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2nd HKASMSS Student Conference on Sport Medicine, Rehabilitation and Exercise Science

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Message from the Chairman

2nd HKASMSS Student Conference on Sport Medicine, Rehabilitation and Exercise Science

It is my pleasure to welcome your participation in the 2nd HKASMSS Student Conference on Sport Medicine, Rehabilitation and Exercise Science. The Department of Sports Science and Physical Education of The Chinese University of Hong Kong is honoured to hold the conference, together with the celebration of 20th anniversary of Hong Kong Association of Sports Medicine and Sports Science.

The first HKASMSS Student Conference on Sport Medicine, Rehabilitation and Exercise Science was hosted by Department of Rehabilitation Science of The Hong Kong Polytechnic University in 2003. This year, the Department of Sports Science and Physical Education of The Chinese University of Hong Kong will continue to organize this conference which aims to provide opportunity for local students to present their research works, and to meet new colleagues from different groups in local institutes working in sports related researches.

We expect the exposure to the local community in sports science to stimulate our students to enrich their work, and to further present their work in international conferences, and even publish their work in international journals.

Prof. Stephen WONG

Chairman,

2nd HKASMSS Student Conference on Sport Medicine, Rehabilitation and Exercise Science

Message from the President

Hong Kong Association of Sports Medicine and Sports Science

The Hong Kong Association of Sports Medicine and Sports Science (HKASMSS) was founded in 1988. This year, the HKASMSS is celebrating its 20th anniversary!

In celebrating this important event, we are very happy to have Prof. Stephen Wong from the Department of Sports Science and Physical Education, The Chinese University of Hong Kong, to host the 2nd HKASMSS Student Conference on Sport Medicine, Rehabilitation and Exercise Science. We are glad to invite Prof. KM Chan, the founding president of HKASMSS, to join the conference and the celebration.

Most importantly, we would like to invite postgraduate and undergraduate students working in sports medicine, rehabilitation and exercise science research to join and present their works. The conference serves as a platform for students to share their research ideas, to gain experience in delivering presentation, and to gain exposure to the local community in sports medicine and sports science. I am sure our fellow Hong Kong students will enjoy the conference and meet friends!

Please submit papers and join us. See you in the conference!

Dr. Patrick YUNG

President,

The Hong Kong Association of Sports Medicine and Sports Science

Prