrix.

Mean Score	Interpratation
1.00-1.80	Very Low
1.81-2.60	Low
2.61-3.20	Medium
3.21-4.20	High
4.21-5.00	Very high

This indicates that the overall level of ICT factors in parental decision on selecting game and sports activities for primary home school student in Bangkok province was high. In addition, Decision Making, Information Accessibility, and Social Media Engagement was the dimension that had the high mean score ($M = 4.81$, $S.D. = 1.030$, $M=4.07$, $S.D.= 0.906$ and $M= 3.89$, $S.D.=1.008$ in order)

4. Conclusion

4.1. Discussion

The results of the study were subjected to exploratory factor analysis. As a result, we presented and thoroughly formally examined the factorial model of ICT components in the parental decisions on selecting game and sport activities. We distinguished three factors: (1) Decision Making, (2) Information Accessibility and (3) Social Media Engagement The finding suggested that ICT for education policy efforts such as promoting information through technology as guidance for homeschooling physical education from concerned government

agencies and make physical education programs as learning modules to be part of the Thai curriculum in schools.

Overall technological factors relating decisions on selecting is high level, while decision on not selecting is highest level, The result show Two of components of the technological factors that relating decisions on selecting game and sport in recreation activities is the highest levels, are ordered as follows: Before deciding on recreational activities for your child, you study information on interesting activities from various technologies source., and Various technologies help you directly access recreational information such as Facebook, Internet, Instagram, Line, etc. are highest level. Both of parent group decision on selecting and not selecting by technological factors, consistent with the study in *The Development of a Webpage Model for Information of Community Recreation on The Internet* results was information technology is changing rapidly and constantly evolving. As a result, the behavior of selecting to participate in recreational activities by taking advantage of the Internet and social media. Leading to a digital society (11) Although technology factors relating parent's decision on selecting recreational activities for their homeschooling children. Because the homeschooling use technology to help parents support learning management and assist in the process of teaching and learning, consistent with the study in *Twenty-First Century Skill Building for Students with Special Needs Through Problem- Based Learning: An Examination of Homeschool Teacher Blogs*. As a result, the homeschool parents or teachers selected were all bloggers and may fall into a higher socioeconomic group; therefore, meaning that they can provide their students with more opportunities than someone who is not as privileged. It is also possible that the similar demographic of being an individual who publicly shares about their homeschool classroom experiences include a specific personality that is not necessarily representative of the homeschool teacher population. (12)

The results of the research showed that three components were Decision Making, Information Accessibility, and Social Media Engagement. Because of the COVID-19 pandemic took education public services around the world by surprise. Education policy makers were taken by the sudden changes, and the need for isolation and Physical distancing. The rapid transformation of the educational system from the offline to the online, as e-learning, blended learning, physical education, and game & sport in recreation activities perhaps not adaptation for home school education in learning style. consistent with the study in *Seven categories related to crisis e-learning from the teachers' perspective*. As a result, the analysis of the teachers' statements made it possible to distinguish seven categories of statements. Each refers to a different area of crisis e-learning. The first is related to technical problems that emerged during the transformation of online didactics into the digital space. The second category resulted from the use of non- standard solutions related to e-learning, which were dictated by official curricula or the development of students' interests, or the preservation of digital security. The third category referred to the search for optimal methodological solutions based on ICT and serving to improve the quality of education. The fourth category concerned the transfer of knowledge about proven solutions on the border line between ICT and education. The fifth category identified in the course of the analysis was narrowed down to typical challenges and problems occurring in the relationship between the student and the teacher. The penultimate group of data is related to problematic situations occurring between a parent and the teacher. The last group of data is limited to the modernization and retrofitting of teachers with adequate equipment and instrumentation enabling effective communication with students. (13). Parents sharing information on recreation resources between groups of parents through social media., Social media plays an important role in the sharing of recreation information., and Parents receive recreation activities information from various technologies media; website, Facebook, Wikipedia, Instagram, Line, etc. Other than that, no related was found.

4.2. Recommendations

4.2.1. Promoting knowledge information about game and sport in recreation activities for homeschool student. It should be provided as a useful guideline for home schooling PE programs in their need and expectations.

4.2.2. Information technology communication should develop and provide in various aspects by governance welfare.

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“Multidisciplinary approaches in long term development”

The effects of kayak seat types on: Power output, Trunk and Pelvis kinematics

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Abstract

The primary goal of this study was to compare power output and kinematic of trunk and pelvis between two different seat conditions; fixed and swivel seats. Additionally, the relationship between power output and kinematics of trunk and pelvis were also interested to figure out. Twelve healthy collegiate kayakers with regular kayak training (age 20.33 ± 0.78 years old, body weight 63.17 ± 8.13 kgs, height 166 ± 5.53 cm) participated in the study. Kinematic data were collected by 3-dimensional motion analysis system with 6 infrared cameras. Participants performed 30-s maximal paddle speed on a kayak ergometer under 2 conditions; fixed seat and swivel seat. Each condition was performed 3 trials on the two separate days, fixed seat on the first day and swivel seat on the second day. The results showed that the range of motion of pelvic rotation to the left (horizontal plane) and both of the hip-ankle distance were significantly greater in swivel seat condition than fixed seat condition ($p < 0.05$). Additionally, several power output parameters of swivel seat tend to greater than fixed seat but no statistically significant differences were found. In conclusion, the swivel seat was found the differences at the hip rotation and the hip-ankle distance of both legs from the fixed seat which represented the same movement pattern.

Key words: swivel seat; kinematics; kayak ergometer

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Introduction

Kayaking is one of the most popular activities for fitness, recreation and competition. Even though the optimal strategy and technique of paddling are important in competition, the kayakers are facing a more challenging to apply a blend of optimal biomechanical and physiological efficiency. The paddling action is defined by a series of cyclic movements performed by the upper limbs coordinated with pedaling movements of the leg and trunk rotation (Plagenhoef, 1979; Logan & Holt, 1985). The paddling movement is more complicated with alternating upper body movement during the pull, lift and push-phase (McDonnell et al. 2013) and it involves most of the upper body musculatures (Trevithick, et al., 2007). The paddling technique combines the action between upper limbs, the lower limbs and trunk rotation (Mann & Kearney, 1980).

Although the forward motion is mostly produced by the upper limbs, trunk rotation significantly improves the propulsion during the pull phase of the stroke. A swivel seat is designed to increase trunk rotation and to improve the mechanics of the stroke technique. The swivel seat has been created before 2005 but the ICF did not authorize until 2005. However the swivel seat has been approved to use only in marathon kayak competition according to USCA Competition rules 2012. The swivel seat has a mechanism which allows it to freely rotate about its vertical axis, encouraging the paddler's pelvic rotation. It might be hypothesized that the movements of the seat about the vertical axis would encourage a more fluid trunk rotation and help the kayakers to obtain more optimal transfer with these combinations of rotation. (Michael et al., 2009; Michael et al., 2010). It is commonly believed that the balance of the boat may be affected more than usual by the rotational movements of the swivel seat since its mechanism freely rotates and stops movements. These movements may affect the body and hands' positions at the start of the stroke and would interfere with the boat stability especially around the longitudinal (rolling) and vertical axes (yawing). In addition, there has been some disagreement about the real effect of the new seat design for on-water performance in the kayaking community. In addition, there has been some disagreement about the real effect of the new seat design for on-water performance in the kayaking community. It is unclear whether that kayak's swivel seat has not been permitted in any types of competition derived from mechanical advantage of the seat or not. In addition, the debate between kayakers has't shown clearly if their assumptions are possible. Therefore, it is possible that the swivel seat may have more mechanical advantage than that of the fixed seat because of its freely rotation. Ergometers are widely used for training, performance assessment, and research in physiological and biomechanical studies. When environmental conditions prohibit specific equipment use such as in rainy conditions, it often requires specific training which is usually performed on a kayaking ergometer in a sheltered environment and alternative to on-water rowing (Colloud et al., 2006). Kayaking ergometer has been designed to meet the requirement of reproducing the movements and load conditions of on-water kayaking. Begon et al., (2003) investigated phases, stroke duration, pelvic rotation, and upper trunk rotation between a kayak ergometer and on-water kayaking at a constant rate. These authors found no significant difference between the two conditions. However, there is lack of evidence of power output and kinematic data of trunk and leg movements during using the different seat types.

Methods

1. Participants

Twelve collegiate kayakers (\bar{x}_{age} 20.33±0.78 years old, \bar{x}_{weight} 63.17±8.13 kgs, \bar{x}_{height} 166±5.53 cm) were recruited in the study. Healthy collegiate kayakers, age range between 18-24 years old who had been trained on regular basis at least two years and competed at the University Game of Thailand level were recruited to the

study. The participants who had history of injuries, especially lower back and lower limbs in the past 3 month prior to the study, had injuries until they cannot perform on kayak ergometer, knowingly pregnant females, not allowed to attend all competitive events, abnormal range of motion of hip, knee ankle and trunk were excluded from the study. Ethical approval was obtained from Mahidol University Central Institutional Review Board (MU-CIRB) prior to participated recruitment. They were informed about the purposes, procedures and advantages of the study before starting the experimental procedures. Written consent forms were obtained from all participants before the study was performed.

2. Procedures

Anthropometric measurements including body weight, height and foot length distance were recorded for each participant before the laboratory testing. Participants come to laboratory before at least thirty minutes. Stretching and warm-up were done for 15 minutes before adjusting the seat distance, accounting for differences in leg length, to replicate positioning in the boat as closely as possible. After warm-up and adjusting seat, participants were asked to familiarize on kayak ergometer in 30 seconds, 3 times for averaging maximum stroke rate to calculate increment five-minute's stroke warm up. This involves two minutes at 60% of participant's perceived maximum and two minutes at 75%. This will be followed by 30 strokes incrementally increasing up to 90% of their perceived maximum. Prior to testing, reflective markers were attached over the landmark according to modified Helen Hayes model. Static and dynamic calibrations of coordinates of reflective markers on the body, paddle shaft and ergometer were captured at 200 Hz by 3D Motion analysis system (Qualisys, Gothenburg, Sweden) with 6 infrared cameras. Qualisys Track Manager (QTM) computer software was used for collecting the temporospatial data. Then participants were asked to perform 5-minute incremental warm-up and 3-minute rest interval before performing 30-s maximal paddle speed on each seat type trial (ST); fixed seat and swivel seat on a kayak ergometer (Webasport, Austria). Three trials of each condition of seat types were performed with 2-minute rest between each trial. All participants had to attend two days, performed fixed seat in first day and swivel seat in second day. Each day consists of familiarization in the morning and performed the testing protocol in the afternoon. The kinematic changes of angle of trunk, hip, knee and ankle between fixed and swivel seats were imported to Visual 3D (C-motion, Inc., US) as c3d file to analyze trunk and lower limbs' movement.

3. Statistical analysis

All statistical analyses were conducted using SPSS statistical software package. Shapiro-Wilk test was employed for the normality of data. Paired t-test was used to detect differences between seat conditions. Statistical significance was set at $p < 0.05$. Bonferroni adjustment was undertaken to avoid an increased risk of Type II error (Perneger, 1998). Pearson correlations were also used to find the relationship between kinematics variables Cohen's d was used to measure the effect size of observed differences, with the standard deviation pooled from the swivel and fixed seat data. The effect size was considered small between 0.2 and 0.5, moderate between 0.5 and 0.8, and large when the effect was > 0.8 .

Result

The mean values and standard deviation and the comparisons of power output during paddling between fixed and swivel seats are presented in Table 1. The result showed that the mean values of paddling time, power, force, cadence, thirty-second distances and speed of swivel seat greater than fixed seat but there was no significant difference.

Table 1 Power output between two seat conditions

	Fixed seat	Swivel seat	p-value
Paddling Time (s)	32.12±0.95	32.14 ±1.24	0.92
Power (W)	36.82±8.34	38.13±10.80	0.38
Force (N)	41.42±4.80	41.57±4.78	0.80
Cadence (spm)	57.30±5.90	57.65±5.88	0.60
30-s Distance (m)	66.82±7.43	67.54±7.80	0.52
Speed (m/s)	2.16±0.17	2.18±0.21	0.62

The comparisons of kinematic data during paddling between fixed and swivel seats are presented in Table 3. The result showed that the mean value of pelvic rotation to the left and both sides hip-ankle distance of swivel seat significantly greater than fixed seat ($p < 0.05$).

Table 2 Trunk and pelvis kinematics between two seat conditions

*Significant level < 0.05,	Variables	Fixed seat	Swivel seat	t	p-value	difference
	(n = 12)	Mean ± S.D.	Mean ± S.D.			
	Lt. Hip-ankle distance (m)	0.07± 0.02	0.09± 0.02	2.34	0.04*	
	Rt. Hip-ankle distance (m)	0.08± 0.03	0.10± 0.03	4.29	0.007**	
	Pelvic rotation to the left (°)	12.17±5.86	15.83±3.27	2.511	0.029*	
	Pelvic rotation to the right (°)	17.18±6.10	19.45±4.75	1.972	0.074	
	Anterior pelvic tilt (°)	22.94±8.97	21.61±6.22	0.721	0.486	
	Posterior pelvic tilt (°)	22.84±9.19	21.84±6.19	0.476	0.643	
	Trunk rotation to the left (°)	32.08±6.67	27.14±8.70	1.981	0.073	
	Trunk rotation to the right (°)	27.43±6.56	25.24±8.53	1.479	0.167	
	Lt. Lateral flexion (°)	19.60±7.08	18.51±8.27	1.052	0.315	
	Rt. lateral flexion (°)	17.03±4.70	18.77±4.31	.1683	0.121	

**Significant difference level ≤ 0.01

The correlations revealed relationships between kinematic values and power output are presented in Table 4 and 5. The result showed that an increase in range of motion (RoM) of pelvic rotation to the right was negatively correlated with power ($r = -.659$; $p \leq 0.05$), distance ($r = -.722$; $p \leq 0.01$) and speed ($r = -.646$; $p \leq 0.05$). Trunk rotation to the right was negatively correlated with time ($r = -.616$; $p \leq 0.05$), while Lt. trunk lateral flexion was positively correlated with force ($r = .648$; $p \leq 0.05$). Lt. hip-ankle distance was negatively correlated with power ($r = -.677$; $p \leq 0.05$), distance ($r = -.761$; $p \leq 0.01$) and speed ($r = -.671$; $p \leq 0.05$) in the fixed seat. The result showed that an increase in range of motion (RoM) of pelvic rotation to the right was negatively correlated with power ($r = -.717$; $p \leq 0.01$), force ($r = .606$; $p \leq 0.05$), distance ($r = -.704$; $p \leq 0.05$) and speed ($r = -.704$; $p \leq 0.05$), and

pelvic rotation to the left was negatively correlated with power ($r = -.628$; $p \leq 0.05$), force ($r = -.622$; $p \leq 0.05$) and speed ($r = -.645$; $p \leq 0.05$), while anterior pelvic tilt and posterior pelvic tilt were negatively correlated with cadence ($r = -.692$; $p \leq 0.05$ and $r = -.743$; $p \leq 0.01$, respectively). Trunk rotation to the right was negatively correlated with cadence ($r = -.632$; $p \leq 0.05$). Rt. hip-ankle distance was negatively correlated with power ($r = -.632$; $p \leq 0.05$) and speed ($r = -.632$; $p \leq 0.05$), while Lt. hip-ankle distance was negatively correlated with power ($r = -.714$; $p \leq 0.01$), force ($r = -.538$; $p \leq 0.05$) and speed ($r = -.681$; $p \leq 0.05$) in swivel seat.

Table 3 Correlation between kinematic values and power output on fixed seat

Variables	Time	Power	Force	Cadence	Distance	speed
Pelvic rotation to the right	-.421	-.659*	-.550	-.312	-.722**	-.646*
Pelvic rotation to the left	-.122	-.476	-.009	-.448	-.421	-.505
Trunk rotation to the right	-.616*	-.257	-.272	-.433	-.406	-.258
Trunk rotation to the left	-.427	-.022	-.062	-.247	-.277	-.034
Rt. trunk lateral flexion	.447	-.218	-.253	.023	.001	-.223
Lt. trunk lateral flexion	.128	.163	.648*	-.338	.114	.176
Anterior pelvic tilt	-.266	.134	.385	-.349	-.054	.153
Posterior pelvic tilt	-.261	.110	.388	-.379	-.079	.125
Rt. hip-ankle distance	-.069	-.345	.030	-.249	-.384	-.346
Lt. hip-ankle distance	-.285	-.677*	-.242	-.544	-.761**	-.671*

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4 Correlation between kinematic values and power output on swivel seat

Variables	Time	Power	Force	Cadence	Distance	speed
Pelvic rotation to the right	-.238	-.717**	-.606*	-.448	-.704*	-.704*
Pelvic rotation to the left	.332	-.628*	-.622*	.135	-.402	-.645*
Trunk rotation to the right	-.320	-.331	-.177	-.632*	-.411	-.299
Trunk rotation to the left	-.368	.117	.084	.054	-.026	.161
Rt. trunk lateral flexion	-.138	-.167	-.169	-.073	-.132	-.143
Lt. trunk lateral flexion	.374	.042	.393	-.121	.174	.051
Anterior pelvic tilt	-.374	-.264	-.041	-.692*	-.387	-.239
Posterior pelvic tilt	-.325	-.363	-.066	-.743**	-.458	-.358
Rt. hip-ankle distance	.162	-.672*	-.542	-.304	-.494	-.637*
Lt. hip-ankle distance	.138	-.714**	-.583*	-.312	-.534	-.681*

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Discussion

1. Power output of kayak paddling

The result of this study revealed that although no significant values were obtained in the study when paddling on fixed and swivel seats, total distance in 30 seconds tended to be higher when performing on swivel seat than on fixed seat. In kayak sprint competition, the winner would be the first kayak which reaches the finish line. The previous study revealed that the kayak with swivel seat might reach the finish line faster (Palomo, 2013). The power output was the parameter that indicated the speed and ability to paddle (van Someren & Dumber, 1997; Bishop et al., 2001). However, there are several methods to collect the power output data which would lead to difficulty when comparing (Colloud et al., 2006; Steer et al., 2006; Benson et al., 2011). For the precision and validity, the software installed with the kayak ergometer was used. The metric unit was the international unit which was easily proceeded.

Two parameters which have been considered as increasing the ability of paddle are, stroke length (SL) and stroke rate (SR)/frequency (SF) (Mann and Kearney, 1980; Palomo, 2013; Michael et al., 2010). When SL is constant, the increasing SR would affect the speed of kayak directly. However, there was no significant difference found between two seat conditions in this study. The tendency of power output when performing on swivel seat was greater than that of fixed seat.

The study was set up to measure the constant paddling duration for 30 seconds only while the participants were asked to perform at their own maximal speed. This power output value corresponded with the study of Michael et al. (2010) which compared the power output over 2 minutes and found significant differences between the 100th and 120th second. It might be revealed that the 30-s paddling duration of our study was too short to determine the differences. In addition, Palomo (2013) studied the performance of the kayakers in 30-s paddling and found no significant differences in stroke rate between fixed and swivel seats. In contrast, Lok et al. (2016) investigated the differences in kinematic and kinetic variables between the fixed and swivel seat conditions in the 200m simulated race. They found that there was a significantly higher stroke rate in sub-elite using swivel seats ($p < 0.05$).

2. Kinematics of kayak paddling

The result of this study revealed that the mean values of ROM of pelvic rotation and Rt. ankle plantarflexion of the swivel seat were significantly greater than those of fixed seat ($p < 0.05$). All of the mean values of ROM of both sides were collected in the cycle of pull phase. During the beginning of the pull phase, the kayakers sat in an upright position with slight trunk flexion. The trunk and hip were rotated to the opposite side from the pulling paddle. The hip, knee and ankle on the same side were in their most flexed position and continued to sit in a position of trunk flexion and the trunk rotate to the same side of the paddle. During the pull phase the hip, knee and ankle flexion decreased, reaching its minimum peak just before the beginning of the pull phase of the other side in the pull phase.

In this study, the hip-ankle distance represented the ankle joint's movement since the participants' feet were on the footrest with strapping. The movement of the ankle joint would occur by the movement of lower legs. This would be the first study using this distance. The results showed that the hip-ankle distance of swivel seat condition was significantly greater than that of the fixed seat condition on both sides. This would derive from the seat, which could enable the pelvis move backwards more easily. When kayakers pulled paddle in the pull phase, plantarflexion gradually increased to generate propulsive force to the footrest of kayak ergometer. The ankle joint's movements in kayaking normally occur in the sagittal plane by the contraction of the muscles in the superficial back line (SBL), the superficial front line (SFL) and the spiral line (SPL). Those muscles were composed of gastrocnemius in SBL, quadriceps in SFL and lateral abdominal oblique in SPL. It is noticed that kayakers easily control rotation of the seat with trunk and pelvic rotations in the dominant side. Hence, Rt. larger pelvic rotation might be promoted by the dominant side of the participants who all were right side dominant. Lt.

pelvic rotation was stabilized in the point that the participants were accustomed to. Core muscle strength plays the important role for this sport. However, the parameters which indicated the muscle activities or EMG, were not measured and this would be the suggestion for the next study.

For trunk rotation, the reference points were different from pelvic rotation in this study. The vertical axis, located between both hips was the axis of rotation whereas the reference point of pelvic rotation used the vertical axis of global system. This result corresponded with the study of Palomo (2013) which compared the performance of the kayakers in 30-s paddling and found no significant differences between the two seat conditions in the mean knee ROM but found significant greater rotational ROM of pelvis with swivel seat than with the fixed seat. If the characteristics of participants in Palomo's study were considered, it would be found that their performance level was higher than that of in our study, which was presented by means of stroke rate at 125-128 strokes per min in both seat conditions. Although the performance level were significantly different, the results still revealed the similarity of no significant difference between the two seat conditions in the mean knee ROM and significant greater Rt. rotational ROM of pelvis with swivel seat than with the fixed seat. However, it is interesting that the higher performance of athletes, the more control of movement. In this study, the mean ROMs of knee flexion, 25.29 ± 7.47 degrees and 28.30 ± 5.96 degrees during performing on fixed and swivel seats respectively in the right sides and the mean ROMs of knee flexion, 26.20 ± 7.55 degrees and 24.13 ± 4.67 degrees during performing on fixed and swivel seats in the left sides, were less than those of elite athletes, 40.0 ± 16.8 degrees and 36.5 ± 9 degrees during performing on fixed and swivel seats respectively in the right sides and the mean ROMs of knee flexion, 39.0 ± 16.9 degrees and 37.5 ± 6 degrees during performing on fixed and swivel seats in the left sides. Mean of pelvic rotation, 29.35 ± 7 degrees and 35.48 ± 6 degrees during performing on fixed and swivel seats respectively, were less than those of elite athletes, 58.9 ± 11.9 degrees and 65.6 ± 11.6 degrees during performing on fixed and swivel seats respectively. In addition, Petrone, Isotti, and Guerrini (2016) studied kinematic and kinetic variables between the fixed and swivel seat conditions at 70 and 90 strokes per minute and found no significant differences of the kinematics values between seat conditions. The hip, knee and ankle were found to have no significant differences but ankle plantarflexion in swivel seat condition was greater than that of the fixed seat in this study. The greater plantarflexion of Rt. ankle during paddling with swivel seat might occur from free rotation of swivel seat which affected more rotation backward in Rt. pelvic and larger length between hip and foot plate. This would be the theoretical suggestion because the data had not been collected. When kayakers pulled paddle under water in the pull phase, plantarflexion gradually increased to generate propulsive force to the footplate of kayak ergometer. The ankle joint's movements in kayaking normally occur in the sagittal plane by the contraction of the muscles in the superficial back line (SBL), the superficial front line (SFL) and the spiral line (SPL). Those muscles were composed of gastrocnemius in SBL, quadriceps in SFL and lateral abdominal oblique in SPL. The only significant difference in Rt. ankle might be the dominant limb of a kayaker. Kayakers easily control rotation of the seat with trunk and pelvic rotations in the dominant side, hence, Rt. larger pelvic rotation might be promoted by the dominant side of the participants who all were right side dominant. Lt. pelvic rotation was stabilized in the point that the participants were accustomed to. In contrast, Fohanno, Colloud, Mansour, and Lacouture (2011) investigated the effects of two seat conditions (fixed versus swivel seats) at training pace and race pace. It was found that there was a significantly higher rotational trunk and pelvis at both paces in kayakers using swivel seats. ($p < 0.05$). Even though the swivel seat would promote the larger rotation of the pelvis which also promotes larger displacement of the trunk, there was no significant difference for the anteroposterior axis between two seats might be associated with the strength of core muscles to pull back to the beginning position and continue to the other side. The more freely the trunk moves to each side, the more powerful muscle contraction to control the movement.

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Effects of Caffeinated Drinks on Brain Waves Responses during Isokinetic Exercise in Healthy Males

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Abstract

The aim of the cross-over design study was to determine effects of caffeinated drink on brain waves responses during isokinetic exercise in healthy males. Twenty-five males (age: 21 ± 2 years, BMI: 22.5 ± 1.3 kg/m²) were randomly assigned to either caffeinated or placebo drinks. Brain activity were assessed using an electroencephalogram (EEG) during perform elbow flexion-extension exercise with isokinetic dynamometry (60 degree/sec, 5 times/set for 3 sets and rest between set for 30 seconds). Shapiro-Wilk test was used to test normality of data distribution and pair *t*-test was calculated to compare the two conditions. There was no significant difference for brain waves responses during isokinetic elbow flexion-extension between conditions ($P > 0.05$). These results indicate that consuming caffeinated drink prior to isokinetic exercise might not affect brain activity in healthy male adults.

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Keywords: Electroencephalogram; EEG; Isokinetic dynamometry

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1. Introduction

Caffeinated drinks, legal central nervous system (CNS) stimulants, are beverages such as coffee, tea and energy drinks that contain caffeine. Nowadays, the drinks are commonly consumed by a group of people who like to enhance both mental and physical performance. Sherman et al. showed that drinking of 180 mg caffeine in early morning results in explicit memory enhancement for young adults compared to those who drink decaffeinate (Sherman et al., 2016). Moreover, supplementing with 200 mg caffeine before, during and after workout could increase endurance performance in athletes (Spriet, 2014).

Electroencephalography (EEG) is an electrophysiological monitoring method to measure electrical activity of human brain. For brain electrocortical responses to exercise, previous investigation found that alpha and beta activities were enhanced immediately during exercise, compared to before exercise (Crabbe and Dishman, 2004). Whereas Robertson and Marino reported a decline in EEG response, in the prefrontal cortex during incremental exercise, which could indicate a sign of exercise termination (Robertson and Marino, 2015). Barry et al. found that 250 mg caffeine was associated with a global reduction in EEG power in the alpha band, indicated arousal enhancement in young adults (Barry et al. 2005). Interestingly, there were no evidence of whether commercial drinks with low caffeine doses (e.g., a medium sized up of coffee, a cup of tea, a 12oz can of energy drinks) could affected on cortical activity during exercise. Therefore, the study was aimed to examine the acute effects of 50 mg caffeine on brain waves activities during isokinetic exercise in healthy males.

2. Materials and Methods

This study included 25 healthy male participants who were non-smokers, no medical history of neuromuscular or cardiopulmonary disorders. The sample size was calculated using the G-Power 3.1.9.2 analysis at $\alpha = 0.05$, $1 - \beta = 0.85$ using η^2 of the previous study (Flahie DT et al., 2018). The total calculated sample size was 18 and 35% drop out = 6. Thus, the final sample size was 25. All participants were measured for height, body weight, complete a general questionnaire (e.g., age, schedule, and medical history). Their written informed consent to participate was attained after describing all test procedures and associated benefits and risks. This study was approved by the Ethical Committee of Mahidol University Institutional Review Board (MU-CIRB 2018/173.0609).

2.1 Experimental procedure (Figure 1)

Before testing day, participants were oriented to avoid consumption of coffee or any stimulants (tea or energy drink, etc.) and alcohol beverages, as well as intense exercise for 24 h and should sleep for at least 8 h. They were asked to have breakfast at 7.00 am and arrived at the laboratory at 8.00 am. For the cross-over design study, participants were randomly ingested either caffeinated drinks (CAF; 50 mg caffeine mixed with 150 ml of water, with lemon flavoring and citric acid and sugar) or placebo (PLA; 150 ml of water, with lemon flavoring and citric acid and sugar). The 2 conditions were separately intervened at least 3 days apart. Our supplementations were carefully prepared by Institute of Nutrition, Mahidol University.

2.2 Isokinetic exercise

After 30 min of ingestion, participants were asked to perform elbow flexion-extension isokinetic exercise (at 60 degree/sec, 5 times/set for 3set, rest for 30 sec between set) using isokinetic dynamometry (Biodex, United State). During exercise, brain activities were recorded using an EEG unit (eegoTMmylab ANT Neuro, Germany).

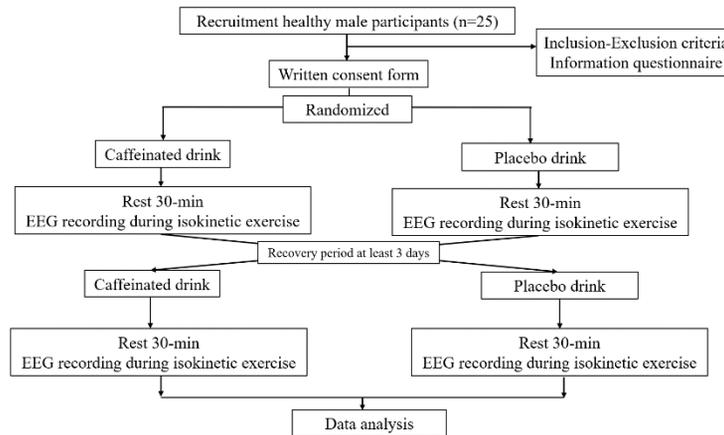


Fig. 1. Experimental procedure.

2.3 EEG measurement

For EEG recording, participants were asked to wear EEG-cap (eegoTMmylab ANT Neuro system). EEG gel was inserted into all electrode sites to keep the impedance below 5 k Ω . The EEG was recorded from the midline fronto-polar (Fpz), midline frontal (Fz), midline central (Cz), midline parietal (Pz), and midline occipital (Oz) electrode sites, according to the international EEG 10–20 system (Figure 3). Brain activities were recorded during elbow flexion-extension exercise. The band pass filters were set with a high pass frequency of 30 Hz and a low pass frequency of 0.3 Hz. The notch filter set to 50 Hz and the analog-to-digital rate was set to 512 Hz. The absolute power (μ V²) of the respective frequency bands, derived by Fast Fourier transforms (FFT), was defined for 4 frequency ranges; delta (0.5–4 Hz), theta (4.5–8 Hz), alpha (8.5–13 Hz), and beta (13.5–30 Hz). In the EEG analysis, the absolute power was calculated for each frequency band (delta, theta, alpha, and beta).

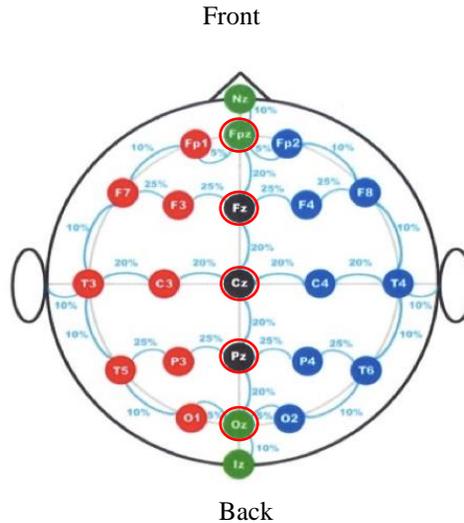


Fig. 2. Electrode sites of international EEG 10–20 system (red circles: the electrodes used in this study) (BCI, 2017).

2.3 Statistical analysis

All statistical analyses were performed using SPSS (version 22, SPSS Inc, Chicago, IL). Data of participant characteristics are presented as mean \pm SD, and mean absolute power of brain waves are presented as mean \pm SEM. The normality of data distribution was tested using a Shapiro-Wilk test. The difference between conditions was analyzed using pair *t*-test. The level of significance was set at $P \leq 0.05$.

3. Results

The participant characteristics are shown in Table 1.

Table 1. Physical characteristics of the participants. Data are presented as mean \pm SD.

Characteristic (n=25)	Mean \pm SD
Age (years)	21 \pm 2
Height (cm)	176.0 \pm 6.9
Body weight (kg)	69.6 \pm 8.5
Body mass index (kg/m ²)	22.52 \pm 1.29

yr = years, cm = centimetre, kg=kilogram, m²= square meter

The result of brain waves showed the similar changes in brain waves of Fpz, Fz, Cz, Pz and Oz electrode sites. The brain waves during elbow flexion-extension showed no significant difference of between conditions (Table 2).

Table 2. Mean absolute power of brain waves including delta, theta, alpha and beta waves during elbow flexion-extension exercise. Values are given as mean (SEM). n=25 for each condition.

Electrode site	Wave forms	Mean absolute power of brain area (μV^2)	
		PLA	CAF
Fpz	Delta	75.7±5.6	74.4±4.3
	Theta	4.9±0.6	5.0±0.4
	Alpha	3.7±0.6	3.4±0.4
	Beta	5.2±0.4	4.7±0.3
Fz	Delta	41.5±3.1	44.3±2.3
	Theta	4.1±0.3	4.9±0.3
	Alpha	3.4±0.3	3.4±0.4
	Beta	4.8±0.4	4.5±0.4
Cz	Delta	37.5±3.3	45.3±3.4
	Theta	4.5±0.3	4.0±0.3
	Alpha	4.1±0.5	3.9±0.5
	Beta	4.5±0.4	4.5±0.4
Pz	Delta	33.9±2.8	37.6±2.5
	Theta	3.8±0.3	3.5±0.2
	Alpha	4.0±0.5	4.8±0.8
	Beta	4.5±0.3	4.4±0.3
Oz	Delta	30.2±3.1	33.0±3.0
	Theta	3.0±0.3	2.9±0.3
	Alpha	4.3±0.6	3.7±0.4
	Beta	4.3±0.4	4.9±0.4

4. Discussion

The present study aimed to verify whether a low caffeine doses of 50 mg could change in cortical activation during an elbow flexion-extension isokinetic exercise.

Our findings demonstrated that 30 min after 50 mg caffeine ingestion could not alter EEG activity in all electrode sites of the brain during isokinetic exercise compared to placebo. Recently, there has been increased attention focus on lower (20-200 mg) caffeine doses are CNS stimulant without negative effects. However, the efficacy of commercial drinks with a low caffeine doses (e.g., a cup of instant coffee, a cup of tea, a 375 ml can of Coke®, a 375 ml can of Red Bull®) during exercise remains unclear. For the resting state of EEG data, the effect of a low caffeine dose on brain waves changes has been previously reported by Meng et al. (Meng et al., 2017). They showed that 26 healthy volunteers who drank a 12 oz. can of Diet Coke® (~ 36 mg of caffeine) had decreased in alpha and beta EEG brain waves during a 32 minutes' resting state with eyes open epochs compared to control no caffeine condition. For the EEG data during exercise, Franco-Alvarenga et al. also found the reduction of the alpha wave at the prefrontal cortex and motor cortex throughout submaximal knee isometric extension exercise after ingesting ~ 400 mg of caffeine compared to placebo in 10 trained cyclists (Franco-Alvarenga et al., 2019). They indicated that the cortical activity responses during exercise is the activation of CNS with caffeine ingestion (Kalmar JM, 2005). Inconsistent with this literature, our finding found no difference of the brain activity between CAF and PLA conditions during exercise, which might be that amount of caffeine dose in the drinks is not strong enough to induce corticospinal excitability during isokinetic exercise.

5. Limitation

The present study did not measure the baseline EEG data during the resting state. Secondly, this study did not obtain other parameters i.e., peak power, mean power, and fatigue index of isokinetic dynamometry.

6. Conclusion

In summary, the present study showed that the commercial dose (50 mg) of caffeinated drinks had no acute effect on motor cortex activation during isokinetic exercise. We concluded that consuming caffeinated drink prior to isokinetic exercise might not affect brain activity in healthy male adults.

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The Effects of Exercise by Swinging the Arms on the Feet in Combination with Massage to Relax the Muscles on Physical Performance in the Elderly

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Abstract

This research aimed to study the effects of exercising by swinging the arms on the feet together with muscle relaxation massage on the physical performance in the elderly. The study was conducted with 15 participants aged between 64.60 ± 2.99 years old. They participated in the exercise program by swinging the arms on the feet together with muscle relaxation massage 3 days per week for 12 weeks. Physical performance of the participants before and after the exercise program was compared by using basic statistical analysis consisting of mean, standard deviation. Moreover, the mean of physical performance of the participants before and after the 12-week exercise program was compared by using pair sample t-test with the statistical significance at the .05 level.

The finding illustrated that basic body components consisting of body weight, blood pressure, heart beat rate and physical fitness such as 2 minute stride, standing up from a chair within 30 seconds, sitting in a chair with arms outstretched toes, reaching out and touching the back of the hand, and getting up and walking from the chair back and forth before and after the 12-week exercise program were different with statistically significant difference at the .05 level.

Keywords: muscle relaxing massage, swinging arm is still standing, elderly,

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Introduction

Arm swing exercise became popular and practiced widely in Thailand because it is a simple and convenient form of exercise that does not take up much space. People lack of sports skills or complex exercises can still exercise by swinging their arms and feet while standing still in the same place. Swinging your arms and feet is a type of movement originated from the People's Republic of China. The type of exercise emphasizes on the importance of the body, the power and posture of the body which are suitable for meditation. The posture, duration, relationship between the movements of all organs was determined. This will have a positive effect on the functioning of various systems in the body to work together. This is in line with Associate Professor Dr. Panya Kaimook, the expert committee from the Office of the Health Promotion Foundation (Thai Health). As a specialist in orthopedic, joint and sports science, he mentioned that the Thai Health Promotion Foundation has been campaigning for arm swing through the "Reduce Tummy, Reduce Disease" campaign since 2013,. There were a number of people interested in the campaign. Arm swing is a wisdom that has been passed down for centuries. Arm swing a simple physical activity that is suitable for all ages. However, it must be practiced correctly in order to benefit and not cause harm or injury. According to a study, it was found that arm swinging can burn up to 230 calories an hour which is close to walking and does not cause any negative effects both in short-term and long-term. The proper way to do arm swing is to swing the arm continuously at least 30 minutes per day. This will help develop the circulatory system of the body. Swinging the arms continuously for 10 minutes at a time for a total of 30 minutes per day on a daily basis together with diet control will help to reduce belly and successfully reduce disease. This is in line with (Saelao and Kanungsukkasem, 2012) who studied the effects of arm swing exercises, walking and walking followed by arm swing. The effect of arm swing on the performance of the female elderly showed that the arm swing and walking exercise in the female elderly resulted in a change in their wellbeing. Therefore, it is suitable as an alternative to exercise for the elderly. The benefits of stretching are not just only for the muscles and joints but there are many health benefits on the body. For example, it results in the ability to recognize, learn and practice movement skills to be more fluently, swiftly and efficiently (Pratunrat, 2009). Ponphimon (2015) also stated that a comparative study of the effects of stretching and cold water immersion studies on the performance of knee pain after plyometric exercise in Thai men showed that stretching or cold water soaking alone can help maintain the ability to reduce swelling and increase flexibility and jumping performance. However, the use of stretching in combination with cold water baths is not a practical way to reduce muscle pain. In summary, stretching or cold water bathing is a more practical approach to recover the athlete's physical performance compared to the combination of the two methods.

Swedish massage is a massage technique based on physical principles on the tissues of the body to improve the efficiency of the musculoskeletal system, nervous system, breathing, and blood circulation which makes the body awake. This type of massage focuses on only the top layer of skin and heavy and fast massage alternating with other massage techniques such as Effeurag, Petrissage, and Tapotement. In addition to this, oil is also used to reduce friction between the massager's hand and the client's skin (Prajyaparamita, 1998, p. 422). This is in line with the research from (Pianornbanyat, 2015) the effect of nursing process combined with Swedish massage on the pain in elderly lung cancer patients that used Swedish massage as a nursing activity. Swedish massage is another way that nurses can use directly with patients or teach their relatives or caregivers of elderly lung cancer patients who are in pain to treat them while at home to help reduce the pain of elderly lung cancer patients. The Swedish massage is Complementary and Alternative Medicine (CAM) which is often used to treat patients together with treatment of modern medicine.

The purpose of Swedish massage is therapeutic to stimulate physiological functions such as stimulating blood circulation, increasing the amount of oxygen in the bloodstream, expel waste from the body and reduce pain. It also affects the mind such as relaxing and reducing stress, anxiety and depression. Swedish massage is also easy and convenient to learn and it is a massage in which the weight and not putting on too much weight (Bureau of Alternative Medicine, Ministry of Public Health, 2012; Holey & Cook, 2003; Cowen et al., 2006). Swedish massage consisted of 5 types of massage which are 1) stroking 2) petrissage 3) tapotement 4) vibration/shaking and 5) friction. Additionally, it can be used with cancer patients at any stage (Cassileth et al., 2004). This is in line with (Nelson et al., 2013) who reported

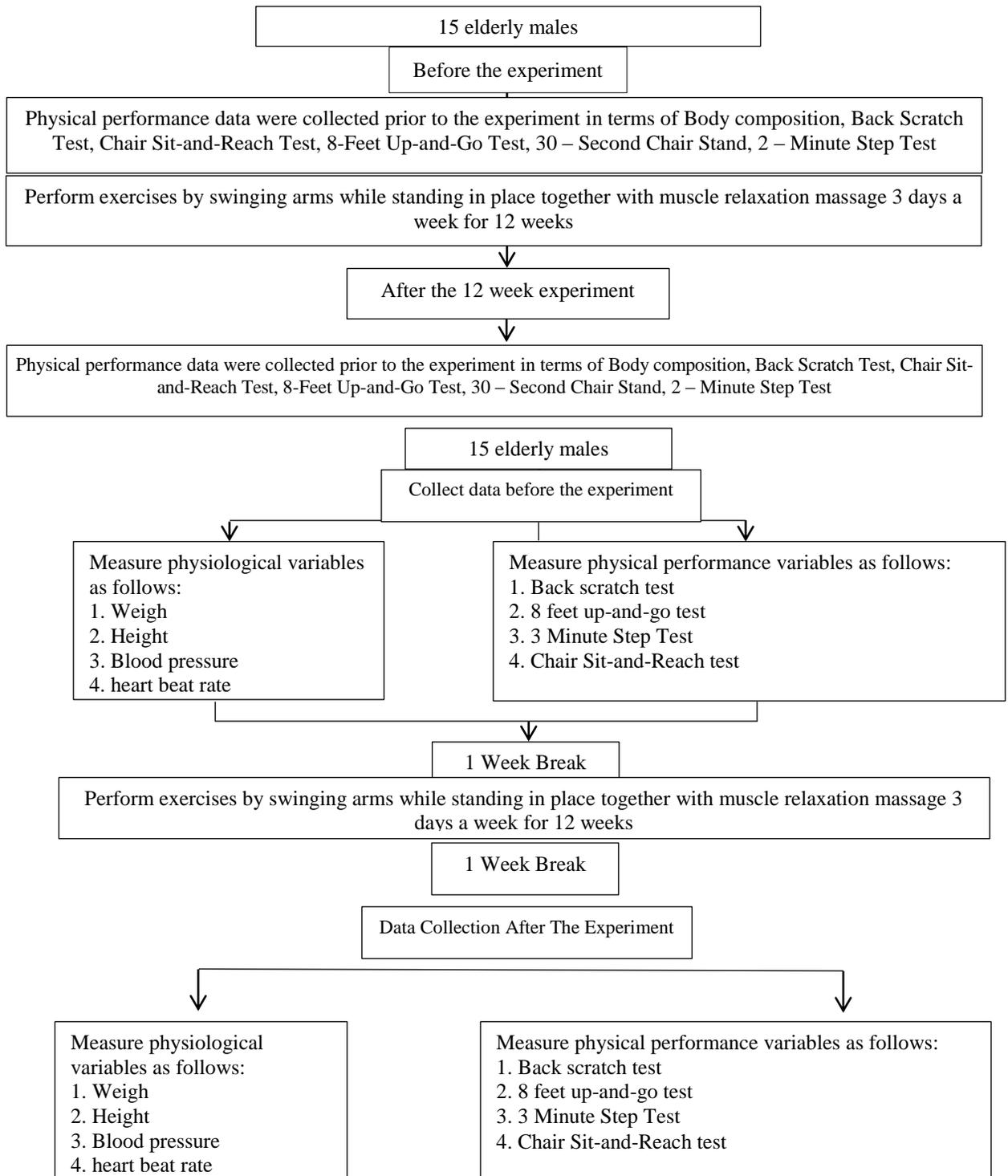
that Swedish Massage, sometimes referred to as oil massage, is the prototype of the world's best known modern massage to treat muscle pain and relax the body. Muscles are relaxed due to kin and muscle contact. There are also physiological effects on the cardiovascular system. Swedish massage helps to dilate blood vessels, stimulates blood circulation to the heart, effectively increases the delivery of oxygen and nutrients to tissues, removes waste and toxins and reduces muscle tension.

Because arm swing while standing in place is a simple and easy exercise that does not require any expertise, it can be done anywhere with no extra cost or additional equipment. It is also a suitable form of exercise for the elderly to help improve their physical fitness. Swedish massage is a massage that helps to restore blood circulation. It increases the amount of oxygen in the bloodstream, increases the flexibility of the muscles and expels waste from the body, and reduces muscle pain. Furthermore, it is a simple and convenient massage technique that is suitable to massage for muscle relaxation for the elderly after exercise. Therefore, the researcher is interested to study the effect of exercise by swinging arms while standing in place together with muscle relaxant massage on physical performance in the elderly.

Objectives

To study the effects of exercising by swinging the arms on the feet together with muscle relaxation massage on the physical performance in the elderly.

Research Framework



Data Analysis

The test results of the subjects were used for statistical analysis with computer programs as follows:

-The mean and standard deviation of the physical characteristics of the sample were identified in terms of age, weight, height, blood pressure, resting heart rate and physical fitness of the elderly

-Pair sample t-test was implemented to compare the mean difference with the statistical significance at the 0.05 level.

The exercise program with arm swing while standing together with muscle relaxation massage affects physical fitness in the elderly.

1. Stretching 3 exercises, 1 minute each for a total duration of 3 minutes.



Stretch the shoulder muscles and the rear upper arm



Stretch the hip and front thigh muscles, back hips, the calves, front body and back shoulder



Stretch the hamstrings, inner thighs, groin, and pelvis.

2. Perform 5 exercises for a total duration of 30 minutes.



Arm swing (switch back and forth between the two arms) for 5 minutes



Arm swing (both arms at the same time) for 5 minutes)



Standing in place with the knees raised for 5 minutes



Swing your arms at the same time and stand while raising one of your knees high. (Duration 7.30 minutes)



Switching between swinging arms and standing in place with knees raised (Duration 7.30 minutes)

Post-exercise Massage



Superficial stroking is the use of the palm to gently stroke the muscles.



Circular kneading is using the palm of the hand to stretch the muscles in a circular motion.



Hand After Hand is the use of both hands to massage but switching between two hands to stroke while massaging.

4. Data Analysis

The test results of the subjects were used for statistical analysis with computer programs as follows:

- The mean and standard deviation of the physical characteristics of the sample were identified in terms of age, weight, height, blood pressure, resting heart rate and physical fitness of the elderly

- Pair sample t-test was implemented to compare the mean difference with the statistical significance at the 0.05 level.

Result analysis

Table 1 shows the mean and standard deviation of the baseline data of the samples before and after week 12 workouts

Description	Number (N)	Mean ± Standard Deviation	
		Before the experiment	After the 12-week experiment
Age (Year)	15	64.60 ± 2.99	64.60 ± 2.99
Height (Centimetre)	15	167.06 ± 4.78	167.06 ± 4.78
Weigh (Kilogram)	15	70.65 ± 7.22	69.80 ± 6.82
Heart rate (times/minute)	15	80.20 ± 13.01	72.40 ± 11.35
systolic blood pressure (millimetre of mercury)	15	140.33 ± 20.84	133.06 ± 17.58
Diastolic blood pressure (millimetre of mercury)	15	79.26 ± 10.55	77.93 ± 8.60

The results from Table 1 show the basic data of the sample group which includes age, height,

weight, heart rate, systolic blood pressure and diastolic blood pressure before and after 12-week exercise. It was found that the mean age was 64.60 ± 2.99 , height 167.06 ± 4.78 , body weight (before the experiment: 70.65 ± 7.22) (after 12-week exercise: 69.80 ± 6.82), heart rate (before the experiment: 80.20 ± 13.01) (after 12-week exercise: 72.40 ± 11.35), systolic blood pressure (before the experiment: 140.33 ± 20.84) (after 12-week exercise: 133.06 ± 17.58) and diastolic blood pressure (before the experiment: 79.26 ± 10.55) (after 12-week exercise: 77.93 ± 8.60).

Table 2 shows the mean and standard deviation of the physical fitness data of the subjects before and after 12 weeks of exercise

Description	Number (N)	Mean \pm Standard Deviation	
		Before the experiment	After the 12-week experiment
2-minute stride	15	94.133 \pm 20.27	99.60 \pm 19.55
Standing up from a chair within 30 seconds	15	24.80 \pm 4.73	26.60 \pm 3.94
Sitting in a chair with arms outstretched toes	15	0.70 \pm 2.23	1.31 \pm 2.34
Reaching out and touching the back of the hand	15	-3.50 \pm 3.28	-2.04 \pm 4.04
Getting up and walking way from the chair 8 feet	15	7.64 \pm 1.43	6.49 \pm 1.19

The results from Table 2 show the physical fitness data of the sample group. This consists of walking for 2 minutes, standing from a chair for 30 seconds, sitting in a chair with arms outstretched toes, reaching out and touching the back of the hand and getting up and walking from the chair before and after the 12-week exercise. It was found that strides 2 minutes (before the experiment: 94.133 ± 20.27) (after 12-week exercise 12: 99.60 ± 19.55), standing up from a chair within 30 seconds (before the experiment: 24.80 ± 4.73) (after 12-week exercise 12: 26.60 ± 3.94), sitting in a chair with arms outstretched toes (before the experiment: 0.70 ± 2.23) (after the 12-week experiment: 1.31 ± 2.34), reaching out and touching the back of the hand (before the experiment: -3.50 ± 3.28) (after 12-week exercise: -2.04 ± 4.04) and getting up and walking from the chair 8 feet (before the experiment: 7.64 ± 1.43) (after 12-week exercise 12: 6.49 ± 1.19).

Table 3 shows the results of data analysis to compare before and after exercise at 12 week

Description	Number (N)	Mean \pm standard deviation between before and after the 12-week experiment.	t	P
Weight	15	0.84 \pm 1.14	2.86	0.012*
Heart Rate	15	7.80 \pm 5.07	0.511	0.000*
Striding for 2 minutes	15	-5.46 \pm 6.79	3.11	0.008*
Standing up from a chair within 30 seconds	15	-1.80 \pm 2.42	2.87	0.012*
Sitting in a chair with arms outstretched toes	15	0.61 \pm 0.80	2.94	0.011*
Reaching out and touching the back of the hand	15	-1.46 \pm 1.55	3.63	0.003*
Getting up and walking way from the chair 8 feet	15	1.14 \pm 1.21	3.64	0.003*

*p < .05

By comparing the mean difference of body weight, heart rate, walking for 2 minutes, standing from a chair within 30 seconds, sitting in a chair with arms outstretched toes, reaching out and touching the back of the hand and getting up from the chair back and forth before and after 12 weeks of exercise, there was a statistically significant difference at the .05 level.

Summary

The study of the effect of arm swing exercise combined with muscle relaxant massage on physical performance in the elderly found that there was a statistically significant difference at the .05 level in body weight, blood pressure, heart rate, 2-minute stride, stand up from the chair within 30 seconds, sitting in a chair with arms touching toes, reaching out and touching the back of the hand and getting up and walking from the chair back and forth before and after 12-week exercise.

Discussion

According to the study on the effect of exercise by swinging arms while standing in place together with muscle relaxant massage on physical performance in the elderly 3 days a week for 12 weeks, the exercise program focus on exercising the upper and lower body muscles such as the shoulder muscles, anterior and posterior forearm muscles, pectoral muscles, thigh muscles and calf muscles. This includes the joints of the shoulders, hips, knees and ankles. By exercising at a light intensity but continuously for 30 minutes and stretching the muscles before and after the exercise of 3 positions for 3 minutes for a period of 3 minutes, namely: 1. stretching the muscles of the shoulders and upper back; 2. stretch the muscles of the hips and thighs in front, hips, back, calves, front body and back shoulder; 3. stretching the hip muscles, posterior thighs, inner thighs, groin and pelvis. Additionally, a massage to relax muscles after stretching was performed for 16 minutes after the exercise which will be a massage that will relax the muscles in the back and lower limbs. It was found that by comparing the mean difference of body weight, heart rate, walking for 2 minutes, standing from a chair within 30 seconds, sitting in a chair with arms outstretched toes, reaching out and touching the back of the hand and getting up from the chair back and forth before and after 12 weeks of exercise, it can be seen that there are differences. This is because the exercise program is a 30-minute swinging exercise program for 3 days a week for 12 weeks where light intensity strengthens the cardiovascular system and makes the elderly physically fit and firm. As a result, the heart rate and blood pressure decrease. It is caused by the high cardiac output (CO) volume per minute, which is directly related to the 1-minute heart rate that works less (heart rate, HR) and the amount of cardiac output in stroke volume (SV) increased (Wongwaithawee Wong K, 2017). This is in line with Jiewpattanakul, et al. (2012) who studied the effect of arm swing exercise program with family on exercise behaviour among elderly people with idiopathic hypertension. The study discovered that after the end of the arm swing exercise program, the elderly in the experimental group had better exercise behaviour than the control group with statistical significance. In addition to this, Chairit and Jungsombatsiri (2015) studied the effect of walking arm-swing exercise for at least 30 minutes a day on lowering blood pressure in hypertensive patients. The results showed that at the end of 3 months and 6 months, the blood pressure of the patients in the experimental group was significantly lower than the control group. Moreover, Soichue, et al. (2017) studied the effect of arm swing exercise program by applying perception theory of self-efficacy together with social support. It was found that the arm swing exercise program by applying the theory of self-efficacy together with social support was able to help the experimental group to have exercise behavior according to the criteria. This is also consistent with Saelao and Kanungsukkasem (2011) who studied the effects of arm-swing exercises, walking and arm-swinging exercises on the well-being of female elderly people. It was found that arm swing and walking exercise in female elderly affected the change of happiness and better performance. Therefore, it is suitable as an alternative to exercise for the elderly. This is also in line with Tonkomthai (2015) who conducted a study on improving lung function by arm swinging in patients with type 2 diabetes. The study aimed to examine the effect of arm swing on inpatient lung function of the patients with type 2 diabetes who were obese and overweight. It was found that after arm swinging, lung function in patients with type 2 diabetes was improved.

The massage section relaxed the muscles after stretching after exercise. As a result, the muscles were

relaxed, flexible, stable and moving better. This is consistent with Choocharoensuk and Khamwong (2017) who conducted the study of the effect of massage on the reduction of post-exercise muscle aches in healthy men. It was found that massage may help reduce muscle aches, reduce pain measurements and promote joint mobility after massage. This is in line with Guchi (2014) who discovered the effect of applied massage on muscular endurance and explosiveness and the level of mental relaxation of athletes. It was found that the applied massage group had a statistically significantly higher mean of endurance and muscle burst strength than the control group.

According to the discussion above, it can be summarized that the effects of exercising by swinging the arms on the feet together with muscle relaxation massage on the physical performance in the elderly can help improve physical fitness and reduce injuries. This was a 30-minute program of movement for both the upper and lower body using light weight. The use of such duration and intensity of exercise is academically good for the cardiovascular system because during that time, the body's energy system uses oxygen to generate energy. As a result, the muscles have more nutrients to feed. The heart is strong resulting in better physical performance of the elderly. In addition, there are stretches and massages to relax the muscles involved which makes the muscles relax because the waste remaining in the muscles was reduced. This then made the elderly more fit, active, and able to do activities and reduce aches and pains.

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Effect of a 4-week Blood Flow Restriction Training Combined with Rehabilitation Program on Muscle strength in Athletes with Chronic Ankle Instability: A Randomized Placebo Controlled Pilot Trial

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Abstract

Traditional rehabilitation program are commonly utilized during chronic ankle instability (CAI). Blood flow restriction (BFR) training has recently been used to enhance muscle strength and improve ankle disability in healthy people and athletes with CAI. This study aimed to determine the additional effect of BFR training combined with rehabilitation program (BFR+R) on muscle strength in athletes suffering CAI. Ten collegiate athletes with CAI were randomly assigned to either BFR+R group or rehabilitation program (R) group. While the BFR+R group was applied with a cuff around the proximal thigh at 80% of arterial occlusion pressure in addition to conventional rehabilitation program, the R group received the rehabilitation only. Both groups trained 3 times weekly for 4 weeks. Isokinetic muscle strength and CAIT scores were measured before and after a 4-week of intervention. The results demonstrated that the BFR+R group displayed significantly greater improvements of muscle strength for plantarflexor, evtor, and invertor compared with the R group ($p<0.05$). Our preliminary results suggest that a 4-week of BFR training combined with rehabilitation program has additional benefit on muscle strength compared to conventional rehabilitation program in athletes suffering CAI.

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Keywords: Chronic ankle instability; Blood flow restriction; Rehabilitation

1. Introduction

Ankle sprains are the most common injured during sports and physical activity. Importantly, previous research has shown that 10-40% of those with a history of ankle sprain may eventually develop into chronic ankle instability (CAI) (Morrison & Kaminski, 2007). Their striking symptoms include pain, weakness, decreased ankle range of motion (ROM), and diminished self-reported function. There are two primary types of CAI, mechanical ankle instability (MAI) and functional ankle instability (FAI). Of these, FAI is more common and mainly caused by lateral ligament injury. FAI can affect the neuromuscular system, leading to impaired postural control. In particular, proximal muscles (gluteal muscles) weakness have been consistently reported which may alter landing mechanics owing to poor shock absorption (Pollard, Sigward, & Powers, 2011).

Although the conservative treatment can be useful for treating FAI, other training modalities including the balance training, strengthening exercise, stretching exercise, plantar massage, and mobilization are commonly utilized by physical therapists (Hale, Hertel, & Olmsted-Kramer, 2007; McKeon & Wikstrom, 2018). Additionally, the conventional rehabilitation program has its limitation for which a heavy load or resistance could not be applied because it can cause pain and exacerbate ankle injuries (Boudreau et al., 2007). Despite this limitation, the rehabilitation program requires a short duration of training program, which is very important for athletes.

Blood flow restriction (BFR) training has recently been known as a novel technique that maintain arterial inflow while occluding venous return from muscles during exercise, resulting in local hypoxia (Loenneke et al., 2012). In particular interest, BFR training was widely used for rehabilitation in patients with post-operative, such as knee arthroscopy, anterior cruciate ligament reconstruction, and achilles tendon rupture including patients with non-operative musculoskeletal deficits, e.g. knee osteoarthritis, patellofemoral pain syndrome or anterior knee pain (Fujita et al., 2007). Moreover, BFR training led to greater muscles activation during submaximal isometric resistance exercise compared with the control in patients with CAI (Lauver, Goetschius, & Donovan, 2019). In addition, BFR training can increase strength of remote muscles through increasing the amplitude of motor evoked potential in corticospinal excitability, which in turn alters motor output to BFR area in distal (Patterson & leFerguson, 2011). Altogether, BFR training can be potentially used as a new strategy to treat CAI (Faltus, Owens, & Hedt, 2018).

However, to date, the efficacy of BFR training in combination with conventional rehabilitation program (BFR + R) in athletes with CAI has been under investigation. Therefore, the present study aimed to determine the effectiveness of BFR training combined with conventional rehabilitation program on muscle strength in athletes with CAI. It was hypothesized that the BFR + R program, in comparison with the R program only, would provide better improvements in muscle strength and ankle stability in athletes suffering CAI.

2. Materials and methods

2.1 Study design

A single-blinded randomized parallel controlled trial was used to determine the effect of 4-week blood flow restriction training combined with conventional rehabilitation program on muscle strength in athletes with CAI. The participants were recruited from athletes who are members of Burapha university team, Thailand. The protocol was approved by The Research Ethics Review Committee for Research Involving

Human Research Participants, Chulalongkorn University, Thailand (COA NO. 017/2021) and conformed to the standards set by the Declaration of Helsinki.

2.2 Sample population

Ten athletes with CAI including rugby, football, volleyball, handball, and basketball players, age ranged between 18 to 23 years, were recruited for this study. The inclusion criteria consisted of a history of unilateral lateral ankle sprain occurred at least 12 months prior to study enrolment, a history self-reported of giving way and/or feelings of ankle instability of the involved ankle during activities of daily living and/or sporting activities for at least 6 months, and a score $\leq 24/30$ on the Cumberland Ankle Instability Tool (CAIT). Participants were excluded if they had a history of bilateral ankle instability and exhibit pathological joint laxity (a positive result on the talar tilt test or anterior drawer test), a history of ankle fracture, surgery of hip, knee, and ankle, and a history of the musculoskeletal disorders. The participants were informed of the purpose and procedure and signed consent forms prior to participate in the study. Then, the participants, matched pair by age, sex, and CAIT score, were randomly allocated to either the BFR + R group (n=5) or the only R group (n=5).

2.3 Procedures

Rehabilitation program

Participants completed conventional rehabilitation program 3 times weekly for 4 consecutive weeks. The program began with a 5-minute dynamic stretching for warming up, followed by a 30-minute standardized rehabilitation exercise program as described in table 1. Exercise progression included a single leg heel raised with weight, single leg squats, single limb stance on bosu ball, and Double limb stance with throwing and catching on bosu, which have been described elsewhere (Jaber, Lohman, Alameri, et al., 2018).

BFR training

The pneumatic occlusion cuff (H Plus cuff, USA) of 10 cm width and 75 cm length was used for the BFR training session. In brief, a cuff was placed around the most proximal thigh of the participant's affected limb and a handheld portable doppler probe (Edan SD3 Vascular Doppler, Shenzhen, P.R.China) was used to measure the participant's posterior tibial artery at the injured side by inflating the cuff to 80% of the participant's arterial occlusion pressure (Lixandrao et al., 2015). The cuff remained inflated throughout the duration of rehabilitation program and was immediately deflated during resting between trials. For the only R group, participants were instructed to wear a the BFR cuff except there was no inflation.

All training sessions were conducted in a laboratory under supervision of a registered physical therapist. Participants did not participate in any other exercise except the exercise programs provided in this study.

Table 1. Outline of the rehabilitation program

Week	Week 1	Week 2	Week 3	Week 4
	All participants dynamic stretching exercise			
	Double leg heel raises (4 sets x 30/15/15/15: reps, rest 30 s)	Single leg heel raises (4 sets x 30/15/15/15: reps, rest 30 s)	Single leg heel raises with weight (20 % 1RM) (4 sets x 30/15/15/15: reps, rest 30 s)	Single leg heel raises with weight (20% 1RM) (4 sets x 30/15/15/15: reps, rest 30 s)
	Double leg squats (3 sets x 10 reps, rest 30 s)	Double leg squats (3 sets x 10 reps, rest 30 s)	Single leg squats (3 sets x 10 reps, rest 30 s, each side)	Single leg squats (3 sets x 10: reps, rest 30 s, each side)
Program	Double limb stance on bosu (10 s, 5 reps per set, 5 sets, rest 30 s)	Single limb stance on bosu (10 s, 5 reps per set, 5 sets, rest 30 s)	Double limb stance with throwing and catching on bosu (5 reps per set for 5 sets, rest 30 s)	Double limb stance with throwing and catching on bosu (5 reps per set for 5 sets, rest 30 s)
	YBT (1 set x 5 reps, rest 10 s)	YBT (1 set x 5 reps, rest 10 s)	YBT (2 sets x 5 reps, rest 10 s)	YBT (2 sets x 5 reps, rest 10 s)

2.4 Outcome Measurements

The isokinetic dynamometer (CON-TREX MJ, Physiomed, Germany) was used to determine the average peak torque to body weight (APT/BW) ratio (concentric/concentric) at the angular velocity of 60°.s⁻¹ of hip extensor, abductor, ankle dorsiflexor/plantarflexor, and ankle evertor/invertor as previously described (Gribble & Robinson, 2009). Prior to the measurements, the isokinetic dynamometer was calibrated before testing each subject. Each participant performed three trials to be familiarized with the procedures. After a 2-minute rest, 3 continuous repetitions throughout the active range of motion of maximal concentric contraction was performed by the reciprocal muscles of a joint in a given movement direction. A 5-minute rest was considered between each test condition to allow adequate recovery between contractions. To ensure that a maximal effort was attained, all subjects received positive verbal encouragement during testing. Each of the 3 maximal contractions under each testing for the injured side of hip extensor, abductor, ankle dorsiflexor/plantarflexor, and ankle evertor/invertor were recorded using the Physiomed Software Package for peak torque calculations. The highest peak torque values were recorded for each of the 3 repetitions and the average of these values were considered as APT

To determine the severity of ankle instability the Cumberland ankle instability tool (CAIT) was used. The CAIT has been reported to be a valid tool with discriminative properties to identify patients with CAI and scores ≤ 24 are considered as unstable ankles (Jay Hertel, 2002).

2.5 Data analysis

Data were expressed as mean \pm S.D. The Shapiro-Wilk test was used to check if data were normally distributed. The Mann-whitney U tests and the Wilcoxon signed-ranks test were applied to compare mean differences in muscle strength and CAIT score between groups and within group (pretest and posttest). A p-value of less than 0.05 was considered statistically significant. All data were analyzed using SPSS version 26 (SPSS, Chicago, IL, USA).

3. Results

Following a 4-week intervention, there were significant increases in the mean values of relative peak torque for hip extensor ($P=0.042$), hip abductor ($P=0.043$), ankle dorsiflexor ($P=0.043$), invertor ($P=0.043$), evertor muscles ($P=0.043$), and CAIT scores ($P=0.041$) in the BFR + R group compared to pre-test values and there were significant increases in the mean values of relative peak torque for ankle plantar flexor, evertor, and invertor muscles compared to the R group ($P=0.009$). For the R group, however, there were significant increases in relative muscle strength for hip extensor ($P=0.039$), hip abductor ($P=0.041$), ankle dorsiflexor muscles ($P=0.043$), as well as CAIT scores ($P=0.034$) (as shown in Table 3).

Table 2. Participants' information

	Group	
	BFR + rehabilitation program (n=5)	Rehabilitation program (n=5)
Sex, men:women	3:2	3:2
Age, years	20.40 ± 0.89	20.00 ± 0.71
Body Mass Index, kg/m ²	21.52 ± 1.16	20.44 ± 0.92
CAIT score	19.80 ± 1.64	19.20 ± 1.30

Table 3. Mean (standard deviation) values of outcome measures during pre and post-intervention between groups

Variables	BFR + R group (n=5)		Only R group (n=5)	
	Pre	Post	Pre	Post
Average peak torque to body weight ratio (N.m ⁻¹ .kg ⁻¹)				
Hip extensor	0.69 ± 0.11	0.89 ± 0.13*	0.65 ± 0.08	0.69 ± 0.09*
Hip abductor	0.59 ± 0.16	0.76 ± 0.31*	0.56 ± 0.16	0.58 ± 0.16*
Ankle dorsiflexor	0.46 ± 0.19	0.70 ± 0.24*	0.42 ± 0.25	0.48 ± 0.25*
Ankle plantarflexor	0.50 ± 0.17	0.78 ± 0.26 [†]	0.45 ± 0.10	0.47 ± 0.08
Ankle evertor	0.19 ± 0.03	0.34 ± 0.13* [†]	0.18 ± 0.06	0.18 ± 0.05
Ankle invertor	0.16 ± 0.04	0.28 ± 0.05* [†]	0.15 ± 0.34	0.16 ± 0.04
CAIT score	19.80 ± 1.64	23.00 ± 2.34*	19.20 ± 1.30	20.40 ± 1.14*

*: significantly different between pre- and post-intervention, $P<0.05$

[†]: Significantly different from the conventional rehabilitation group, $P<0.05$

4. Discussion

This was the first study to examine the effect BFR training combined with rehabilitation program on isokinetic muscle strength in athletes with CAI. We herein reported an additional benefit on muscle strength after BFR + R compared to the only R program. These findings were consistent with those reports by some previous studies (Killinger et al., 2020). For example, Killinger et al. (2020) investigated the effect of BFR on muscle activations in those with CAI and found greater tibialis anterior and fibularis longus activation during isometric dorsiflexion and eversion exercises following BFR compared to the control. In the current study, we

also found greater muscle strength for hip extensor, hip abductor, ankle dorsiflexor, evertor, and invertor after BFR training over a 4-week period. In the current study, closed chain exercises were performed by concentric and eccentric demand from gluteus maximus, gluteus medius, fibularis longus, gastrocnemius, and tibialis anterior, which were muscular co-contraction to help improve joint stability (Jaber, Lohman, Alameri, et al., 2018). Theoretically, BFR with a light load exercise can lead to the recruitment of large motor units (i.e., fast-twitch muscle fibers). This reduction in blood flow would create hypoxic intramuscular environment, which in turn may stimulate the increase in muscle activation via group III and IV muscle afferents. (Yasuda et al, 2010, Brandner, Warmington, & Kidgell, 2015). In addition, the cortical excitability at the primary control site of lower limb BFR training, may have spilled over to the proximal control site, thereby causing the recruitment of a greater muscle mass. This increased amplitude of motor evoked potential in corticospinal region during BFR training may alter motor output to blood flow restricted area in the distal (Madarama et al., 2008; May, Russell, & Warmington, 2018). Furthermore, BFR has been shown to cause high levels of metabolic stress, possibly due to the metabolic waste products accumulation (Takada et al., 2012). This has been described as ‘primary hypertrophy factors’ to activate muscle growth (Rossi, Freitas, Zanchi, Lira, & Cholewa, 2018). Although we found no statistical differences in CAIT score between groups in the present study; however, the improvement may be clinically meaningful because the size of improvement (3.2 points) exceeds its established Minimum Clinically Important Difference (MCID) value (3 points) (Wright et al., 2014). Nevertheless, it should be noted that since a small sample size was included in the present study, it could have had an influence on the power of significance of the study. Clearly, further studies with larger number of participants are needed to confirm this effect.

In conclusion, we demonstrated that the BFR training combined with conventional rehabilitation program induced greater muscle strength of ankle muscles and improved ankle stability compared to the conventional rehabilitation alone in athletes with CAI. This finding may have implications for physical therapist with an interest in developing an appropriate rehabilitation program for improving ankle instability in athletes with CAI.

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“Multidisciplinary approaches in long term development”



The Level of Study Physical Fitness for Physical Education Students and Sport Science students before Professional Experience at Buriram Rajabhat University

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Abstract

Before teaching or before professional experience physical education students and sports science students have to know the level of physical fitness. To be understand and look yourself before leading to other persons about physical fitness. The aim of this study to check level of physical fitness for physical education students and sports science students Before teaching and before professional experience at Buriram Rajabhat University. Research method sample group was students of The Buriram Rajabhat University, 48 students in the 4th year of physical education, divided into 28 males, 20 females, and 53 3rd year sports science students, divided into 33 males, 20 females. All subject obtained from a purposive sample. The tool used for data collection was the physical fitness test of The Bureau of Sports Science, Department of Physical Education, Ministry of Tourism and Sports in 2019. Analyzed the data by averaging, standard deviation and T-test statistics.

The results of the research were as follows: 1. Comparing the average of physical fitness test results of sports science students, male and female, with the existing standards of physical fitness of the people aged 19-59 years 2019. 5 Level 1 very low, 2 low, 3 moderate, 4 good and 5 Excellent. Results of sit and reach was averaging 3 and 3 at moderate and

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moderate levels. The hand grip strength was averaged at 3 and 4 at moderate and good. 60 seconds chair stand averages 5 and 5, Excellent and Excellent. 3 minutes step up and down average 4 and 4, at good and good levels, respectively. 2. The physical fitness of the physical education students, males and females from the mean of male and female test results, sit and reach was averaged as 3 and 2 at moderate and Low. The hand grip strength was averaged 3 and 3 were moderate and moderate. 60 seconds chair stand averages 5 and 5, Excellent and Excellent. 3 minutes step up and down average 4 and 3, were at good and moderate levels, respectively. When combined with the overall average level physical fitness of male students. Both branches were at 3 points, at a moderate level. As for female students in Sports Science, 3.2 points were at a moderate level, and students in Physical Education, 2.6 points, were at a low level. So two of major should be given the knowledge and more activity about physical performance before student professional experience or teaching.

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Keywords: sports science students, physical education students, physical fitness

1. INTRODUCTION

Nowadays, facilities in various technology educational establishments play a huge role in every factor in life. Factors in living for comfort especially communication, almost everything, whether it is teaching spending time on mobile phones reduce the movement activity using improper exercise or lack of exercise will cause a risk of various diseases. National Statistical Office Ministry of Information and Communication Technology (2015) surveyed the movement activity data, exercise of Thai population aged 15 years and over. It was found that 52.8 million people were inadequate exercise, 25.32 million men, 48.1%, and 27.36 million women, 51.9 percent. This leads to a reduced risk of health problems from physical activity. Therefore, in order to take care of and help others, we must have good health and fitness. Perfectly strong both physically and mentally. (Jaturong Hemra, 2018) Physical fitness means the ability of the body to perform. It is duties effected and still have the energy left to carry out other activities effectively good physical performance is based on the elements that complete each aspect of the movement mechanism. (Thaworn Kamutsri, 2017) consists of strength, speed, flexibility, endurance and coordination and the relationship of the nervous system and muscles also)Napradit, and Pantaewan, 2009) Physical fitness consists of muscular strength, muscular endurance, flexibility, cardiorespiratory endurance and body composition. Buriram Rajabhat University is directly responsible for producing and developing personnel. To promote and support the management of education to respond and help solve problems for the local area. Therefore, teaching in the field of physical education and sports science has been organized at the bachelor's level. To help society and the nation according to government policy to be a source of intelligence in physical education and sports science. Is an instructor and a leader in exercise and sports have competent personnel to practice and create people to be good people with ethics. To have specific expertise in the profession and to be the basis for sustainable development of the country. The Buriram Rajabhat University will produce quality graduates. According to that goal It is imperative that students of Buriram Rajabhat University know the level of their physical fitness and those involved in the profession. As well as to developing the physical fitness of oneself and those involved in the profession to a good level.

Therefore, from the above reasons and importance. The researcher is interested in studying the physical fitness of physical education students and sports science students before teaching and before professional experience. As a basic information for improving, promoting and developing physical fitness of students and as a guideline for further research on related matters.

2. RESEARCH OBJECTIVE

To check level of physical fitness for physical education students and sports science students Before teaching and before professional experience at Buriram Rajabhat University.

3. Research Question:

Is students of Physical Education and students of Sports Science in Rajabhat University being physical fitness in good level?

4. The Research Method

The Study Design

The design of this study was exploratory research. The participants were from assigned volunteers.

The Research Population

The populations of this research were 274 Physical Education students and 287 Sports Science students in the academic year 2019 of Buriram Rajabhat University.

The Research Samples:

The samples were 48 4th year students of Physical Education major consisting of 28 males and 20 females. And 53 3rd year students of Sports Science major consisting of 33 males and 20 females of the Buriram Rajabhat University. The samples were from purposive sample.

Inclusion criteria

Qualifications of the selected to be participants in this research.

1. Be students in Physical Education major and Sports Science major before internship. And passed the subjects involving sports training skills courses at least six subjects.

2. Be between the ages of 18-22.

3. Be no congenital diseases such as diabetes, high blood pressure, and heart disease.

4. Be no bodily injury affecting the physical fitness test.

Exclusion criteria

1. Not be students in Physical Education major and Sports Science major

2. Be the age under 18 or over 22

3. Be congenital diseases such as diabetes, high blood pressure, and heart disease

4. Be bodily injury affecting the physical fitness test.

5. Data collection

Test list body composition weight and height scales, Body Mass Index)BMI), The height and body weight were used to calculate the body mass index)BMI) using the formula $BMI = \text{body mass (kilogram)} / \text{height (m}^2\text{)}$ (ACSM 2009) People's Physical Fitness Tests and Benchmarks between the age 19-59 year 2019 (Ministry of Tourism and Sports. 2019) Flexibility measured by Sit and Reach test, The muscle strength measured by Hand Grip Strength test, The muscle endurance measured by 60 seconds Chair Stand test and The cardiovascular endurance measured by 3 minutes step Up and Down test. The values obtained for each item were compared with the physical fitness benchmark of the people aged 19-59 years.

6. Data Analysis

1. Find the mean (x) and standard deviation (SD) of each physical fitness test result of male and female students.

2. Compare the mean of each physical fitness test result among students. Male and female students using the statistical test (T-Test).

3. Present the data in the form of tables and arrangements.

7. Results

Table 1 Show mean and standard deviation of body mass index and heart rate of 4th year students in Physical Education at Buriram Rajabhat University in the academic year 2019 classified by gender.

Test list	Male)N=28)		Female)N=20)	
	Mean	S.D	Mean	S.D
Body Mass Index (BMI)	22.60	2.49	21.54	2.76
Heart rate	84.00	14.26	94.80	13.66

Table 2 Show mean and standard deviation of physical fitness. of students in Physical Education at Buriram Rajabhat University, 4th year in the academic year 2019 classified by gender

Test list	Male)N=28)		Female)N=20)	
	Mean	S.D	Mean	S.D
Sit and Reach	11.58	6.34	11.58	7.19
Hand Grip Strength	0.61	0.18	0.55	0.15
60 Seconds Chair Stand	64.29	10.33	50.55	7.68
3Minutes Step Up and Down	172.79	31.78	153.90	17.96

Table 3 Show mean and standard deviation of body mass index and heart rate of physical fitness of 3rd year sports science students in academic year 2019 classified by gender.

Test list	Male)(N=33)		Female)(N=20)	
	Mean	S.D	Mean	S.D
Body Mass Index (BMI)	22.25	3.27	21.18	2.95
Heart rate	82.70	13.07	93.90	13.39

Table 4 Show mean and standard deviation of physical fitness. Physical fitness of 3rd year sports science students in the academic year 2019 classified by gender

Test list	Male)(N=33)		Female)(N=20)	
	Mean	S.D	Mean	S.D
Sit and Reach	10.87	6.56	13.38	5.70
Hand Grip Strength	0.66	0.10	0.57	0.10
60 Seconds Chair Stand	60.42	12.02	53.90	8.32
3Minutes Step Up and Down	166.64	13.33	161.45	15.04

Table 5 Comparing the average of BMI and heart rate test results of 4th year Physical Education students in the academic year 2019 classified by gender.

Test list	Gender	Mean	S.D	t	p-value
Body Mass Index (BMI)	Male	22.60	2.49	1.40	0.169
	Female	21.54	2.76		
Heart rate	Male	84.00	14.26	-2.63*	0.012
	Female	94.80	13.66		

* Statistically significant at the 0.05 level

Table 6 Comparing the average of each physical fitness test result of 4th year Physical Education students in the academic year 2019 classified by gender.

Test list	Gender	Mean	S.D	t	p-value
Sit and Reach	Male	11.58	6.34	0.004	0.997
	Female	11.58	7.19		
Hand Grip Strength	Male	0.61	0.18	1.292	0.203
	Female	0.55	0.15		
60 Seconds Chair Stand	Male	64.29	10.33	5.031*	0.000
	Female	50.55	7.68		
3Minutes Step Up and Down	Male	172.79	31.78	2.614*	0.012
	Female	153.90	17.96		

*Statistically significant at 0.05 level

Table 7 Comparing the average of BMI and heart rate test results of 3rd year sports science students in the academic year 2019 classified by gender.

Test list	Gender	Mean	S.D	t	p-value
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Body Mass Index (BMI)	Male	22.25	3.27	1.195	0.238
	Female	21.18	2.95		
Heart rate	Male	82.70	13.07	-2.998*	0.004
	Female	93.90	13.39		

*Statistically significant at 0.05 level

Table 8 Comparing the average of each physical fitness test result of 3rd year sports science students in the academic year 2019 classified by gender.

Test list	Gender	Mean	S.D	t	p-value
Sit and Reach	Male	10.87	6.56	-1.414	0.163
	Female	13.38	5.70		
Hand Grip Strength	Male	0.66	0.10	3.436*	0.001
	Female	0.57	0.10		
60 Seconds Chair Stand	Male	60.42	12.02	2.133*	0.038
	Female	53.90	8.32		
3Minutes Step Up and Down	Male	166.64	13.33	1.308	0.197
	Female	161.45	15.04		

*Statistically significant at 0.05 level

Table 9 Comparing the mean of BMI and heart rate test results of male students in the 3rd year of Sports Science and the 4th year of Physical Education

Test list	Class year (male)	Mean	S.D	t	p-value
Body Mass Index (BMI)	3 rd year	22.25	3.27	-0.469	0.640
	4 th year	22.60	2.49		
Heart rate	3 rd year	82.70	13.07	-0.372	0.711
	4 th year	84.00	14.26		

*Statistically significant at 0.05 level

Table10 Comparing the average of the physical fitness test results for each list of male students in the 3rd year of Sports Science and the 4th year of Physical Education.

Test list	Class year (male)	Mean	S.D	t	p-value
Sit and Reach	3 rd year	10.87	6.56	-0.429	0.669
	4 th year	11.58	6.34		
Hand Grip Strength	3 rd year	0.66	0.10	1.490	0.142
	4 th year	0.61	0.18		
60 Seconds Chair Stand	3 rd year	60.42	12.02	-1.332	0.188
	4 th year	64.29	10.33		
3Minutes Step Up and Down	3 rd year	166.64	13.33	-0.955	0.346

*Statistically significant at 0.05 level

Table 11 Comparing of the mean of BMI and heart rate test results of female students in the 3rd year of Sports Science and the 4th year of Physical Education.

Test list	Class year (Female)	Mean	S.D	t	p-value
Body Mass Index (BMI)	3 rd year	21.18	2.95	-0.397	0.694
	4 th year	21.54	2.76		
Heart rate	3 rd year	93.90	13.39	-0.210	0.834
	4 th year	94.80	13.66		

*Statistically significant at 0.05 level

Table 12 Comparing the average of the physical fitness test results for each list of female students in the 3rd year of Sports Science and the 4th year of Physical Education.

Test list	Class year (Female)	Mean	S.D	t	p-value
Sit and Reach	3 rd year	13.38	5.70	0.877	0.386
	4 th year	11.58	7.19		
Hand Grip Strength	3 rd year	0.57	0.10	0.492	0.625
	4 th year	0.55	0.15		
60 Seconds Chair Stand	3 rd year	53.90	8.32	1.323	0.194
	4 th year	50.55	7.68		
3Minutes Step Up and Down	3 rd year	161.45	15.04	1.441	0.158
	4 th year	153.90	17.96		

*Statistically significant at 0.05 level

Table 13 Show the results level from each physical fitness test of male students in 3rd year of Sports Science and 4th year of Physical Education both male and female

Test list	sports science				Physical Education			
	Male	Level	Female	Level	Male	Level	Female	Level
Sit and Reach	3	Moderate	3	Moderate	3	Moderate	2	low
Hand Grip Strength	3	Moderate	4	Good	3	Moderate	3	Moderate
60 Seconds Chair Stand	5	Excellent	5	Excellent	5	Excellent	5	Excellent
3Minutes Step Up and Down	4	Good	4	Good	4	Good	3	Moderate
Total average	3	Moderate	3.2	Moderate	3	Moderate	2.6	low

8. CONCIUSION

Summary of physical fitness of 4th year physical education students, male and female. Body Mass Index (BMI) averages were 22.60 and 21.54 kg/m². heart rate the mean were 84.00 and 94.80 beats per minute, sit and reach were averaged 11.58 and 11.58 centimeters. The hand grip strength was averaged 0.61 and 0.55 kilograms. 60 seconds chair stand averages 64.29. and 50.55 times and 3 minutes step up and down average 172.79 and 153.90 times respectively. Summary of physical fitness of 3rd year sports science students, male and female. (BMI) averages were 22.25 and 21.18 kg/m². heart rate the mean were 82.70 and 93.90 beats per minute, sit and reach were averaged 10.87 and 13.38 centimeters. The hand grip strength was averaged 0.66 and 0.57 kilograms. 60 seconds chair stand averages 60.42. and 53.90 times and 3 minutes step up and down average 166.64 and 161.45 times respectively.

Comparing the average of physical fitness test results of sports science students, male and female, with the existing standards of physical fitness of the people aged 19-59 years 2019. 5 Level 1 very low, 2 low, 3 moderate, 4 good and 5 Excellent. Results of sit and reach was averaged 3 and 3 at moderate and moderate levels. The hand grip strength was averaged at 3 and 4 at moderate and good. 60 seconds chair stand averages 5 and 5, Excellent and Excellent. 3 minutes step up and down average 4 and 4, at good and good levels, respectively. 2. The physical fitness of the physical education students, males and females from the mean of male and female test results, sit and reach was averaged as 3 and 2 at moderate and Low. The hand grip strength was averaged 3 and 3 were moderate and moderate. 60 seconds chair stand averages 5 and 5, Excellent and Excellent. 3 minutes step up and down average 4 and 3, were at good and moderate levels, respectively.

9. DISCUSSION

After comparing the physical fitness level for 5 levels we fine scale to used (Amnat Stoytong and Chanyut Sudtongkong. 2015) Create a normal physical fitness score by categorizing it into 5 levels, which are very high, high, moderate, relatively low, and low. Physical education students, male and female. Body Mass Index (BMI) averages were 22.60 and 21.54 kg/m² and sports science students, male and female. (BMI) averages were 22.25 and 21.18 kg/m² as a normal (World Health Organization 2004) appropriate body-mass index for Asian populations. When combined with the overall average level physical fitness of male students. Both branches were at 3 points, at a moderate level. As for female students in Sports Science, 3.2 points were at a moderate level, and students in Physical Education, 2.6 points, were at a low level. in accordance with (Peerapol Boonyanuwat, Nom Sangtong, Chailikit Soipetkasem. 2012) Study Health-Related Physical Fitness of Upper Secondary School Students in Popular Schools of the Secondary Education Service Area 16, Province of Songkhla. The research found students of Mattayom 4, 5 and 6 had overall health-related physical fitness at a medium level of both male and female. Another study)Pornthep et al., **2020**) fine students of Physical Education program, College of Teacher Education, Phranakhon Rajabhat University. The study fine for 3 Minute step test of both males and females students got the below standard. Also (Charee Jansupom, Narong Jomkokkruad, Pornthip Chatchukiatkun. 2019) study of health - related physical fitness of a students in Rajamangala University of Technology Isan Nakhon Ratchasima. The female students found that hand grip strength force is low, sit and reach is moderate. So this is the aim of study fine our students show the level of moderate and low even studing physical education and sports science, students should have a good level of physical fitness test before teaching others.

10. SUGGESTION

1. Suggestions for the application of research results IT should improve Physical fitness for all student in a good level especially in developing flexibility and muscle strength.

Suggestions for future research

1. Subsequent studies may compare the physical performance of all year to year students to determine their physical fitness.

2. For further studies, the physical fitness of the Buriram population should be assessed in order to plan the development of a healthy city to a sport city.

3. Students of all faculties of Buriram Rajabhat University should study physical fitness students before taking an internship on basic knowledge of good physical fitness.

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The 11th International conference of sports and exercise science (ICSES 2021)

“Multidisciplinary approaches in long term development”



Physical fitness and anthropometric characteristics of the blind national 5-a-side football players

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Abstract

Visual impairment is one of the limiting factors of physical performance in blind athletes. To date, no study investigates physical fitness and body composition profiles in blind Thai national 5-a-side football players. Therefore, this study aimed to investigate and compare physical fitness and body composition profiles between blind national five-a-side (BF) players and sighted professional futsal (FS) players. Nine male blind national 5 – a – side football players and nine male sight futsal players were recruited to the study. Body composition and physical fitness, muscle strength, agility, and cardiovascular endurance were evaluated. The differences in physical characteristics, physical fitness, and body composition profiles between groups of athletes were determined using an independent t-test. The results show that there is a significant difference between the mean age of the BF and FS groups. Isokinetic muscle peak torques of hamstrings and HQ ratios in the BF were significantly higher than FS in both legs. VO₂max values of these two groups were not different, but the agility performance of the FS was significantly superior to BF. DXA body composition assessments reveal that there was no significant difference in %body fat, fat mass, total lean mass, regional lean mass, and visceral fat mass. It can be concluded that a compromised vision in the blind players potentially affects the inferior in spatial perception and agility. Additionally, sport-specific training may lead to differences in muscle strength, and hamstrings-quadriceps muscle balance between player groups.

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Keywords: Blind 5-a- side football; Physical fitness; Body composition

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1. Introduction

Visual impairment or a functional limitation of the visual system could appear as a lower visual acuity or contrast sensitivity, visual field loss, photophobia, diplopia, visual distortion, visual perceptual difficulties, or any combination of the above (1). Five-a-side football is one of the Paralympic modalities for people with visual impairment. It is a five against five-game in a field of 40 m × 20 m and a totally 40 minutes duration that consists of two halves. Except for the goalkeeper who is sighted, the athletes could be classified in three levels: 1) totally blind or B1; from no light perception up to light perception but the inability to recognize the shape of a hand; 2) partially sighted or B2; able to recognize the shape of a hand up to a visual acuity of 2/60 or a visual field of fewer than 5 degrees; 3) partially sighted or B3; visual acuity from 2/60 to 6/60 or visual field from 5 to 20 degrees (2, 4, 5). According to the rules of 5-a-side football, the physical fitness and physiological demands of blind 5-a-side football players are likely comparable to those of conventional futsal, requiring a good technique and physical fitness such as aerobic fitness, agility, muscle strength.

It has been shown that agility, and gait speed depends on the visual class of impairment, and the capabilities of the visually impaired athletes to regulate the balance and perform quick movement were lower compared to those of sighted athletes (7-10). A previous study showed that 16-week training can cause significant improvements in aerobic and anaerobic fitness, but not in body composition parameters of the Brazilian Paralympic 5-a-side football players (2). The inferior aerobic, anaerobic fitness, and motor profiles e.g. agility, and standing long jump of these players compared to that of professional futsal players were also reported (11, 12). However, to date, there was no study investigates physical fitness and body composition profiles in blind Thai national 5-a-side players. Therefore, the study was aimed to evaluate and compare physical fitness, and body composition profiles of blind national 5-a-side players and sight professional futsal players. The information gained from the present study would provide new information of physical fitness and body composition data in this group of athletes as well as the difference compared to the sight futsal players. These will be essential for developing a future training program for physical fitness improvement of blind Thai national 5-a-side players.

2. Materials and Methods

2.1 Participants

Nine players who are blind national five-a-side players and nine sight futsal Thailand league players were recruited to participate in this study. The experimental protocol, procedures, as well as risks, and benefits of the test were clearly explained to each individual. The written informed consent form was signed with the subject's understanding of the experimental protocol before participating in the research study. This study was approved by Central Institutional Review Board-Mahidol University (COA.NO 2020/039.1603). The participants were asked to avoid drinking alcohol, coffee and did not perform strenuous training or exercise at least 24 hours before the test. The tests were conducted at the same time of day to avoid the circadian effects. The timeline of the experimental procedures is shown in Figure 1.

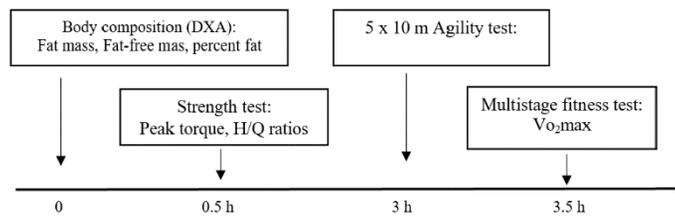


Figure 1. Timeline of the experimental procedures

2.2 Body composition

Dual X-Ray absorptiometry (DXA) (GE Healthcare, USA) was used to assess whole body composition. Participants were asked to remove all jewelry and metal before lying down on the DXA table without moving for the whole period of scanning (about 7 minutes). The testing position was set in the standard anatomical position and lying in the field of view. The participant must be lying in the center and squat the patient. The top of the head was not over 3 centimeters below a line on a pad, and Velcro straps were used to fasten the knee and ankle joints. The participant's body figure shown on the computer screen was subdivided by creating lines and areas of arms, legs, trunk, and head. Fat, lean soft tissue, and bone mass composition was determined for each sub-region (15).

2.3 Strength test

An isokinetic dynamometer (Biodex System 4) was used to evaluate the peak torques of knee extension (Q) and flexion (H), and the H/Q ratio. Participants were asked to warm up before isokinetic assessment by cycling (Monark ergometer) at 50-100 W) followed by dynamic stretches for the major lower-limb muscle groups. Concentric isokinetic torques were assessed during knee extension and flexion movements at the angular velocity of 60° per second through a knee range of motion of 0° (flexion) to 80° (extension). The participant was given three trials at the submaximal effort and then performed one set of five repetitions at the maximal voluntary contraction (13,14). A 30-second rest was given after the sub-maximal trial, and a three-minute break was given when a transition to the opposite leg. The order of testing was randomized for the dominant (D) and non-dominant (N-D) legs. Dominance leg was determined as the leg that is preferred when kicking a ball. The data analysis was composed of the ratio of muscle (H/Q) torque for both the D and N-D extremities, relative PTs (Nm•kg⁻¹) for knee flexion (PT-H), and knee extension (PT-Q).

2.4 Agility 5 x 10

The agility test was 5 meters sprints forward and returning as fast as possible to the starting point, a total of 10 meters in distance (Figure 2). This was repeated five times without stopping (covering 50 meters in total), the participant was suggested by a given sound cue to cross their feet after the line before a turn and returns (11). In visual impairment athletes, two assistances 'guides' were recruited. Each was placed on each line and shouted at different moments. When the test started, guider 1 shouted repeatedly "I" (alerting sound) alternating with a handclap. The participant with visual impairment was asked to run as fast as possible towards guider 1; when the participant surpassed the finish line, guider 2 on the opposite side performed the same procedure, so the participant returned to the starting line, and completing one cycle.

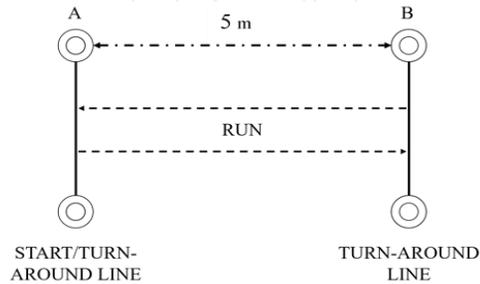


Figure 2. Agility 5 x 10 test

2.5 Multistage fitness test

The test area (40 x 20 meters) and the distance were defined as 20 meters. The participant was suggested to continuously run with the speed pre-set by a beep, which showed increased velocity, and decreased time between distances, according to the increase in the number of levels completed. If the participant could not reach the end of the distance 2 continuous times before the beep, the test was terminated. The maximum oxygen consumption (VO₂max) was estimated using the formula (8):

$$y = 31.025 + (3.238 \times \text{velocity}) - (3.248 \times \text{age}) + (0.1536 \times \text{age} \times \text{velocity}).$$

2.6 Statistical analysis

All data were analyzed using PASW Statistics 18.0 (SPSS Inc., Chicago IL, USA). Continuous data were reported as mean \pm SD. Shapiro-Wilk test will be used to determine the normal distribution of continuous data. Independent-T test was performed to test the differences in physical characteristics, physical fitness, and body composition profiles between groups of athletes. The level of statistical significance was set at $p < 0.05$.

3. Results

3.1 General characteristics and body composition

The average age of the blind football players was significantly higher than that of the futsal players ($p=0.032$). Height, weight, and BMI were not significantly different (Table 1). There was no significant difference in % body fat, total fat mass, visceral fat, fat-free mass, and regional lean mass i.e. arms, thighs, and trunk lean mass between groups.

Table 1. General characteristics and body composition of blind football and futsal players.

Variables	Groups	
	Blind football players (n=9)	Futsal players (n=9)
Age (years)	26.6 ± 4.8*	22.4 ± 2.0
Height (cm)	170.0 ± 3.6	170.8 ± 5.4
Weight (kg)	68.34 ± 4.90	66.21 ± 5.32
BMI (kg/m ²)	23.72 ± 2.60	22.70 ± 1.28
%Body fat (%)	18.66 ± 8.07	15.14 ± 4.76
Fat-free mass (kg)	53.36 ± 4.76	53.41 ± 3.84
Visceral adipose tissue mass (g)	311.33 ± 282.69	205.77 ± 104.14
Fat mass (kg)	12.45 ± 6.20	9.73 ± 3.80
Right arm muscle mass (g)	3,249.11 ± 380.84	3,019.77 ± 273.95
Left arm muscle mass (g)	3,094.33 ± 413.35	2,988.11 ± 262.55
Right thigh muscle mass (g)	9,953 ± 806.58	9,915.22 ± 674.19
Left thigh muscle mass (g)	9,835.0 ± 840.14	9,985.44 ± 816.40
Trunk (g)	23,924.67 ± 2,696.42	24,227.89 ± 1,987.23

*Significant difference between blind football and futsal player ($p < 0.05$).

3.2 Muscle strength

Table 2 shows mean peak torque values at the velocity of 60°/s of quadriceps, hamstring, and the HQ ratio for both right and left legs. There was no significant difference in peak torques of quadriceps in the right ($p = 0.086$) and the left ($p = 0.085$) legs when compared between blind football players and futsal players. Significant differences in peak torque of hamstring and the HQ ratio of right and left legs were significantly observed between groups with higher values in blind football players ($p < 0.01$).

Table 2. Mean ± SD values of quadriceps peak torque, hamstring peak torque, and HQ ratio of right and left legs.

Variables	Groups	
	Blind football players (n=9)	Futsal players (n=9)
Right leg		
Peak torque of quadriceps (Nm)	201.28 ± 30.43	170.08 ± 41.22
Peak torque of hamstring (Nm)	115.06 ± 32.24*	66.13 ± 16.85
Peak torque of quadriceps (Nm/kg)	2.95 ± 0.48	2.55 ± 0.51
Peak torque of hamstring (Nm/kg)	1.68 ± 0.46*	0.99 ± 0.21
HQ ratio	0.83 ± 0.15*	0.61 ± 0.16
Left leg		
Peak torque of quadriceps (Nm)	205.19 ± 37.55	177.54 ± 25.15
Peak torque of hamstring (Nm)	109.00 ± 27.93*	68.80 ± 8.96
Peak torque of quadriceps (Nm/kg)	3.00 ± 0.51	2.68 ± 0.37
Peak torque of hamstring (Nm/kg)	1.60 ± 0.42*	1.04 ± 0.14
HQ ratio	0.79 ± 0.17*	0.59 ± 0.11

*Significant difference between blind football and futsal player ($p < 0.05$).

3.3 Cardiovascular endurance and agility performance

The predicted maximal oxygen consumption rates (VO₂max) from the 20 m-multistage fitness test of blind football players and futsal players were 39.07 ± 8.70 ml/kg/min, and 42.38 ± 4.02 ml/kg/min, respectively. There was no significant difference in VO₂max when compared between groups ($p < 0.05$). Agility of futsal players (15.05 ± 3.59 s) was significantly better than blind national 5-a-side football players (20.15 ± 4.42 s) ($p = 0.008$).

4. Discussion

Our results show that while the agility of the 5-a-side football players (FB) is inferior to that of futsal players, but their muscle fitness is superior to that of semi-professional futsal athletes (FS). We are also the first to show the body composition profiles of the blind national football players from the DXA assessment. Although height, and percentage of fat of the FB (height = 1.70 m, %body fat = 18%) and FS (height = 1.71 m, %body fat = 15%) in the present study are similar to those of blind 5-a-side footballers from the Brazilian Paralympic Team (height = 1.72 m., %body fat = 16%) (2), and previously reported in elite futsal players (height = 1.76 m., %body fat = 15%) (16), their body weight, fat-free mass, and BMI are lower compared to those previously reported. Isokinetic concentric peak torque of knee extensor of the FB and FS players were not different, and these values similar to those of Brazilian elite futsal players (2.85 Nm/kg) (2). However, futsal players in the present study had a lower knee flexors strength compared to blind national football players, and futsal players in the previous study (17). This strength imbalance of futsal players may increase the risk of hamstring injuries. Aerobic fitness of the blind national football in the present study are lowered (VO₂max = 39 ml/min/kg) compared to those of the Brazilian 5-a-side football team (VO₂max = 45-50 ml/min/kg) (2), and English futsal players (VO₂max = 58-60 ml/min/kg) using the 20 m-multistage fitness test (18). The difference in aerobic fitness is likely related to the level of adaptations resulted from the season of training period, competitive level, and training program (2,11,16,18-19). In addition to, we characterized agility of the players using 5x10 test and agility performance of the 5-a-side players in the present study is similar to the previous study (20 ± 4 Vs. 22 ± 3 s) (11), but inferior compared to sighted futsal player (15 ± 3.5 s). The normal vision in futsal players is strongly a major factor responsible for superior agility performance than blind football players. Future studies seeking for development of cardiorespiratory fitness, and agility for blind 5-a-side football players are needed.

5. Conclusion

Results demonstrate that vision is a crucial indicator of agility as this performance of the blind 5-a-side football players is inferior to that of professional futsal players. However, their hamstring muscles strength and H/Q ratio is superior to that of futsal players. The latter is likely associated with the difference in sport-specific training programs between 5-a-side football and futsal. This study can be served as a baseline of their physical fitness level and may potentially contribute to the prescription of training programs for blind national 5-a-side football players, and futsal Thailand league players to develop their physical fitness.

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Poster Presentation Session

The 11th International conference of sports and exercise science

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Abstract



**The 11th International conference of sports and
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“Multidisciplinary approaches in long term development”



Heart Rate Variability and Cardiorespiratory Fitness in Relation with Visceral Adiposity in Obese Adults

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Abstract

Objectives: The purpose of the present study was to evaluate the heart rate variability (HRV) and cardiorespiratory fitness (CRF) variables in association with general and visceral adiposity in obese adults.

Methods: Thirty obese women and three obese men (aged 41.2 ± 8.4 years; BMI 28.7 ± 3.7 kg/m²; body fat percentage (%BF) $41.2 \pm 5.2\%$) were included in the study. Subjects were recorded using a 5-min electrocardiographic recording in sitting position. The ECG recording took place in a quiet air-conditioned room at a fixed time in the morning. The RR intervals were analyzed by ECG recording using the eMotion Faros Manager HRV software program. The CRF was measured as peak oxygen consumption test on a treadmill until voluntary exhaustion. Expired gas samples were collected on a breath-by-breath basis using a metabolic cart. Dual-energy X-ray absorptiometry was used to estimate total fat mass (TFM) and VAT. Pearson's correlation was used to assess the relationship between adiposity indices with HRV and CRF variables. HRV variables with skewed distribution were log-transformed using the natural logarithm.

Results: The data showed a reduction of CRF was significantly related to an increase in BMI ($r = -0.36$, $p < 0.05$), body fat percentage (%BF) ($r = -0.63$, $p < 0.01$), TFM ($r = -0.54$, $p < 0.01$), fat mass (FM) ($r = -0.54$, $p < 0.01$), visceral fat area ($r = -0.36$, $p < 0.05$), and visceral fat mass ($r = -0.36$, $p < 0.05$). Furthermore, a reduction of HRV related to an increase of VAT although this relation appeared significant only for very low frequency ($r = -0.33$, $p < 0.05$).

Discussion and conclusion: Finally, we concluded that lower CRF was significantly associated with higher amount of fat both general body and visceral. In addition, VAT, rather than the general body fat mass, is responsible to the impairment of sympatho-vagal balance activity in obese adults.

Keywords: central obesity; heart rate variability; visceral fat; peak oxygen consumption

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"Multidisciplinary approaches in long term development"

Superstition in Sports in Thailand: Literature Review

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Abstract

The objective of this first literature review is to unveil the current status of knowledge on superstition in sport. Superstitious behaviors vary with the type of sport and by the importance of the competition. Cultural factors, in conjunction with education level, as well as gender, have a strong influence on superstitious behaviors in sports. Based on current thoughts, religiosity and superstition are different psychological constructs used as psychological aids by many athletes. Three main ritual themes are: praying, merit making, horoscopes, and vows. The types of superstitions that each athlete discussed included luck, individual rituals and routines, team rituals and routines, clothing and equipment, food and eating rituals, and behavior taboos. The participants used these rituals and behaviors as a way to bring themselves good luck and ward off bad luck, deal with high levels of stress and anxiety, regulate emotions and gain control over uncertain factors for optimal performance. The findings suggest that athletes perform superstitions to put their minds at ease, build confidence and mental power, and give themselves that extra sense of luck in order to perform better.

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Keywords: Superstition/ ritual/ optimal performance/ mental power

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"Multidisciplinary approaches in long term development"

Design and Marketing Factors for Mobile Fitness Chatkamon Singnoy^a, Onwaree Ingkatacha^a, and Sugree Supawarikul^b

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Abstract

Objectives of this study were to determine factors of decision making and marketing in Mobile Fitness using a mobile fitness vehicle. This survey research includes 25 Participants who exercise in Mobile Fitness facilities located at gas stations from 15:00 to 21:00 o'clock. Data collection used interviews and an open end questionnaire. Mean and standard deviation were used for statistical analysis.

The results of the study showed that most of the service users were married. Their education is at the bachelor degree level. Most were male between 21-26 years of age, and most of them were students earning less than 10,000 baht per month. Most users were primarily interested in subscribing to a monthly fitness membership with the goal of keeping fit and healthy. They judge the accessibility of services via online media and word of mouth publicity (friends). In addition, their decision to use the service is also based on price and location. Most use the service 4-5 times a week. There are also times when they are interested in exercising between 16:00 and 22:00. Users focus on a safe and convenient location, clean and adequate equipment, and the care and enthusiasm of the staff. However, the interview results found that the majority of people responded positively because the THAI mobile fitness program is suitable for the Bangkok lifestyle. It is convenient to have a location close to home with a restaurant and parking. Matters needing improvement are the smell of oil and the bathroom smell, including the cleanliness of the toilet in the gas station where the facility is located. In addition, during the afternoon, the weather is quite hot. However, there is the option to provide the service in a completely closed and air conditioned room. The important thing is to promote the facility so that more people can understand it. Most of the interviewees did not understand why it was created because the locations are so scattered. Additionally, many people go to service stations with the aim of using the toilet or buying food, and are less interested in the fitness centre. A reasonable price for using the fitness centres at the service station is not more than 100 baht. Various marketing mix factors will help the Mobile Fitness operators to run a successful business.

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Keywords: Decision Factors /Marketing Behaviors / Exercise in Mobile Fitness

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Attitude and Behavior of Food Consumption in Thai National Physical Disabilities Athletes

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Nakhon Ratchasima 30000, Thailand*

Abstract

Purpose: This survey study was to assess the attitude and behavior of food consumption in Thai National physical disabilities athletes. **Methods:** The participants were 35 physical disabilities athletes from the Thai national team during training camp for participating in international events (11 females and 24 males) from 5 sports-type; para-table tennis (n = 11), para-rowing (n = 4), wheelchair tennis (n = 7), para-shooting (n = 10), and para-swimming (n = 3) in His Majesty the King's 80th Birthday Anniversary Stadium, Nakhon Ratchasima, Thailand. The instruments were a self-administered questionnaire; 1) personal data (9 items) 2) attitude of food consumption (rating scale from 1-5; 20 items), 3) food consumption behavior (rating scale from 1-3; 30 items), and reliability = 0.89. Data were analyzed using descriptive statistics by percentage, mean and standard deviation. **Results:** The data of this study show that attitudes of food consumption were highest for consuming a variety of foods to keep fit and eating disproportionately affecting future health (3.80±0.89; 22.86%), eating sweet foods to make you fat (3.34±0.77; 20.00%), consuming full meals at every meal will prevent malnutrition (3.74±0.90; 8.57%), and average attitudes of food consumption at 3.6±0.26. The behavior of food consumption was highest for eating freshly cooked food without contaminants (1.71±0.50; 74.28%), drink 10-12 glasses of clean water a day (1.69±0.46; 68.28%), eat all 3 main meals from 5 food groups during the competition period (1.14±0.54; 22.86%), and average behavior of food consumption at 1.22±0.13. **Conclusion:** In conclusion, this study suggested that Thai National physical disabilities athletes have the attitudes and behavior of food consumption were at a moderate level.

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Keywords: attitude; behavior; food consumption; disabilities athletes



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Examining Grip Strength in Table Tennis Players Suttirak Nasome^{a*}, Supon Yapapha^a, Watcharapon Boonkro^a, Chanwit Intarak^a, and Krissanat Putthithanasombat^b

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Abstract

The aim of this study was to determine the presence of force production differences between dominant and non-dominant upper limbs in table tennis players. **Methods.** A total of 24 players (18 males age 21.06, height 173.61, weight 74.22 and 6 females age 21, height 162.33, weight 55), aged between 18 and 22 years (age 21.04, height 170.79, weight 69.42) participated in this study. All subjects carried out a simple grip strength test using an isometric handgrip dynamometer (Takei 5101; Tokyo, Japan). Once handgrip dynamometer was adjusted to the size of the player's hands, each subject performed three attempts with each hand alternatively trying to reach the peak force in the three first seconds. Two - minutes rest period between attempts was established. Tests were executed maintaining the standard position (from stand position, extending the arm next to the body and maintaining a neutral grip with the palm oriented to the tight) and the best result for each hand was registered. A 2x2 ANOVA was performed in order to examine the interaction between sex group and laterality (dominant and non-dominant hand).

Results. Males showed higher levels of grip strength than females both with the dominant and non-dominant hand (47.31±5.41 and 43.63±5.86 kgf for dominant and non-dominant hand in female players, respectively vs. 31.15±4.56 and 27.57±5.15 kgf for dominant and non-dominant hand in male players, respectively). Also, male and female players showed higher levels of grip strength when they used the dominant hand, although these differences were more remarkable in the male players.

Keywords: Circuit training / Lean body mass / Body fat

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Effect of Circuit Training on Lean Body Mass and Body Fat in College Students

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Abstract

The research of this study was to study and compare the effect of a circuit training programs towards muscle mass and fat mass of students of the faculty of sports and health science, Thailand national sports university Udon Thani campus, Thailand, aged 18-22 years, in males and females of 30 years old. People, divided into 2 groups: 15 control groups, not trained. And 15 subjects were given a 10 station circuit training program consisting of resistance and endurance 3 days a week for 12 weeks. Resistance training was associated with muscle mass and mass fat.

Statistically analysed (Paired sample t-test). The study compared mean muscle mass before 12 weeks of training in the experimental group (56.09 ± 2.15 seconds) and the control group (54.20 ± 8.43 seconds) after 12 weeks of training. (58.74 ± 2.15 s) and control group (52.56 ± 8.49 s) showed a statistically significant level $< .05$.

However compared the mean fat mass before 12 weeks of training in the experimental group (12.39 ± 5.39 s) and control (13.45 ± 6.84 s) after 12 weeks of training, experimental group (10.85 ± 4.66) and control (23.75 ± 26.62 s) showed a statistically significant level $< .05$. Results shown, it could be suggested that circuit training programs can increase your body's muscle mass and reduce fat mass.

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Keywords: Circuit training / Lean body mass / Body fat

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Study of Somatic Anxiety and Cognitive Anxiety of male Football Players

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Abstract

The purpose of this study was to study of somatic anxiety and cognitive anxiety of male football players. Subjects of 120 people between 18-22 years old were randomly selected. The Competitive Sport Anxiety Inventory – 2 (CSAI - 2R) questionnaire (confidence value of .87) were used. The data were analyzed using percentage, mean, standard deviation, and one-way analysis of variance (f-test) with the statistically significant at .05. The results showed the level of somatic anxiety and cognitive anxiety of male football players in the first round has 85 people (70.83%) and the finals amounted to 35 people (29.17%). The results also showed that males had lower levels of somatic anxiety and cognitive anxiety in both competitions; it was found that there were no significant differences. In conclusion, if the players are able to cope with anxiety that is too high or too low it can help players show their athletic abilities as well.

Keywords: Somatic anxiety / Cognitive anxiety

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Effects of Exercise Program Using Elastic on Physical Fitness in the Elderly

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Abstract

This study aimed to investigate the effects of exercise program using elastic on physical fitness in the elderly. The samples were the elderly aged between 60 and 70 years old in Wangprachop Subdistrict Administrative Organization, Tak Province. The experimental group consisted of 21 participants while the control group was composed of 21 participants. The data were collected for the period of four weeks. The sample received the exercise promoting program using elastic. The experimental group was provided with the exercise program using elastic which consisted of certain activities, i.e. lectures, group discussions, demonstrations and practice. The exercise guide was also provided for the group. The collected data were analyzed through descriptive statistics, and the mean scores were compared through Paired Sample t-test and Independent t-test at a significance level of 0.05.

The findings revealed that the experimental group achieved higher mean scores of muscle strength, flexibility and cardiovascular endurance of heart and blood circulation than those of the pre-experiment and of the control group at a statistical significance level of .05. The results pointed out that the exercise program using elastic improved physical fitness. This should be implemented with the elderly and people who are involved in caring for the elderly; specifically appropriate activities for the elderly in community should be provided in order to enable them to care for their own health properly and enhance physical fitness.

Keywords: Exercise Program Using Elastic, Physical Fitness, the Elderly

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Open and Close Skills on the Basic Psychological Needs of Thai Paralympic Athletes

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Abstract

The Athletes is affected by the hardiness training and competition, so the athletes need to use psychological skills to enhance the performance to play each sport. This research aims to study the information and compare the basic psychological needs of Thai Paralympic Athletes who are grouped into open skills and closed skills. The population of the research is 40 athletes who are classified which are 21 athletes (tennis, and table tennis) for opened skills and 19 athletes (swimming, shooting, athletics) for closed skills. The instrument of the research is the questionnaires for the basic psychological needs of Thai Paralympic Athletes (Tongprasert, 2013) which have 20 items and 3 components (Competence, Autonomy, and Relatedness). The analyzed information is used the independent sample test. The results of the research showed that the opened skills had the basic psychological needs ($x = 4.07$, $S.D = 1.12$) which were in the Competence at high ($x = 4.00$, $S.D = 0.97$), then in the Relatedness ($x = 3.91$, $S.D = 0.96$), and the Autonomy ($x = 3.58$, $S.D = 0.91$) at last. The closed skills had the basic psychological needs ($x = 3.83$, $S.D = 0.84$) which were related in order; the Relatedness ($x = 4.13$, $S.D = 1.30$) at high, then the Competence ($x = 4.07$, $S.D = 1.16$), and the Autonomy ($x = 4.00$, $S.D = 1.17$) at last. When the results are compared the athletes of opened skills group and closed skills group which were not differ from the basic psychological needs, both of two groups needed the foundation skills in sport psychology. However, there were some different needs of the basic psychological need. Then the sport psychology was the important skills for the athletes to be success.

Keywords: Open and Close Skills, Basic Psychological Needs, Thai Paralympic Athletes

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Physiological Variables and Energy System during Muay Thai Exercise in Thai Males

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Abstract

Introduction: There is very little research in Thailand that has examined the physiological responses and capacities during a simulation of MuayThai. The aim of this study was to measure the physiological variables which related to the energy systems of the MuayThai exercise among Thai population. Twenty active Thai males (mean \pm SD; age 21.5 ± 3.5 years; BMI 22.9 ± 1.6 kg/m²; $\dot{V}O_{2max}$ 45.4 ± 6.6 mL/kg/min) completed the preliminary test to assess their maximum oxygen uptake and anaerobic threshold. Subjects completed a MuayThai exercise session consisted of 5 rounds of 3 minutes, with 2 minutes rest between each round. Oxycon mobile gas analyzer was used to measure the oxygen consumption ($\dot{V}O_2$), carbon dioxide production ($\dot{V}CO_2$) and respiratory exchange ratio (RER). Heart rate (HR) and rating of perceive exertion (RPE) questionnaires were measured throughout the experiment. **Results:** The average heart rate and oxygen consumption were above the level of the anaerobic threshold assessed in a preliminary incremental test. The average HR during the 5 rounds was approximately 175 ± 12 bpm and $\dot{V}O_2$ was 2592.9 mL/min. Resting HR during the rest periods was 128 ± 15 bpm and $\dot{V}O_2$ was 961.2 mL/min. The average respiratory exchange ratio (RER) was 0.89 at rest, 0.98 at each round and 1.31 during resting periods. Statistically, RERs in every round of MuayThai exercise were significantly different to those found during the resting periods ($p < 0.001$). In a similar pattern, RPEs were significantly different in every round compared to resting periods ($p < 0.001$). In addition, RPE, which reflected tiredness, gradually increased in every round and reached its highest value in the final round. **Conclusions:** MuayThai exercise is a high-intensity activity and requires a lot of energy in both aerobic and anaerobic systems. Energy from both fat and carbohydrate were utilized during exercise.

Keywords: Physiological Responses, Heart rate, Oxygen Consumption, Respiratory Exchange Ratio, MuayThai

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The creation of physical education instructional innovation in the serve and drop badminton skills learning management for upper secondary school students

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Abstract

Objectives: The purpose of this research was to create the instructional innovation in the badminton serve and badminton drop skills for upper secondary school students.

Methods: The sample of this research was thirty Matthayomsuksa 4 students at Bansuan Jananusorn School, selected by using the purposive sampling method. The instruments used in this research consisted of: 1) Instructional innovation which consist of five lesson plans for cooperative learning with peer-to-peer method, 2) an achievement test of badminton serve skills and skills assessment, and 3) an achievement test of badminton drop skills and skills assessment. Tool's quality were measured with a content validity index from five experts by using Rowinelli and Hambleton's formula. The statistics in data analysis were the average and standard deviation.

Results: The results of the study were as follows: 1) The quality of instructional innovation plans in the badminton serve and badminton drop skills for cooperative learning with peer-to-peer method had a content validity index in a good level (IOC = 0.6-1.00) by five experts; 2) The quality of an achievement test in the badminton serve and badminton drop skills and skills assessment had a content validity index in a good level (IOC = 0.6-1.00) by five experts.

Discussion and conclusion : It is important that badminton instructional innovation can solve the problems in badminton serve and badminton drop' skills. At the same time, badminton instructional innovation needs to be designed and delivered with innovations that attract the attention and motivation of students.

Keywords: instructional innovation, badminton serve skills, badminton drop skills

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1. Introduction

Learning management in the 21st century has been developed and modified to be student-centered learning and teaching. As the National Education Act B.E. 2542, especially in Chapter 4, Guidelines for Educational Management, Section 22, states that “Education management must adhere to the principle that all learners are capable for learning and enable to improve themselves, and they are considered as the most significant.” Educational management process must encourage learners to develop naturally and to the fullest potential.” as the Office of the National Education Commission mentioned about student-centered learning management that teaching and learning management must be diverse and suitable for learners, stimulate learners to have critical thinking, creative thinking, knowledge seeking and technology applying which learners must be developed in all dimensions and able to work well with others. (National Education Commission, 2000) in accordance with Tissanana Khammanee (2010) mentioned about student-centered learning management that if teachers can design learning activities that encourage learners to play important roles in learning by participating in learning activities in 4 areas: moving and performing various activities (physical), using thought (intelligence), interacting and exchanging learning with others (social), and creating emotions that will help learning meaningful to oneself (emotion).

Cooperative learning is a learning management concept that is derived from Slavin, and Johnson and Johnson who believe that the relationship between learners and learners affects learning in a good direction, help learners to have higher learning achievement, more work, and more durable learning. It also helps students to have more sportsmanship, attentive to others, appreciate differences and diversity, and help to develop social skills as well as working with others.

In addition, there is also peer-to-peer learning method or technique used in teaching and learning nowadays that are consistent with the cooperative learning. Peer-To-Peer learning is a method of learning management that allows learners to help each other, interact, and cooperate learning activities in pairs or small groups. It's a learning process before doing real hands-on activity as well as those who are more academically capable will be helpers. (Siwanit Attawutkul, 2008) mentioned that peer-to-peer learning can develop students to have higher skill achievement, as Suchok Chantani conducted a research on the effectiveness of peer-to-peer teaching according to Scaffolding guideline on the basic skills of kicking in Taekwondo and it was found that peer-to-peer teaching according to Scaffolding guideline affects basic kicking skill of students in Taekwondo higher than normal teaching group (Suchok Chantani, 2017).

At present, badminton is one of the most popular sports. There are domestic and international competitions together with learning management both in educational institutions and outside educational institutions. In educational institutes, badminton is taught in physical education subject in various classes. Badminton is a sport that can help to develop players in all 4 areas: physical, emotion, social and intelligence. However, from teaching badminton in physical education class at Bansuan Jananusorn School in Mattayomsuksa 4, Health and Physical Education 2, and subject code P31102, with basic skill in learning and teaching, including 1. Basic movement 2. Forehand and backhand hitting 3. Lob hitting 4. Long serve 5. Short serve 6. Dropping. It was found that in the past years, there were some problems in learning management. For example, teachers had to teach in one period and were unable to take care of their students thoroughly due to the large number of students. Moreover, students have different basic skill in badminton which causing some students to learn slowly and not keep up with their peers. As a result, students have low skill achievement, especially short serve skill which is an important skill for beginners in pairs. From the problem, it was found that students cannot do short serve. As a result, playing badminton becomes inconsistent and lacks of fun. And dropping skill was found that students were unable to do dropping into the drop point and many times, it was found that the shuttlecock was dropped without crossing the net. As a result, playing or competition of

badminton in the classroom quickly ends and lack of fun. Therefore, learning management that has only one teacher to transfer that knowledge is unable to look after students thoroughly and unable to help develop students who learn slowly and are unable to understand and practice correctly within a period, which may lead those students to feel bored of the skill they have learned (Norarat Funchian, 2018)

As mention previously, the researcher has created physical education instructional innovation in the serve and drop badminton skills cooperative learning management with peer-to-peer method in order to solve problems of learning management in the past and to further develop students' skill achievement.

2.Objectives

To create and examine the quality of the instructional innovation in the badminton serve and badminton drop skills for upper secondary school students.

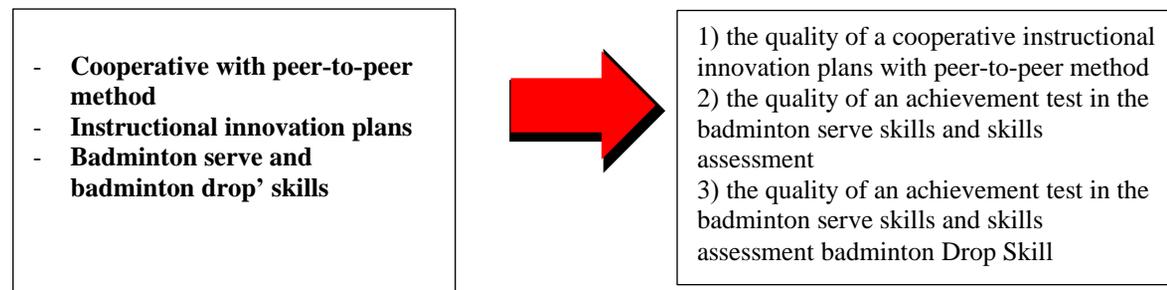
3.Definition

3.1 Badminton instructional innovation means creating new things or improving and developing new learning methods in order to solve learning management problems, develop learning for learners and teachers' learning management to have more quality. In this article, the researcher refers to cooperative Physical Education learning management with peer-to-peer method by using the teaching method that allows students with different abilities to voluntarily match each other so that they can help each other in learning.

3.2 Badminton serve skills means passing a short serve with backhand. Using backhand grip to start playing in pairs.

3.3 Badminton drop skills means passing the shuttlecock to fall over the opponent's net closing to the net by passing both forehand and backhand.

4. Conceptual Framework



5.Methodology

5.1 Populations

The populations used in this research were 484 upper secondary school students from Bansuan Jananusorn School during the 2nd semester in the academic year 2021.

5.2 Sampling

The sample in this research used a purposive sampling for 1 classroom (30 students). The inclusion criteria were as follows: 1) Being a student in Mattayomsuksa 4 and studying in a badminton subject 2) Being a volunteer to participate in the research 3) No illnesses that hinder participation. The exclusion criteria were

as follows: 1) Reluctance to continue the research 2) Having an illness that hinders participation 3) Lack of participation in learning activities for more than 80%.

5.3 Instruments

1) badminton Instructional innovation consists of structure and 8 cooperative learning management plan with peer-to-peer method.

- 2) badminton Serving skill test and serving skill assessment criteria.
- 3) badminton Dropping skill test and dropping skill assessment criteria.

5.4 Methods

In this research process, the researcher has collected data from documents, journals, research and various databases, then the information was analyzed and developed until the instructional innovation to be applied by passing the examination and get certified of such innovation from the experts in order to be applied in learning management. The steps as follows.

- 1) Studying curriculum, curriculum objectives, learning outcomes, measurement and evaluation.
- 2) Analysis of learning standards and course descriptions to create learning units and set learning objectives.
- 3) Studying theories and research related to instructional innovations.
- 4) Implementing instructional innovation in the serve and drop badminton skills.
- 5) Created instructional innovation in the serve and drop badminton skills is sent to 5 experts in order to consider the suitability. After that, the researcher revise and improve according to the advice from the experts.
- 6) Development of instruments used in conducting research, including
 - 6.1) 8 instructional innovation plans
 - 6.2) badminton Serve skills test and serving skill assessment criteria.
 - 6.3) badminton Drop skills test and dropping skill assessment criteria.

All the instruments are sent to 5 experts in order to assess the suitability of the instruments. After that, the researcher revise and improve according to the advice form the experts.

- 7) Data were collected and analyzed using mean and standard deviation statistics.

6. Results

The results were expected that:

- 1) Instructional innovation in the serve and drop badminton skills should have a consistency index between 0.60-1.00 which is valid and can be used.
- 2) Serving and dropping skill test and skill assessment criteria in badminton should have a consistency index between 0.60-1.00 which is valid and can be used.

Table 1 Instructional innovation of serve and drop badminton skills.

No.	Teaching Topic	Learning Management
1	badminton serve skills	Cooperative learning with peer-to-peer method
2	badminton drop skills	Cooperative learning with peer-to-peer method
3-8	badminton serve and drop skills	Cooperative learning with peer-to-peer method

Table 2 Skills test of Badminton skills.

No.	Teaching Topic	Objectives	Test Method
1	badminton serve skills	To test ability of badminton serve skills.	<ol style="list-style-type: none"> 1) The person taking the test Standing on the right side of the passing field Stand about 1 foot from the short passing line and about 6 inches from the center line. 2) The test subject makes 10 short passes to the right serving court of the opposing side. 3) In each pass The subject must attempt to deliver the ball to the target legally as determined by the test subject. Only the back of the hand must be used. 4) Passing the ball: The subject shall have the ball pass through the rope 20 inches away from the upper edge of the net into the scoring zone. 5) The tester is to check the trajectory of the ball in each short pass is correct or not.
2	badminton drop skills	To test ability of badminton drop skills.	<ol style="list-style-type: none"> 1) The person taking the test Stand close to the short passing line. The area of the intersection with the central dividing line 2) The test assistant stands opposite to the test taker. The shuttle is then tossed across the net for the subject to hit the dropper in the designated area. 3) The test subject must hit the drop ball 5 times forehand and 5 times for backhand. 4) The tester will determine whether the delivery of the child to the testee is the correct child or not. If incorrect, retest the ball.

7. Discussion

The study of the creation of instructional innovation in the serve and drop badminton skills learning management for upper secondary school students. The researcher can use the results for discussing the creation of instructional innovations in badminton subject as follows:

- 1) The creation of instructional innovation in the serve and drop badminton is a collaborative learning

management with peer-to-peer method, which is the process of learning management in pairs or in groups by allowing those who have greater abilities to help those have weaker abilities in order to acquire knowledge and understanding of what they have learned and be able to work by themselves. Moreover, teachers give them some advice and organize suitable activities for students.

Consistent with Weeraphan Chankao (2018) who mentioned that peer-to-peer learning means to organize learning activities in pairs or small groups for students to participate in activities, help each other, and take turns to become teachers and learners in order to gain knowledge and understanding about what is being studied. The teacher has a role to give some advice and organize learning activities that are suitable for students. And in accordance with Suchok Chantani (2017) who stated that peer-to-peer teaching is learning before doing for seeking helpers who are different to exchange experiences and knowledge in order to expand the conceptual framework more broadly and effectively by relying on "people" as people driven to open a variety of ideas from the exchange among skillful people and different experiences through 5 stages of learning management, including 1) Preparatory stage 2) Teaching stage 3) Practice stage 4) Application stage and 5) conclusion and practice stage. From the information above, it can be discussed that the creation of Instructional innovation in the serve and drop badminton skills have a consistency index between 0.60-1.00 which is valid and can be used.

2) The researcher created serving and dropping skill test and skill assessment criteria in badminton according to the concept of Panit Bilmas (1987) who mentioned that in order to get a suitable test, teachers need to answer the questions why do the test?, what do you want from the test?, and what to do with the test results?. If the teachers can answer these questions, they will get a suitable test.

And Somchai Ratanathong (2002), who stated that a test is a set of questions or stimuli that are used for test takers to respond. It can be measurable, observable, and interpretable, and good skills testing and assessment criteria must increase learning motivation and encourage students to be more interested in that subject. In addition, a good evaluation should be able to diagnose students' defects and monitor learners' development in order to improve students in that matter to have more quality. From the above information can be discussed that serving and dropping skill test and skill assessment criteria in badminton have a consistency index between 0.60-1.00 which is valid and can be used.

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“Multidisciplinary approaches in long term development”



The creation of physical education instructional innovation in the Thai-Krabikrabong beating skills for lower secondary school students in the wester region demonstration school of Rajabhat university

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Abstract

Objectives: The purposes of research were to create and examine a quality of the innovative Krabi-krabong beating skills in physical education subject for lower secondary school students at the wester region demonstration school of Rajabhat university.

Methods: The Samples were 30 students from grade 8 of the Phetchaburi Rajabhat University Demonstration School and selected by purposive sampling method. The instruments used in this research consisted of a quality evaluation questionnaire of the instructional innovation beat skills Krabi-krabong 7 plans and assessment skill test. Tool quality determination uses Rowinelli and Hambleton's content validity analysis from 3 experts. The statistics used in this study was mean and standard deviation.

Results: The results of the research found that the quality of instructional innovation plans in Krabi-krabong beating skills in physical education subject by blended learning approach, and an assessment in the Krabi-krabong beating skills test had a content validity index in a good level (IOC between 0.60-1.00) by three experts.

Discussion and conclusion: In general, we consider that the nature of physical education as a school subject now entails the use of blended learning. We consider that the aspect of the subject that has to do with education, with cognition, may greatly benefit from suitably devised blended learning courses, in such a way as also to reinforce its other aspect, that of skill movements. Future research should tend in this direction before arriving at more generalizable conclusions.

Keywords: Instructional Innovation; Learning Management; Krabi-Krabong beating skills

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1. Introduction

In the past, learning management and classroom atmosphere creation were a traditional method that focused on teachers as the center. It emphasizes on teaching methods that teachers are the lecturer of the content or “storytelling” as we are used to call it, “Lecture”. It is a teaching method that has been taught for a long time or known as the traditional teaching approach. Therefore, traditional classrooms need to be adapted because learners are new generations who has grown up with technology as part of their digital native. There are a variety of features, different experiences, different interests, and the potential to learn by themselves via the internet, create and transfer their knowledge with modern technology (Wattanachai Winijchakul, 2015). Classroom is essentially to be a place for exchanging learning experiences with each other, such as discussion and knowledge exchange, study and seek for knowledge from various learning sources in order to develop and extend ideas to real knowledge, and know more deeply because in the 21st century society, data and information are changing all the time, knowledge need to be sought in order to develop ideas, visions, problem solving and catching up with the changing world. As (Krijai Panich, 2012) explains that the best way to spend time learning in the classroom to create the highest value for learners is to practice applying knowledge in different situations in order to achieve mastery learning and it is a learning management method that raises the value of being a teacher, i.e., teachers no longer teach by transferring knowledge directly to students, but they transfer knowledge through various technologies and innovations that are useful and easy for learners to learn. This will enable students to explore by themselves and anywhere and anytime based on their interests due to the influence of technology on today's lifestyles and can be easily accessed by everyone with no time limitation and distance which are suitable for lifelong learning. Therefore, technology is beneficial for learning management in order to reduce problems such as insufficient teaching time due to too many special activities held by the school or public holidays according to government regulations Including the short duration of the lessons, for example, A class takes an hour for teaching as well as must have a minimum of 40 hours of teaching for one semester which is not enough for learning management that is a practical skill especially in physical education subject because teachers cannot take care of students thoroughly due to there are many learners and each learner's skills are different.

From the issues mentioned above, it is realized the importance of using information technology for education and new learning management. The teachers will manage the learning with blended technology in order to attract learners to be interested and pay attention to the study along with the characteristics that express the intention, diligence in learning, seeking knowledge from learning sources both inside and outside of the school. It also raises Thai-Krabikrabong Beating skills, which is the wisdom of Thai ancestors, to see the value, benefits and importance and be able to apply knowledge in daily life.

The results from this study found that learning methods in the 21st century are related to learning skills and the use of information, communication and technology applying in blended learning activities so that students can learn anywhere and anytime, improve their skills and solve problems from school activities which affects teachers' learning management in ordinary classes. This study will be benefit for learning management for students in Thai society nowadays.

2. Objectives

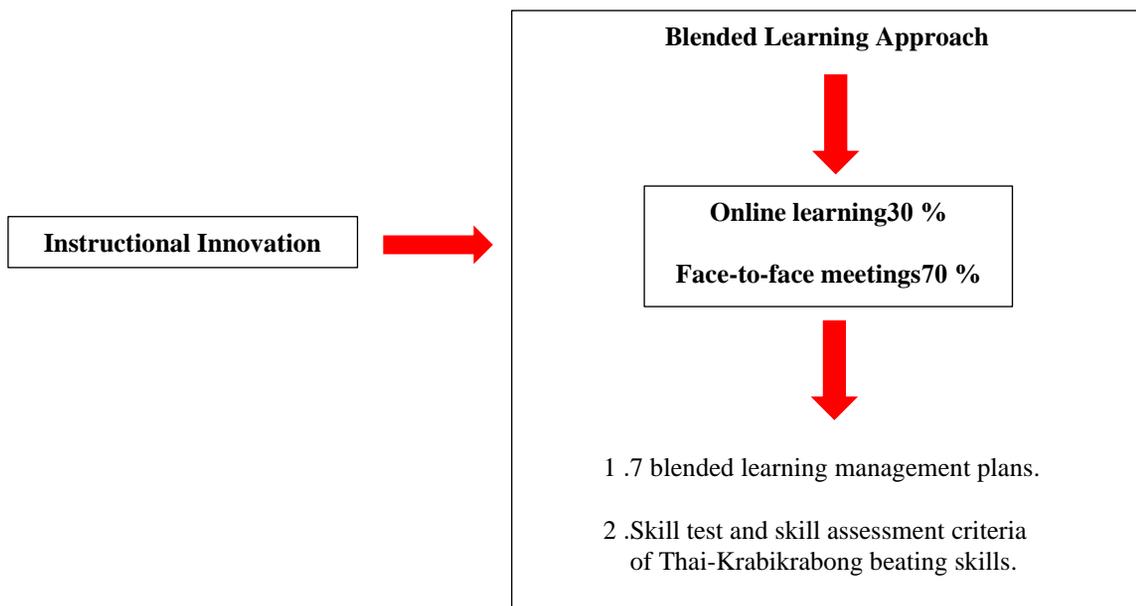
To create and examine a quality of the innovative Krabi-krabong beating skills in physical education subject for lower secondary school students at the wester region demonstration school of Rajabhat university.

3. Definition

3.1 Instructional innovation is a systematic approach to improve and develop new learning methods that can improve better quality for learners' learning and teachers' learning management, such as student-centered learning management, learning center management, group dynamics process, collaborative learning management and learning management through computer networks and the internet. (Pichit Ritcharoon, 2016) In this article, the researcher refers instructional innovation to blended learning, which is a learning management that integrates online learning through a network and learning in the classroom with face-to-face meetings. By using the Internet as a medium and as a tool for improving effective learning management. There is a process for students to interact with online learning and participate in traditional classes that 30% for online learning and 70% for face-to-face meetings in order to develop students' potential to be challenging and responsive to their needs. As a result, learners can improve their learning abilities and seek additional knowledge without limits of time.

3.2 The content of Thai-Krabikrabong beating skills is divided into 7 parts, including 1) Batting skills. 2) Picking skills 3) Principles of movement in 8 directions 4) 1st bat, stick 8 (8 targets) 5) 2nd bat, stick 7 (7 targets) 6) 3rd bat, stick 9 (9 targets) and 7) The application of beating skills for playing.

4. Conceptual Framework



5. Methodology

5.1 Populations

The population is 260 students from demonstration schools of Rajabhat university in the western region, consisting of Demonstration School of Nakhon Pathom Rajabhat University, Demonstration School of

Muban Chombueng Rajabhat University, Demonstration School of Phetchaburi Rajabhat University, and Demonstration School of Kanchanaburi Rajabhat University in lower secondary school studying in Matthayomsuksa 1 to Matthayomsuksa 3.

5.2 Sampling

The sample group is obtained by purposive selected. The inclusion criteria were as follows:

- 1) Being students in Matthayomsuksa 2.
- 2) No underlying disease.

The criteria for exclusion from the research are as follows:

- 1) Unable to continue the trial or unexpected events that unable to further participation in the trial, such as an accident resulting in injury or having a sudden illness, etc.
- 2) Lack of participation in teaching activities more than 3 times.

5.3 Instruments

- 1) Instructional innovation consisting of the structure and 7 blended learning plans.
- 2) Skill test and skill assessment criteria of Thai-Krabikrabong beating skills.

5.4 Methods

In this research process, the researcher has collected data from documents, journals, research and various databases, then the information was analyzed and developed until the instructional innovation to be applied by passing the examination and get certified of such innovation from the experts in order to be applied in learning management. The steps as follows.

- 1) Studying and analyzing the curriculum structure and content of health and physical education subject group.
- 2) Analyzing of learning standards and course descriptions to create learning units and set learning objectives.
- 3) Studying theories and research related to instructional innovations.
- 4) Implementing instructional innovation in Thai-Krabikrabong beating skills.
- 5) Created instructional innovation in Thai-Krabikrabong beating skills is sent to 3 experts in order to consider the suitability. After that, the researcher revise and improve according to the advice from the experts.
- 6) Development of instruments used in conducting research, including
 - 6.1 7 instructional innovation plans.
 - 6.2 Skill test and skill assessment criteria of Thai-Krabikrabong beating skills.

All the instruments are sent to 3 experts in order to assess the suitability of the instruments. After that, the researcher revise and improve according to the advice form the experts.

- 7) Data were collected and analyzed using mean and standard deviation statistics.

6. Results

The results were found that:

- 1) Instructional innovation of blended Thai-Krabikrabong beating skills had a consistency index between 0.60-1.00, which is valid and usable.
- 2) Skill test and skill assessment criteria of Thai-Krabikrabong beating skills had a consistency index between 0.60-1.00, which is valid and usable.

Table 1 Instructional innovation of blended Thai-Krabikrabong beating skills.

No.	Teaching Topic	Proportion)Percent(Learning Management
1	Batting skills	30	Online course via Google classroom
		70	Face-to-face meetings
2	Picking skills	30	Online course via Google classroom
		70	Face-to-face meetings
3	Movement skills in 8 directions	30	Online course via Google classroom
		70	Face-to-face meetings
4	1 st bat, stick 8 (8 targets)	30	Online course via video clips
		70	Face-to-face meetings
5	2 nd bat, stick 7 (7 targets)	30	Online course via video clips
		70	Face-to-face meetings
6	3 rd bat, stick 9 (9 targets)	30	Online course via video clips
		70	Face-to-face meetings
7	The application of beating skills for playing.	30	Online course via Google classroom
		70	Face-to-face meetings

Table 2 Skill test of Thai-Krabikrabong beating skills.

No.	Teaching Topic	Objectives	Test Method
1	Batting skills	To test the skill of beating at the target point	Hit the candle flame.
2	Picking skills	To test the skill of picking at the target point .	Randomly hit the targets in sequence for 8 times continuously and set 8 targets: head level, neck level, waist level and leg level.
3	Movement skills in 8 directions	To test flexibility	Set 8 cones :front-back, left-right, obliquely left, front- obliquely back left, obliquely right front-obliquely back right Place 2 meters away from the center of the circle and set the timer.
4	1 st bat, stick 8)8 targets(To test accuracy	Start testing for 2 people and divided into offensive and defensive by switching duties: batting and picking for 8 target points, including neck-neck, waist-waist, legs-legs and head-head.
5	2 nd bat, stick 7)7 targets(To test accuracy	Start testing for 2 people and divided into offensive and defensive by switching duties: batting and picking for 7 target points, including neck-neck-head, waist-waist-waist, half step heads.
6	3 rd bat, stick 9)9 targets(to test accuracy	Start testing for 2 people and divided into offensive and defensive by switching duties: batting and picking for 8 target points, including neck-neck waist-waist legs-legs head-head, push back-neck-neck and push back-push back- haft step head.
7	The application of beating skills for playing.	To test the application of beating skills	Playing with the soundtrack by taking for 5-8 minutes.

Table 3 Skill assessment criteria of Thai-Krabikrabong beating skills.

No.	Teaching Topic	Evaluation criteria form
1	Batting skills	Rubrics are divided into 5 levels :1 2 3 4 5.
2	Picking skills	Behavior observation form, 1 point means yes, 0 point means no.
3	Movement skills in 8 directions	Rubrics are divided into 5 levels :1 2 3 4 5.
4	1 st bat, stick 8 (8 targets)	Behavior observation form, 1 point means yes, 0 point means no. Offensive for 5 items and defensive for 5 items.
5	2 nd bat, stick 7 (7 targets)	Behavior observation form, 1 point means yes, 0 point means no. Offensive for 5 items and defensive for 5 items.
6	3 rd bat, stick 9 (9 targets)	Behavior observation form, 1 point means yes, 0 point means no. Offensive for 5 items and defensive for 5 items.
7	The application of beating skills for playing.	Behavioral observation form If it is the truest, 2 point means yes, 1 point means no. for 5 items.

Context and the integrated blended approach

Since blended learning has become an ‘umbrella term’ with different definitions, models, and conceptualizations, Hrastinski (2019) suggested to provide a detailed description of what blended learning means in one specific research and/or practice context. In the construction of blended learning in this research, constructivism theory was drawn on and the module construction process operated through a constructivist alignment approach (Biggs, 1996). This approach is emphasized through the 7 lesson plans (Table 1) which allowed the intended outcomes, the teaching and learning activities, and the assessment tasks to be aligned and interconnected. The blended learning approach was enacted throughout grade 8 supported by an innovative use of the Demonstration School of Nakhon Pathom Rajabhat University virtual learning environment. The seven weeks of each plan were divided in two parts. Each plan consist of the online course was 30%, and face to face was 70 %.

The process of instructional innovation consisting of 3 steps as follows:

- 1) Preparation and teaching stage is the process of preparing students' bodies and minds every time before studying in physical education classes. It is an activity to clarify blended learning activities and allow students to enroll in the online learning system created by the teacher in order to help students to understand and foresee the importance of what they are learning, such as principles, methods, necessary benefits and importance of activities to be taught, together with regulations, rules or other necessary agreements.
- 2) Practice and applying stage are the process by which students practice their skills through exercises or activities assigned by the teacher and apply what they have been learned in the previous process to practice activities for fun in the real situation under the supervision of teachers in the classroom.
- 3) Conclusion and good practice stage are the process by which teachers summarize and evaluate the teaching results by face-to-face meeting order to let students know and use their conclusions to improve the things that are not good. It is also a step for students to clean their bodies and be ready for studying in other subjects.

How to apply instructional innovation

Blended learning approach can be applied for teaching in other subjects to reduce the limitations in learning management, divide study period and choose a study location independently, for example, practical subject is required for a lot of time to practice, but there is inadequate time. Therefore, blended learning approach is applied by teaching in the online system and then spending the rest of time to focus on practice in the classroom. It is a student-centered learning so that students can spend a lot of time to search, analyze and synthesize data well.

In order to use the blended learning method to be effective, it is necessary to analyze the problems in learning management itself. and consider dividing the ratio between studying in a normal classroom and studying online to suit the course objectives including taking into account the condition, resources and appropriate learning contexts, such as computers, networks and readiness of students.

7. Discussion

The research in the topic of the creation of physical education instructional innovation in Thai-Krabikrabong beating skills learning management for lower secondary school students in the western region demonstration school of Rajabhat university. The researcher can bring the results to discuss the creation of new learning innovations in Thai-Krabikrabong beating skills class as follows:

- 1) The creation of Instructional innovation in Thai-Krabikrabong beating skills learning management is a blended learning method which is a learning management that integrates online learning and face-to-face meetings together by using the internet as a medium and as a tool for improving effective learning management. It provides a process for students to interact with online learning and participate in traditional learning in order to develop students' potential to be challenging and responsive to their needs. As a result, learners can improve their learning abilities and seek additional knowledge without limits of time.

Consistent with Smith (2001) cited in (Panita Wanpirun, 2008) defines blended learning that it is a distance learning management that uses modern technologies such as television, the internet, voice mail and conference calls combined with traditional education which corresponds to (Collis and Moonen, 2001). Stated that blended learning is a combination between face-to-face meetings and online learning together including both in the classroom and online learning using online learning for filling the gap of learning in the classroom. And in accordance with (Driscoll, 2002) give the definition of blended teaching which is the integration of teaching technology in all forms such as videotapes, CD-ROMs, website, movies, etc. together with face-to-face meetings between the learner and the teacher with the proportion of the mix between online presentation and face-to-face meetings in the classroom that 30% for online learning and 70% for face-to-face meetings. This is consistent with Srisak Chamornman (2006) who said that blended or hybrid learning is teaching methods that presents content via the internet for 30-80% and Sorapong Sukkasem (2560) said that the blended learning management is a combination of face-to-face meetings and online learning. The proportion of online teaching must be at least 25% but not more than 80%. As Niemiec and Otte (2009) mentioned that blended it must provide part of the content must be presented online, such as having an online discussion. or operation online and some with face-to-face classroom presentations at least 25% but not more than 74%. It can be analyzed that the proportion of blended learning has at least 25% but not more than 80% part of the content presented online, integrated with face-to-face meetings. They meet each other in the classroom and the process of instructional innovation from the original management of physical education learning has 5 steps, adapted into 3 steps, including 1) Preparation and teaching stage. 2) Practice and applying stage and 3) Conclusion and good practice stage using Thorndike's theory of learning known as Connectionism Theory.

Concepts include 1) The Law of Exercise or Repetition, which he pointed out that this repetition or exercise. If it's done over and over again, it will make the action more accurate and stable. 2) The Law of

Effect is the most famous and popular law. The essence of this rule is reward or fulfillment which will help to promote that behavior, but punishment or disappointment will reduce the behavior. and 3) The Law of Readiness. This rule refers to the readiness of the body in order to show any behavior from the above information. It can be argued that creating instructional innovation in Thai-Krabikrabong beating skills has consistency index between 0.60-1.00, which is valid and usable.

- 2) Skill test and skill assessment criteria of Thai-Krabikrabong beating skills. The researcher created a new test and assessment criteria for Thai-Krabikrabong beating skills according to the idea of Pinwadee Thanathani (2007) mentioned that testing is the use of media or tools or any situation as a stimulus for a reaction or a behavioral response.

Therefore, educational testing refers to the use of any test or test situation. to be a stimulus to show response behavior and Chawan Paratkul (2009), who said that a test is a set of questions. or any workgroup created in order to induce the test subject to exhibit any behavior for the examinee to observe and measure, it should be seen that the stories of the tests must always consist of stimulus and response to the test tool. Good skills testing and assessment criteria are required to motivate students, encourage students to be interested in that subject and turned to pay attention to study. In addition, a good assessment should be able to diagnose student defects and be able to monitor learner development. to reinforce students in that matter To be more quality, in line with Songsri Tunthong (2009), who discussed the benefits of 9 measurements and evaluations, including 1) To check the basic knowledge 2) To develop teaching and learning 3) To diagnose the student's shortcomings 4) To judge the results 5) To align or classify in the assessment for grading or categorizing, the results obtained from the measurements are compared or rated the ability of the test takers in the same group. 6) To check the development of learners 7) To prophesy or prophesy Forecasting is the use of results from current measurements to predict the future whether students will succeed or not and what should I study in the future? 8) To evaluate Assessment is an assessment aimed at the overall quality of education. and 9) to create motivation for studying Assessments, especially during class assessments, can be used to increase learning efficiency. From the above information, it can be discussed whether Skill test and sword skill assessment criteria It should have a consistency index between 0.60-1.00, which is valid and usable.

7.1 Recommendations for applying the research results

1. For blended learning approach, instructors should have the preparation of the environment in the classroom and students' equipment for effective learning management.
2. Teachers can choose which instructional process to use either online or face-to-face as appropriate for the context and set the channel for placing online media.

7.2 Recommendations for the next research

1. It should have a comparative study of the proportions of the blended learning management in different ratios in order to develop educational innovations in physical education t to become more diverse and effective.
2. It should have educational innovation in other subjects that face the same problem due to limited time and divided the time to practice.

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**The 11th International Conference of
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**Effects of Co-operative Physical Education Learning Management
with the Peer-Assisted Learning (PALT) and
Student Teams-Achievement Division (STADT) Techniques upon
Taekwondo Skills of Upper Secondary School Students**

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Abstract

Objective: To answer the research question: “Among upper secondary school students (USSS) undergoing taekwondo training, are peer-assisted learning (PALT) and student teams-achievement division (STADT) techniques, compared to conventional teaching method (CTM), linked to better learning outcomes?”

Methods: Using a prospective randomised controlled study design, the investigators enrolled a sample of USSS population undergoing an 8-week taekwondo course at Prachinkallayanee School, PrachinBuri, Thailand. The predictor variable was teaching method (PALT vs. STADT vs. CTM) with content validity among the three techniques of .96. The main outcomes were overall, front, round and sidekick taekwondo skills, measure by the taekwondo practical test with validity, reliability and objectivity of 1.0, .97, and 1.0, respectively. Appropriate statistics were computed, and the statistical significant level was set at $P < .05$.

Results: The study sample was composed of 75 subjects with a mean age of 17 ± 1 years and 90.7% were girls. All teaching techniques significantly improved student’s taekwondo skills ($P = .0001$). At the end of the study period, subjects undergoing PALT had significantly higher overall taekwondo skills than those in the CTM group ($P = .0005$, 95% confidence interval [95% CI], -1.475 to -.365), and PALT subjects developed significantly superior round-kick taekwondo skills than subjects in the other two groups ($P < .0001$).

Conclusion: PALT can better encourage taekwondo skills in USSS than STADT and CTM.

Keywords: peer-assisted learning; student teams-achievement division; taekwondo skills; secondary school student

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Introduction

Learning reform is at the centre of modern education. In Thailand, the 1999 National Education Act indicated the educational guidelines focusing on student-centred learning (SCL), which requires the aid of multiple teaching methods. One apparent advantage of SCL is that students will experience similar learning problems and be able to help each other to combat such schooling difficulties (*Ministry of Education, 1999*). Over the past decades, many Thai schools, colleges and universities have significantly promoted the application of SCL approach to their curricula. However, its effectiveness unfortunately remains unsatisfactory. A possible explanation seems to rely upon teacher's persistent use of traditional teaching, regardless of differences on learning capability of their students. This conventional teaching does not enough support the learning development of learners, and mainly emphasises learning by memorisation rather than critical thinking, analysis, practising and problem solving, as well as self-learning and behavioural expression. The failure of the Thai teaching processes therefore necessitates urgent improvement (*Ministry of Education, 1999*).

As a result, learning management is a key component of learning improvement among learners. A suitable teaching method depending on learners and their environments usually improves and accelerates student's comprehension, satisfaction, and development. Given this, instructional models of cooperative learning attracted much of our interest and led to this research. The cooperative learning models can indeed be defined as integration-based teaching milieus, which are able to promote learning and development of the learners. Of those, peer tutoring derives from the teaching concept using the distribution of teaching roles from teacher to learners, and can be classified into 2 types: 1) teaching via classmates, and 2) teaching via higher-class students (*Chanthani, 2017*). Student Teams-Achievement Division Technique (STADT) is another cooperative learning model, which categorised learners into several small groups based on their learning capability before being taught by one another within the group. Based on STADT, learners have to help each other and have an individual responsibility for achieving their duty on learning process. Moreover, they must cooperate with their group members in apprehending the lesson in order to accomplish the group's success (*Slavin, 1990*).

Thanks to the abovementioned backgrounds, the investigators originally aimed to intensify the quality of taekwondo teaching/learning in upper secondary schools. It is important to note that taekwondo skills can be divided into 4 groups: 1) standing skills: horsing, full, walking, back- and guard stands, 2) basically protective skills: low, middle, inside, outside, high and double knife hand block, 3) basic kicking skills: front, round, side-, chop-, hook-, back hook- (swing back) and back kicks, 4) punching skills: riding stance and body punches (*Department of Physical Education, Ministry of Tourism and Sports, 2016*). We assumed that front, round and sidekicks are fundamental to developing other taekwondo skills, and thereby used as exercises and tests for the target students in this study.

The main purpose of this study to answer the research question: "Among upper secondary school students (USSS) undergoing taekwondo training, are peer-assisted learning technique (PALT) and student teams-achievement division technique (STADT), compared to conventional teaching method (CTM), linked to better learning outcomes?" The investigators hypothesised that both PALT and STADT would adequately improve taekwondo skills and be significantly more effective than CTM in an 8-week study interval. The specific aims were: 1) to design and implement a prospective randomised controlled trial (RCT), 2) to identify a cohort of USSS participating in a taekwondo course, 3) to estimate and evaluate taekwondo skills after be taught with PALT or STADT or CTM, and 4) to propose an appropriate taekwondo training method for USSS.

Materials and Methods

1. Study Design and Subject Description

To address the proposed specific aim, we used a prospective RCT study design with compromised experimental group-control groups. The sample was derived from the last-year USSS (M.6) population undergoing a taekwondo course at Prachinkallayanee School (one of the 19 schools in the 7th Secondary Educational Service Area; N = 6,325), PrachinBuri, Thailand, during an 8-week period (January, 2021 - March, 2021). To be included in the current cohort, the subjects must be enrolled in M.6 at the target school in the second semester of the academic year 2020, and willing to participate in this study. Subjects were excluded from the study, if 1) in other classes or in other schools, 2) duration of follow-up < 8 weeks, 3) pre-existing/underlying diseases, which may interfere taekwondo training, and 4) deferred study participation.

School selection was purposely selected—Prachinkallayanee School is the working place of the primary author-investigator (S.A.), so that the study and follow-up can be eased. Three of 4 classrooms (M.6/5, 6/6, 6/7, and 6/8) participating in a taekwondo course during the study period were selected using simple random sampling via lottery method, excluding students in M.6/8 from the study. Because an adequate sample size is largely estimated to be at least 25 subjects per group to overcome the beta error of a clinical trial (Pitak-Arnnop *et al.*, 2011), 25 students from each classroom were simply randomised chosen via lottery method as well. We thereafter used stratified randomisation for group assignment (teaching method assignment): PALT for M.6/6 (n = 25), STADT for M.6/7 (n = 25), and CTM for M. 6/5 (n= 25).

After obtaining the ethical approval by the institutional review board of Graduate School of Srinakharinwirot University (Approval No. SWUEC/E/G-304/2563), we followed the ethical guidelines of the World Medical Association's Declaration of Helsinki for human researches, and the CONSORT statement for RCTs. Every subject and her/his parent(s) gave a written consent prior to the study debut.

In this study, we defined specific terminology, as follows:

- CTM is a taekwondo teaching method for USSS coded by the latest version of the Physical Education (PE) Teaching Manual of the Ministry of Education of Thailand.
- Cooperative learning is an active teaching management basing on group working of learners, which is divided in this study into 2 subtypes: 1) PALT requires learners to teach each other, especially between the more competent and the less competent ones (1:1), and 2) STADT necessitates small, but heterogeneous group assignment before students teach one another within their group.
- Basic taekwondo skills include 3 basic kicking skills: front-, round- and sidekicks.
- PE learning outcome means taekwondo learning ability of students according to earned test points in the practical test on basic taekwondoskills.

2. Study Variables

The predictor variable was taekwondo teaching method (active learning: PALT and STADT vs. passive learning: CTM; 8 hours and with 8 teaching plans for each during the study period before the post-test). To develop teaching plans of each teaching method, we used the Thai Basic Education Core Curriculum B.E. 2551 (A.D. 2008) with regard to CTM, and relevant books, documents and researches in relation to cooperative teaching PALT and STADT (Khamanee, 2009)

The main outcomes were overall, front-, round- and side kick taekwondo skills, measured by the taekwondo practical test. With the aim of inventing the practical test for this study, we followed the previously reported recommendations by Amornsakdakul, (2015), coupled with relevant books, documents, and researches (Khamanee, 2009) and then modified our taekwondo practical test to suit the target subjects.

Other demographic variables included gender and age of the subjects.

3. Interventional Procedures

Both of the 24 teaching plans (8 plans for each teaching method) and the practical test were approved by 5 other experts in the field and by the study’s advisors (the second and third authors of this paper: P.K. and P.M.) to examine the content validity, accuracy, and appropriateness. Thenceforth, the primary author-investigator (S.A.) applied the teaching plans and practical test to the younger pilot cohort (M. 5, n = 18 for each teaching method).

On tool analysis, content validities among the three teaching techniques were .96 from the learner-based pilot test, and 1.0 from the interrater agreement of the 5 experts (Cohen’s kappa coefficient [κ] = 1.0). The practical test had validity, reliability and objectivity of 1.0, .97, and 1.0, respectively. Given this, we can therefore employ the teaching plans and practical test in the study cohort’s samples.

After obtaining the approval by Graduate School of Srinakharinwirot University, the primary author-investigator (S.A.) explained the study’s objective, methods, and evaluation to his Head of Academic Affairs and PE teachers at the school in order to set the cooperative PE learning management together. The primary author-investigator was the only taekwondo teacher in this study. The subjects were taught once a week (each for 50 min in an 8-week interval, i.e. a total of 400 min), and tested twice by the taekwondo practical test on front-, round- and sidekicks, i.e. at Week 1 prior to the study, and at the end of Week 8 after the study ended. There was no drop-out subject in this RCT.

The research conceptual framework is summarised in *Fig. 1*.

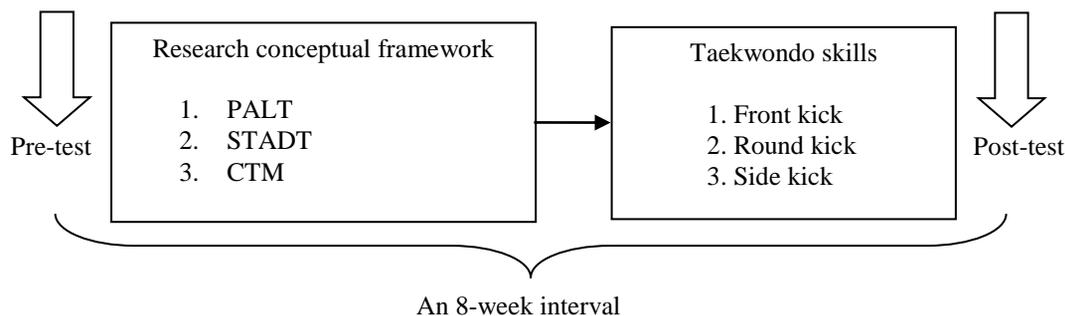


Fig. 1 Showing Diaphragmatic Research Conceptual Framework

4. Data Collection and Management, and Statistical Analyses

Prior to entry, all data were reviewed for accuracy and completeness. The primary author-investigator (S.A.) designed and implemented the data sheet and data entry programmes, including appropriate checks for accuracy. A database was constructed, and analyses were completed using SPSS/ PC.

Data analyses included calculating the descriptive and bivariate statistics for categorical and continuous data elements, including mean (\bar{x}) and standard deviation (S.D.) of test scores, and demographic data. Paired *t*-test and one-way analysis of variance (one-way ANOVA) were utilised to test the significant difference within group and among groups, respectively. We finally used the Tukey’s Honest Significant Difference (HSD) test to compare all possible pairs of means, and find out which specific group’s means (compare with each other) were different. A $P < .05$ was considered statistically significant.

Results

During the study interval, 75 subjects (all students of M.6/5, 6/6, 6/7) were screened for the study eligibility were enrolled in the study. Because of 75 subjects with a mean age of 17 ± 1 years (90.7% females) completed the study protocol and follow-up. *Table 1* summarises the bivariate analyses of the study variables vs. study enrolment.

Table 1 Showing Bivariate Analysis of Study Variables vs. Study Enrolment Status

Demographic Variables	Study Enrolment Status		P Values (Adjusted Odds Ratio [OR _{adj.}], 95% Confidence Interval [95% CI])
	Screened: Enrolled in Study	Screened: Not Enrolled in Study	
Sample size (n, %)	75 (100%)	8 (100%)	NA
Gender – Female (n, %)	68 (90.7%)	0 (0%)	-

Note: NA – not applicable. Continuous data are listed as mean \pm SD. Categorical data are presented as number (percentage). Statistically significant *P*-values are indicated in **bold** typeface.

Table 2 summarises the bivariate analyses of the study variables vs. teaching method group (PALT or STADT or CTM). The most important findings (*Fig. 2*) included

1. There were no statistically significant differences ($P > .05$) between the 3 study groups for the pre-test scores.
2. At the study end, PALT and STADT had significantly higher overall taekwondo skills than those in the CTM group. However, no significant differences between the PALT and STADT groups were found. (overall $P = .0008$; PALT vs. STADT: $P = .147$, 95% confidence interval [95% CI], -.995 to .115; PALT vs. CTM: $P = .0005$, 95% CI, -1.475 to -.365; STADT vs. CTM: $P = .104$, 95% CI, -1.035 to .075).
3. The within-group analyses demonstrated the statistically significant improvement of student's overall taekwondo skills ($P = .0001$ in every test).

Table 2 Showing Bivariate Analyses of Study Variables vs. Intervention Status

Study Variables	Study Enrolment Group			Between-Group P Values: PALT vs. STADT vs. CTM
	PALT	STADT	CTM	
Sample size (n, %)	25 (33.3)	25 (33.3)	25 (33.3)	NA
Gender – Female (n, %)	22 (29.30%)	23 (30.63%)	23 (30.63%)	-
Pre-test scores	18.36 \pm 48.	18.32 \pm 47.	18.24 \pm 43.	.646 [§]
Post-test scores	28.60 \pm 63.	28.16 \pm 92.	27.68 \pm 88.	.0008 [§]
Within-Group <i>P</i> values: pre-test vs. post-test scores (95% CI)	.0001 [†] (-10.56 to -9.92)	.0001 [†] (-10.26 to -9.42)	.0001 [†] (-9.83 to -9.05)	NA

Note: NA – not applicable. Continuous data are listed as mean \pm SD. Categorical data are presented as number (percentage). Statistically significant *P*-values are indicated in **bold** typeface. [§] tested by one-way ANOVA; [†] tested with paired *t*-test.

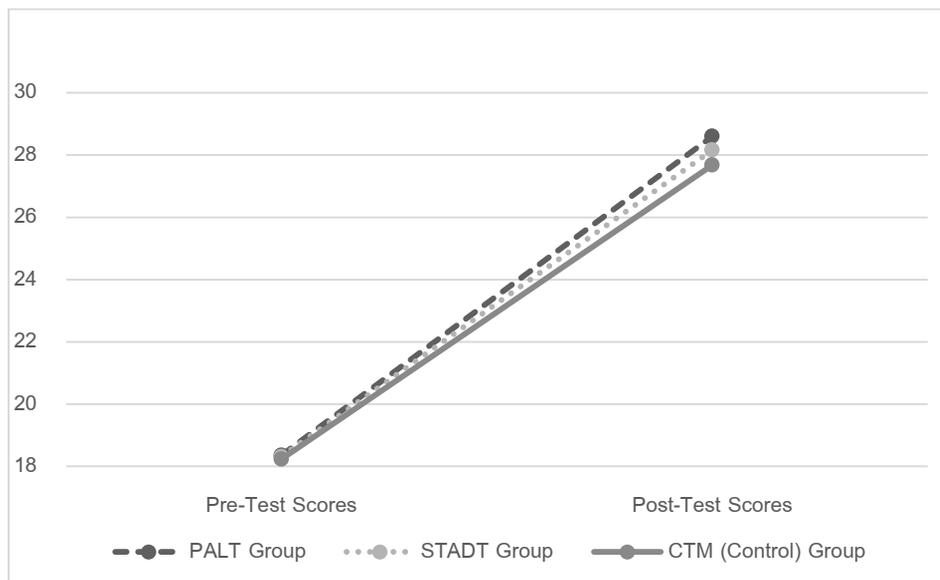


Fig. 2 Showing Pre- and Post-Test Scores in Each Study Arm

Using one-way ANOVA and Tukey’s range test, the further tests revealed the statistically significant difference on post-test scores of round kicks between PALT and CTM groups ($P < .0001$), while post-test scores of the other two taekwondo skills were not different among the 3 teaching styles (front kick: $P = .85$; sidekick: $P = .37$).

Discussion

The principal aim of PE learning management is to improve and maintain learner’s physical health, joy, sport skills and comprehension, and consequently results in sport playing with safety, moral, orderliness, group unity, good sportsmanship, and positive attitude (Pianchob, 2005). Most of the schools under the mission of the Office of the Basic Education Commission (OBEC), especially secondary schools including Prachinkallayanee School, arrange PE teaching management to promote student’s active activities in forms of sports, exercises, and gaming. This teaching management aims to ameliorate several outcomes, including: 1) knowledge via understanding, analysis ability, memorisation, interpretation, problem solving, and evaluating, 2) attitude towards value interest and appreciation, which mirror various emotions and feelings, 3) physical skills composing of effective coordination of the neuromuscular system to encourage effective daily activities and preserve energy for using in emergency situations and leisure, and 4) social characteristics regarding social adaptation and interactions, leadership/followership, as well as pursuing rules, regulations, and discipline, durability, fairness, honesty, sportsmanship, and morality (Ministry of Education, 1999; Department of Physical Education, Ministry of Tourism and Sports, 2016).

PE in primary and secondary schools plays an important role in growth and development of students, who will be the nation’s future manpower. Students with adequate PE and practice usually have good physical and mental health, and habits, including preferring exercising and playing sports that she/he is familiar and favours. This will motivate learner’s self-caring, body and mind health recognition/promotion afterwards (Pianchob, 2005). It is therefore the responsibility of PE teachers to search good and effective teaching materials in order to induce their students to realise sport’s value, maintain memory, and use sport for

exercising and self-development, including transmission of knowledge and practice to any other interested individuals.

Taekwondo amid other martial arts, e.g. Thai boxing, sword play (“Krabai Krabong”), has become a popular fighting sport among Thais over the past decade. In the 2016 Olympic Game in Brazilian Rio de Janeiro, our Thai taekwondo team won the silver and bronze medals, disseminating pride across this country (*Department of Physical Education, Ministry of Tourism and Sports, 2016*). Because of this, many Thai schools have organised taekwondo training as a part of PE in their curricula. In order to improve effectiveness of taekwondo training, we designed and implemented an RCT to determine whether the cooperative PE teaching management, i.e. PALT and STADT, when compared to CTM, increased the student’s basic taekwondo skills. The authors hypothesised that both PALT and STADT would adequately improve taekwondo skills and be significantly more effective than CTM in an 8-week study interval. Our main results were that all teaching techniques were effective in improving student’s taekwondo skills ($P = .0001$). After 8 study weeks, PALT subjects possessed significantly higher overall taekwondo skills than students undergoing CTM ($P = .0008$), and developed significantly superior round-kick taekwondo skills to subjects in the other two groups ($P < .0001$).

In our study, PALT appears highly effective in accelerating and strengthening learner’s taekwondo skill development. A possible explanation is that this teaching manner engage learners to teach each other, mainly 1:1 (one more competent and one less competent with their own free; in other words, the more competent students are appointed to assist in the teaching purpose). Students, compared to teachers, could use more familiar verbal and body languages, making their tuition far more feasible and effective. A recent study by *Chanthani (2017)* demonstrated the significant improvement on taekwondo kicking skills in PALT students, compared to those with CTM, at Week 4 and 8. Not only PE but other subjects’ learning can also be immensely improved by PALT. *Wangmo et al (2019)* recently found that in the science class of Grade 7 students (equivalent to M.1 in Thailand), PALT had positive impact on student’s performance ($P = .0072$; 95% CI, 3.22 to 19.59) and learning satisfaction (all subjects had positive satisfaction, compared to CTM group: no satisfaction at all).

Concerning STADT, this training mode also significantly increased student’s basic taekwondo skills. It can be implied that team working and within-group interactions among learners would promote basic knowledge, confidence and acceptance of each other, and positive social skills (*Suh, 1998; Khamanee, 2009; Boon-arkas, 2013*). *Tuncharoen (2018)* found that STADT surged learning achievement and attitude towards ecological science with the amount of 70%. In our study, we noticed that there were three types of learners: high, middle-grade, and low competent students. It is, therefore, important to enroll and amalgamate each student type together within a group with 4- to 6-student members. We observed several benefits of STADT, i.e. increased personal and social skills, responsibility, and adequate support for group success. Higher taekwondo skills notwithstanding, learning achievement in the STADT was not significantly higher than that in the PALT group. It can be partly explained by several facts. For example, PALT could propagate more intensive interactions between learners (1:1), while STADT in our study incorporated 4-6 students per group, and the ratio of 3 student types (i.e. more, middle-graded, and low competent) may vary from one group to another. Moreover, Thai culture may lessen team-working effectiveness of STADT (*Lertwannawit et al., 2009*).

It is understandable that CTM also boosted our student’s taekwondo skills. Had we analysed learning achievement of taekwondo learners in relation to CTM only, our study would have suffered from clinical equipoise and subsequent research misconduct. Simply speaking, carefully taught students frequently get higher post-test scores, regardless of teaching techniques. To conceal the positive effect of CTM, we hypothesised that students would have freedom and subsequent comfort during learning, which could escalate their attention to their lesson and teacher’s guidance. Fair discussion, conclusion and evaluation, and positive rewarding from the teacher altogether motivated our students to follow the training. In case of unsatisfied post-test scores, such students would be recalled returning to an individual exercise by the teacher. The significantly lower post-test scores in the CTM group, when compared to the PALT group (and not

significantly lower when compared to the STADT group), may be due to the fact that responsibility of CTM learners remained self-centred rather than group-focused. This learning interaction with no specific rules/regulations and/or aim could result in less student's cooperation and help to each other.

This study has many weaknesses. First, despite single teacher (in order to avoid the introduction of confounding factors related to different teaching patterns, teacher skill levels, and triaging protocols among PE teachers), the study sample was limited to students in M. 6's 3 classrooms at the same school. It is not known whether our subjects were representative to our school's students. Second, we did not consider different experiences and/or previous backgrounds (before study participation) among study subjects. Last but not least, although our one-way ANOVA analysis disclosed the statistically significant differences among 3 teaching techniques ($P = .0008$), the further Tukey's HSD test can capture the meaningful difference between PALT and CTM only ($P = .0005$, 95% CI, -1.475 to -.365). On other words, STADT would be able to be as effective as PALT, despite non-superior significance to CTM. This non-significance may derive from limited sample size. Had the sample size been 34 subjects per group (with unchanged \bar{x} and SD), the outcomes in the STADT and CTM groups would have been statistically significant (overall $P = .0001$; PALT vs. STADT: $P = .074$, 95% CI, -.913 to .033; PALT vs. CTM: $P < .001$, 95% CI, -1.393 to -.447; STADT vs. CTM: $P = .046$, 95% CI, -.953 to -.007). This may indicate that the sample size of 25 subjects per group is inadequate to overcome the beta error. The outcome comparison between the STADT and CTM groups in our report should, therefore, be interpreted cautiously.

Future research efforts on the topic of taekwondo teaching techniques and learning outcomes should focus on 1) assessing the external validity of these findings by developing and implementing a multicentre RCT to confirm the results, 2) comparing other training milieus, e.g. jigsaw teaching, Team-Assisted Individualisation (T.A.I), and Team-Games-Tournament (T.G.T.), and 3) identify ingassessment of learning outcomes, for example, using a counting and speed test custom-made device (*Piayura and Buranarugsa, 2020*), which may be useful in standardisation of the test.

Conclusions

To the best of our knowledge, this is the first study to directly examine the effect that cooperative PE learning management has on the taekwondo training outcomes in a USSS cohort. The results of this study suggest that post-test scores are higher than pre-test scores, regardless of training techniques. Besides, subjects receiving PALT had overall and round-kick skills than the other two samples. STADT might have been more effective than CTM, if the sample size had been higher than 25 subjects per group and/or within-group interactions among students are crucially motivated. Future studies addressing more teaching techniques in a larger cohort and tested with valid and standardised assessment are recommended.

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The 11th International conference of sports and exercise science (ICSES 2021)

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Attitude Toward Exercise Affects Health Behaviors of Burapha University Students in 2017

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Abstract

Objectives: 1. to study attitude toward exercise, and health behaviors of college students at Burapha University, 2. to compare attitude toward exercise, and health behaviors between sportsmen, exercised students, and non-exercised students, 3. to compare attitude toward exercise, and health behaviors between health care science students, pure science students, and social science students, and 4. to identify relationship between attitude toward exercise, health behaviors and academic achievement (GPAX). Method: A cross-sectional survey study by questionnaire was performed at Burapha University in 2017. Sample size was calculated via Cohen's table, α was set at 0.05, β 0.20, power 0.80, effect size 0.15, $n=144/\text{group}$, +5% over calculated for drop out for three groups, then $n=454$. Purposive sampling was executed. Health behaviors was measured by Auamnoy Health Behaviors scale. The scale consisted of 6 dimensions. Results: response rate was 447 (98.46%) and internal consistency was confirmed by Cronbach's alpha 0.742. Respondents were female 273 (61.10%) and male 174 (38.90%); sportsmen 55 (12.30%), exercised students 278 (62.20%) and non-exercised students 114 (25.50%). When compared body mass index (BMI); sportsmen < exercised students < non-exercised students significantly ($p=0.036^*$). When compared attitude toward exercise, and health behaviors; sportsmen > exercised students > non-exercised students significantly ($p=0.021^*$). Pearson's correlation confirmed a significant positive relationship between attitude toward exercise, and health behaviors ($r=+0.247^*$, $p<0.05$). Attitude toward exercise, and GPAX were positively correlated but not significant ($r=+0.072$, $p>0.05$). Whereas health behaviors had a significant negative relationship with GPAX ($r=-0.046^*$, $p<0.05$). Conclusions: we proved that attitude toward exercise had significant positive correlation with health behaviors, and non-significant positive correlation with GPAX. However, health behaviors had significant negative correlation with GPAX.

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Keywords: Health behaviors; Attitude toward exercise; Sportsmen.

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Introduction

Health behaviors, sometimes called health-related behaviors, determine health and well-being in people. The concepts are increasingly recognized as multidimensional and implanted in health lifestyles (Short and Mollborn, 2015). Health behaviors have been defined in various ways. For example, Conner and Norman (2005) defined them as any activity undertaken for the purpose of preventing or detecting disease, or for improving health and well-being. Gochman (1997) in the Handbook of Health Behavior Research defined them as “behavior patterns, actions and habits that relate to health maintenance, to health restoration and to health improvement”. Key health behaviors include smoking, diet, exercise/physical activity, health screening, sexual behaviors, and alcohol use (Conner, 2015). All findings in health behaviors could be categorized under one of six domains: health cognitions; care seeking; risk behaviors; lifestyle; responses to illness, including adherence; and preventive, protective, and safety behaviors (Ben-Sira, 1997).

Ajzen, 1982 did survey by self-administered questionnaire to study attitude-behavior relation to smoking marijuana in 155 male and female college students. He found that attitude tends to have predictive validity to its corresponding behavioral domain (Ajzen, Timko et al., 1982). The present research took a close look at the relation between health attitude and health behaviors. The aim of this study was

1. to study attitude toward exercise, and health behaviors of college students at Burapha University,
2. to compare attitude toward exercise, and health behaviors between sportsmen, exercised students, and non-exercised students,
3. to compare attitude toward exercise, and health behaviors between health science students, pure science students, and social science students, and
4. to identify relationship between attitude toward exercise, health behaviors and academic achievement (GPAX).

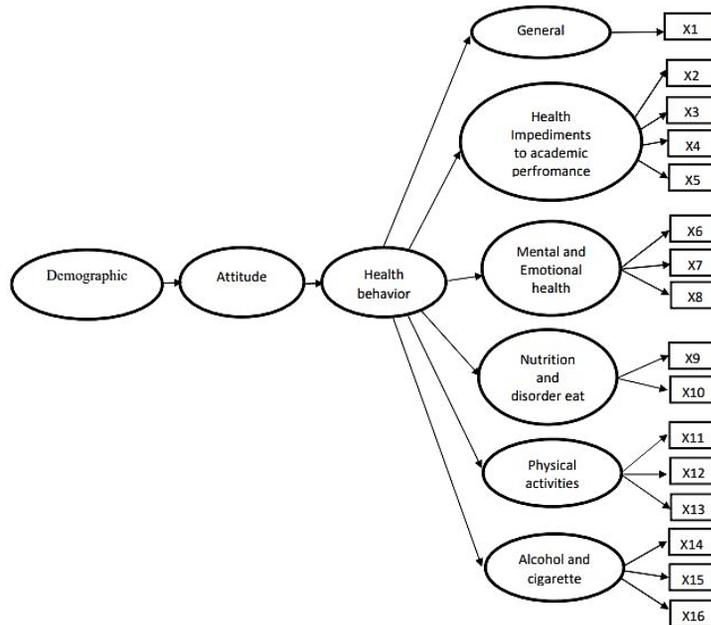


Fig. 1. Conceptual framework

2. Methodology

A cross-sectional survey study by self-administered questionnaire was performed in 447 college students at Burapha University, Thailand in 2017. The protocol of this study was approved by The Pharmacy College Research Ethic Committee of Burapha University on September 6, 2016, serial number 5/2559.

Population was 36,649 undergraduate students of Burapha University in the year 2017.

Sample size was calculated by using Cohen's Table (Cohen, 1977). α was set at 0.05, β 0.02, power 0.80 and effect size 0.15, $n=144 \times 3=432$. Overcalculated for dropout 5%, then $n=454$. The non-probability sampling (purposive sampling) was executed to collect data.

The questionnaire was divided into three parts:

1. demographic data inquired gender, age, weight, height, body mass index (BMI), alcohol consumption, cigarette smoking and academic achievement (GPAX),
2. attitude toward exercise was measured by 3 measurement variables using visual analogue scale, and
3. health behaviors were inspected via Aumny Health Behaviors scale adapted from Lesińska-Sawicka scale (Lesińska-Sawicka, Pisarek et al., 2021).

The questionnaire consisted of 16 measurement variables measured in 6 dimensions in ratio scale via visual analogue scale. Face validity and content validity were examined by 3 experts from College of Pharmacy, Chulalongkorn University, Thailand. Cronbach's alpha was implemented to assure reliability (internal consistency). $r > 0.70$ was set as passed.

Sportsmen students referred to the students who formally or officially played sports for Burapha University. Exercised students referred to the students who exercised or played sports at least 3 times/week. Non-exercised students referred to the students who played sports less than 3 times/week.

Attitude toward exercise was calculated by Auamnoy Attitude scale. It is a unidimensional scale with 3 analogous questions for reliability (one was a negative question) measured in visual analogue scale.

Health behaviors were measured by Auamnoy Health Behaviors scale. The scale consists of 16 measurement variables composed of 6 constructs i.e., 1. general health, 2. health impediments to academic performance, 3. mental and emotional health, 4. nutrition and disordered eating, 5. physical activities, and 6. alcohol and cigarette use.

Nonmetric variables were demonstrated in frequency and percentage whereas metric variables in mean \pm SD. One way ANOVA was conducted to compare means of metric variables. Pearson's correlation was executed to investigate linear relationship between 2 ratio variables. Statistical analysis was performed via SPSS 17. α was set at 0.05 and p-value <0.05 was significant.

3. Results

Table 1. Demographic data of non-metric variables

Variables	Number of respondents	Percent (%)
Gender		
Female	273	61.10
Male	174	38.90
Total	447	100
Alcohol consumption		
No	261	58.39
Yes	186	41.61
Total	447	100
Cigarettes		
No	326	72.93
Yes	121	27.07
Total	447	100
Grouping by exercise		
Sportsmen	55	12.3
Students who exercise	278	62.2
Students who do not exercise	114	25.5
Total	447	100
Grouping by studying		
Health care science	144	32.20
Pure Science	144	32.20
Social Science	159	35.60
Total	447	100

From Table 1, respondents were grouped according to:

1. gender: female 273 (61.10%) and male 174 (38.90%).
2. alcohol consumption: drinking 186 (41.61%) and non-drinking 261 (58.39%).
3. smoking: smoking 121 (27.09%) and non-smoking 326 (72.93%)
4. exercise: sportsmen 55 (12.30%), students who exercise 278 (62.20%) and students who did not exercise 114 (25.50%), and

5. studying: health care science students 114 (32.20%), pure science students 114 (32.20%) and social science students 159 (35.60%),

Table 2. Data of metric variables

Variables	Mean	SD
GPAX	3.06	0.42
Weight (kg)	54.42	12.28
Height (m)	1.63	0.09
BMI	21.83	6.57
Age (years)	20.49	1.64
Attitude toward exercise	8.20	0.65
Health behaviors	40.95	1.68

From Table 2, mean and SD of respondents were GPAX 3.06 ± 0.42 , weight 54.42 ± 12.28 kg. height 1.63 ± 0.09 m, BMI 21.83 ± 0.657 , age 20.49 ± 1.64 years, scores of attitude toward exercise 8.20 ± 0.65 and health behaviors scores 40.95 ± 1.68 .

Table 3. Comparison of means of BMI, age, attitude toward exercise, and health behaviors between groups of students classified by exercising by ANOVA

Variables	Student groups	Mean	SD	F-test	p-value
BMI	Sportsmen	21.02	3.85	4.16	0.036*
	Exercise	21.87	3.92		
	Not exercise	22.59	3.13		
	Average	21.83	3.57		
Age	Sportsmen	20.58	1.42	0.3	0.741
	Exercise	20.51	1.32		
	Not exercise	20.39	2.31		
	Average	20.49	1.64		
Attitude toward exercise	Sportsmen	9.15	0.62	5.47	0.021*
	Exercise	8.46	0.64		
	Not exercise	6.98	0.67		
	Average	8.20	0.65		
Health behaviors	Sportsmen	42.45	1.46	6.36	0.038*
	Exercise	40.61	1.77		
	Not exercise	39.78	1.57		
	Average	40.95	1.68		

From Table 3, ages of 3 groups of students were not significantly different ($p=0.741$, ANOVA). However, BMI was significantly sportsmen < exercised students < non-exercised students ($p=0.036^*$, ANOVA). Scores of attitude toward exercise were significantly sportsmen > exercised students > non-exercised students ($p=0.021^*$, ANOVA). Health behaviors scores were significantly sportsmen > exercised students > non-exercised students ($p=0.038^*$, ANOVA).

Table 4. Comparison of means of BMI, age, attitude toward exercise, and health behaviors between groups of students classified by studying via ANOVA

Variables		Mean	SD	F-test	p-value
BMI	Health care science	21.93	3.83	1.751	0.175
	Pure science	22.01	10.11		
	Social science	21.45	4.03		
	Total	21.78	6.57		
Age	Health care science	20.61	2.25	0.919	0.415
	Pure science	20.51	1.32		
	Social science	20.36	1.19		
	Total	20.49	1.64		
Attitude toward exercise	Health care science	8.18	0.62	0.209	0.811
	Pure science	8.13	0.73		
	Social science	8.17	0.59		
	Total	8.16	0.65		
Health behaviors	Health care science	42.45	1.76	2.247	0.107
	Pure science	42.46	1.70		
	Social science	42.81	1.57		
	Total	42.58	1.68		

From Table 4, BMI, age, attitude toward exercise, and health behaviors between 3 groups of students that were classified by studying namely, health care science, pure science and social science were not significantly different ($p=0.175, 0.415, 0.811, \text{ and } 0.107$, respectively, ANOVA).

Table 5. Correlation matrix between GPAX, attitude toward exercise, and health behaviors

Variables	GPAX	Attitude toward exercise	Health behaviors
GPAX	1		
Attitude toward exercise	+0.072	1	
Health behaviors	-0.046*	+0.247*	1

* $p<0.05$

From Table 5, attitude toward exercise, and health behaviors were significantly and positively correlated ($r=+0.247^*$, $p<0.05$).

Attitude toward exercise, and GPAX were positively correlated but, not significant ($r=+0.072$, $p>0.05$).

However, health behaviors and GPAX were significantly and negatively correlated ($r=-0.046^*$, $p<0.05$).

4. Conclusion

Students who were sportsmen had less BMI (21.02 ± 3.85) than students who did exercise (21.87 ± 3.92), and students who did exercise had less BMI than students who did not do exercise (22.59 ± 3.13). Sportsmen had higher positive attitude (9.15 ± 0.62) than students who did exercise (8.46 ± 0.64), and students who did exercise had higher positive attitude than students who did not do exercise (6.98 ± 0.67). Sportsmen had higher health behaviors scores (21.02 ± 3.85) than students who did exercise (21.87 ± 3.92), and students who did exercise had higher health behaviors scores than students who did not do exercise (22.59 ± 11.13). Therefore, the importance of attitude toward exercise on health behaviors was proven. Moreover, we found that attitude toward exercise had significant positive correlation with health behaviors and non-significant positive correlation with GPAX. However, health behaviors had significant negative correlation with academic achievement (GPAX).

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**The Construction of the Ladder Training Combined with
the Training of Returning Serves Effecting Performance
of Returning Serves with forehand and backhand of
Students in Thailand National Sports University**

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Abstract

The purpose of this research was to study the construction of the ladder training combined with the training of returning serves effecting performance of returning serves with forehand and backhand of students in Thailand National Sports University. The subjects used in this study were twenty students from Thailand National Sports University, Lampang Campus; they were the experimental group. The statistics used were mean, standard deviation and t-test dependent. The finding revealed that the quality of the ladder training combined with the training of returning serves effecting performance of returning serves with forehand and backhand of students in Thailand National Sports University. It was found that the consistency was 1.00 from 5 experts, it consisted of warm up, practice step of the ladder training combined with the training of returning serves and cool down. It takes 4 weeks to practice, 3 days a week, 1 hour a day and have been experimenting with the ladder training combined with the training of returning serves. It was found that after 4 week of training, the average of performance of returning serves with forehand was 19.66 better than before 9.50, the average of performance of returning serves with backhand was 19.22 Better than before 9.27 and comparing the average of performance of returning serves with forehand and backhand between before and after 4 week of training with significant at .05. Therefore, the ladder training combined with the training of returning serves effecting performance of returning serves with forehand and backhand to be included in the lesson plan to develop the return of serve as a receiver especially the preparation in previous step to run for a ball, speed and flexibility of footwork in order to develop students' performance of returning serves.

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Keyword: agility, ladder training, training of returning serves

Introduction

Tennis is a type of sport that needs various important skills including the forehand, the backhand, the volley and the serve. One of the most major skills is the return of serve. It has been said in 2017 by Pacharapon Kumsaman in his interview that the return of serve is like the serve for the receiver. If the receiver could control and hit the ball back to the court, this can make the opponent disadvantageous. So the receiver changes to the defensive side and can break the game. The return of serves is important because if you can return serves well and positioning will give you a competitive advantage. Therefore, the receiver must observe the method of serving the opponent from the throw of the ball in order to predict how it will serve. If the player is able to move fluently towards the ball, he or she can have time to decide how to control the ball in the desired direction. The return of serve seems to be important for the tennis player because it could help him or her to win the game. Therefore, it is crucial to develop this among other tennis skill and should be enclosure in the teaching content.

The tennis subject of Thailand National Sports University includes the teaching skills and the tennis instruction. As the results of the observation and the interview, students who learn tennis subject have problems in the return of serve as a receiver especially the preparation in previous step to run for a ball, speed and flexibility of footwork (Pacharapon Kumsaman, interview 2017). To improve the performance of students in the return of serve, there are several footwork practicing techniques such as the nine channel table and fixed ladder training. It has been previously found that agility training by using fixed ladder can improve the athlete agility in moving toward the ball, let to the good skill in the return of serve (Uppajantho P., et al., 2015). The document studies relating to footwork training with ladder training also demonstrated that there were a variety of ladder training which could improve the agility of athletes. The researcher then chose 8 patterns of ladder training which were suitable and consistent with the ability in movement to reach the ball for return of serve. It could be said that footwork training with ladder training is very useful for moving toward the serving ball. Because of the agility and speed of movement from one side to another part of the court, the player can effectively reach the serving ball. It also helps train the neuro-muscular relationship. It can practice multiple people at a time and consistent with the movement skill in receiving the returning serves the must rely on the flexibility of moving towards the goal. Therefore, the receiver must have the flexibility to move to return the ball in time)Pacharapon Kumsaman, interview 2017 (the consistent with Thanakron Aungsomboon)interview 2017(that tennis players should practice their agility with ladders training because it helps to have flexibility in moving with speed to hit the ball effectively. It can be said that stepping with the ladders training is beneficial to ability to move towards the ball to return the serves. The ability to return of serves requires the flexibility of moving from one point to another with speed for effective reception.

I am interested in studying The Construction of the Ladder Training Combined with the Training of Returning Serves Effecting Performance of Returning Serves with forehand and backhand of Students in Thailand National Sports University, Lampang Campus. Optimistically, the results of this study will be used to improve the tennis teaching in performance of return serves with forehand and backhand. Besides, it could be an alternate technique for trainers and the others to select the appropriate training. Moreover, data obtained from this study can be used as a guideline for training the potential tennis players in good return serve skill.

Objectives

To study the construction of the ladder training combined with the training of returning serves

effecting performance of returning serves with forehand and backhand of students in Thailand national sports University.

Research hypothesis

The construction of the ladder training combined with the training of returning serves effecting performance of returning serves with forehand and backhand of students in Thailand National Sports University can develop their performance of return serves.

Terminology definition

The return of serves means training for serving skills consisting of: 1. Training for forehand and backhand skills 2. Practicing for return of serves with bare hands 3. Practice for return of serves with a tennis racket.

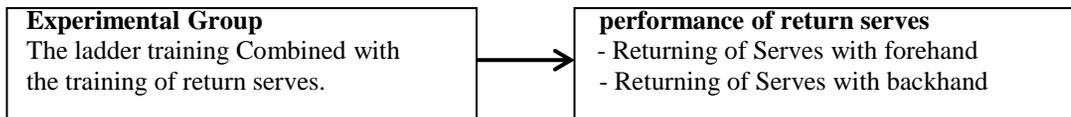
The ladder drill means defined as 8 types of foot movement exercises 1. run through 2. lateral 3. one foot lateral 4. in out lateral 5. lateral in, in out, out 6. lateral feet 7. hop scotch 8. in-out movement training to return of serves By training to move forward and move sideways.

Ladder training combined with the return of serves means training the movement of the feet with eight types of ladder drill. Practice combined with the return of serves.

Performance of return serves means the movement of the return serves by hitting 10 forehands skill and 10 for backhands skill, for a total of 20 in the scoring box. Specified in accordance with the return of serves which has been improved from Potchaneer Thanakom (Prasert KraiManai).

Students means students of the Faculty of Sports Science and Health. National Sports University Lampang Campus Academic year 2017, who have studied tennis, 170 students

Conceptual framework



Methods

Populations of research were students of Thailand National Sports University, Lampang Campus. There are 170 people who have studied tennis.

Sample of research were students of Thailand National Sports University, Lampang Campus. There are 20 people who have studied tennis.

Research tools

The ladder training, the returning of serve and the return of serves performance tests have been used as the research tools. In order to qualify and validate the research tools, the index of item objective congruence (IOC) was applied and calculated. The IOC value obtained from the ladder practice was 1.0 whereas the IOC of the return serve ability tests was 0.96

Building and Quality Tools

Step to create the ladder training combined with the training of returning serves.

1. Study the relevant documents and research on the creation of the ladder training combined with the training of returning serves to improve the performance to return of serves with forehand and backhand. The exercise consists of 3 steps as follows:

- 1.1 The process of warm up is stretching the muscles.
- 1.2 The training process is the ladder training combined with the training of returning serves.
- 1.3 The process of warm up is stretching the muscles.
2. Consult your advisor to verify the construction of the ladder training combined with the training of returning serves.
3. Bring the ladder training combined with the training of returning serves form created for 5 experts to determine the consistency of the experts with a consistency index of not less than .50 (Pisanu Fongsri. 2014: 20). The ladder training combined with the training of returning serves obtained a conformity value from an expert or an IOC (Index of consistency: IOC) value equal to 1.00. Experts have suggested to adjust the training time. By allowing more breaks between training and should determine the position to stand to receive the ball.
4. Take the ladder training combined with the training of returning serves. Finding the confidence of the tool. The exercise was taken in a pilot study with a group of 20 people similar to the sample group to determine the feasibility of the real model.
5. Take the results of the experiment and various flaws to consult with advisors and experts to check and test again. Until I got the ladder training combined with the training of returning serves for students of Thailand National Sports University is complete and ready to be used.
6. Use the obtained values to analyze the statistical results and draw conclusions from the research.

Data analysis

The data analysis was conducted in the following way:

1. Content validity of the ladder training combined with the training of returning serves used Index of Item-Objective Congruence: IOC.
2. Compare the mean and standard deviation of sample group used the ladder training combined with the training of returning serves effecting performance of returning serves with forehand and backhand of students in Thailand National Sports University that the researcher created for pilot study during before and after the 4 week of training.
3. The statistical significance was set at the .05 level.

Results

Table 1 Shows the consistency index of used the ladder training combined with the training of returning serves of the students in the National Sports University, Lampang Campus.

list the ladder training combined with the training of returning serves	experts					IOC
	1	2	3	4	5	
Week 1	1	1	1	1	1	1.00
Week2	1	1	1	1	1	1.00
Week3	1	1	1	1	1	1.00
Week4	1	1	1	1	1	1.00
Week5	1	1	1	1	1	1.00
Week6	1	1	1	1	1	1.00
Week7	1	1	1	1	1	1.00
Week8	1	1	1	1	1	1.00
total						1.00

Table 1 show that the ladder training combined with the training of returning serves of the students in the National Sports University, Lampang Campus. When taken to find quality by content validity testing by

considering 5experts to find the Index of Item-Objective Congruence (IOC) .It was found that all items of conformity index were the total conformity index is 1.00.

Table 2 The comparison of mean for performance of returning serves with forehand that the ladder training combined with the training of returning serves of the sample in the pilot study before and after the 4 week of training (n=20).

list	n	x	S.D.	t	p
before training	20	9.50	1.85	14.30-	00.
after training	20	19.66	3.74		

*p <05.

Table 2 show that when comparing the mean of the ladder training combined with the training of returning serves with forehand of samples in the pilot study between before and after the 4 week of training. There was a significant difference at the .05 level.

Table 3 The comparison of mean for performance of returning serves with backhand that the ladder training combined with the training of returning serves of the sample in the pilot study before and after the 4 week of training (n=20).

list	n	x	S.D.	t	p
before training	20	9.27	2.13	14.15-	00.
after training	20	19.22	2.79		

*p <05.

Table 3 show that when comparing the mean of the ladder training combined with the training of returning serves with backhand of samples in the pilot study between before and after the 4 week of training. There was a significant difference at the .05 level.

Discussion

Content validity analysis of the ladder training combined with the training of returning serves. The researcher used discretion and recommendations from 5experts to decide on the creation and improvement of the exercises .It was found that the Index of Item-Objective Congruence (IOC) of the questions created by the researcher up, which has a total of 8items, of which 8items. All 8 items are accurate in content according to the theory, which is consistent with Phisanu Fongsri (2014), said that questions with a consistency index of not less than .50 will be questions. That is accurate to the content as for questions with a consistency index lower than 0.5. They can be used and need to be improved in accordance with Suchira Rattanathaworn (.2007) Which was taken to determine the quality by testing the validity (validity) by considering the method of 5 experts and finding the consistency (Index of Item-Objective Congruence: IOC) with the consistency of all items Therefore, the test on the sand can be used for testing. Consistent with Sastra Wongbutlee (2008) found that the football skill test When the quality of content validity was determined using the Index of Item-Objective Congruence (IOC) method of the 3 experts, all items of conformity value could be tested on the ground. Sand can be used for testing. Consistent with Prasert Khaimaan (2004) said that the principle of creating a test of sports skills must be in accordance with the purpose and plan in advance and conduct a test trial It can be seen that the ladder training combined with the training of returning serves of the students in Thailand National Sports University. Created by the researcher according to the principles of training consist of 3 steps. These include the warm-up, the training, and the warm-up. A pilot study was conducted to determine the feasibility of the practice exercises in real conditions for 4 weeks, 3 days per week to determine the suitability of the ladder training combined with the training of returning serves with students of the

Faculty of Sports Science. National Sports University Lampang campus that voluntarily participates found to be appropriate is consistent with Hongthong Buathong ((2016, said that the principle of creating a training program must take into account the readiness of the athletes as important, such as age, gender, shape and level. readiness of the body Therefore, the correct program for training and therefore appropriate It is necessary to have a plan according to the conditions of the athletes in each category to achieve Maximum performance in training Therefore, the ladder training combined with the training of returning serves that the researcher created can be measured according to the content. Objectives and measurable behaviors Able to develop the performance of returning serves with forehand and backhand.

When comparing the average of the ladder training combined with the training of returning serves of the National Sports University students, Lampang Campus of the sample in the study pilot during training and after 4 weeks of training, it was found that the difference was statistically significant at the .05 level. This is because the ladder training combined with the training of returning serves are effective and passed the quality check of the exercises When used in the experiment with the pilot sample, it improved the performance of returning serves the serve after 4 weeks of training, resulting in the students' performance of returning serves tennis more effectively, in consistent with Amnuay Boonseng (2017), p.m. 185) that when athletes practice consistently, it will result in the body being able to adjust to the load or pressure of training quickly Makes it easy to develop the ability of athletes. to progress even higher Interruption or cessation of training for 3-2 days will result in a loss of endurance and muscle tightness of the muscles that have been trained and are consistent with Sontaya Seelamat (2012, pp. (181-180that training planning is a guide and a way to lead athletes to a defined goal Good planning will increase your prudence and keep you informed of your training needs and results throughout the course of your training. It is also consistent with the National Takraw Sport Development Institute (2016, online) that practice or practice often with understanding makes learning durable. If it is not done repeatedly, learning will not last forever. For athletes who practice repetitively over and over again in order for the body's mechanics to be remembered until it becomes the most natural posture. When the body has already recognized the pattern. Movement, whether in practice or real competition , does not cause any errors and is consistent with Charoen Krabuanrat (2002, p. (29-28that the rehearsal is consistent and that there is a correct and concise system When athletes practice regularly, it will result in the body adapting to the weight or pressure of training quickly. This makes it easier to develop the ability and physical fitness of athletes to advance even further that is the training of returning serves with forehand and backhand. Correct and practice according to the exercises regularly and continuously resulting in students the performance of returning serves with forehand and backhand. According to the assumption It is the ladder training combined with the training of returning serves of the students of the Thailand National Sports University, Lampang Campus After the 4 week of training. The performance of returning serves with forehand and backhand. There was a significant at a .05 level. This is because the ladder training combined with the training of returning serves will improve the students' speed training the most. Instructors must determine the kinetic training style in accordance with the training skills, setting the duration of the training to increase the training difficulty. Sequence of movement reaction exercises arranging training styles in accordance with the movements of tennis; which allows movement change of direction and changing positions quickly Effective in moving towards the target, can improve the movement to returning serves of students as well, consistent with Nattapon Chaisorn (2016, n. 81-82) that the ladders training help practice The nervous system stimulates the muscles to contract quickly and increases the efficiency of foot movement, giving the trained person the ability to run faster. Being able to move from one point to another quickly is a training that helps develop motor skills as well. Consistent with Prajongchit Upchanto (2015, p. 1-2, referenced in Manoch Butmuang). 2007, p. 3) that the ladders training is a device Agility drills to improve stride speed, agility, and overall speed are the coordination of the muscles and Nerves are quality speed training. Training will make the muscles and nerves can continue training longer and more patiently. It is also consistent with Thanakorn Aungsomboon (interview, 28 November 2017) that tennis players should practice their agility with the ladder training because it will have flexibility to move from point to point with speed to

hit the ball effectively. It is also consistent with research by Prajongjit Upchanto, Nattapon Chaisorn, Chandrakumar N, Ramesh C. and Matthew Wagner C., Gary Oden L., Page Glave A. and William Hyman V., Sethu S. It is said that Ladders agility training can provide athletes with increased mobility towards targets and allows students to the ladder training combined with the training of returning serves have to move to better the performance of returning serves. In addition, the ladder training combined with the training of returning serves can also be used in conjunction with the receiving training program to solve the problem of the performance of returning serves with forehand and backhand of Students in Thailand National Sports University of students studying tennis subject.

Suggestion

The tennis teacher or trainer should combine the ladder training combined with the training of returning serves into the lesson plan to improve serve handling. Especially the preparation to move towards the ball, speed and agility. In order to improve the efficiency of the student's performance of returning serves with forehand and backhand.

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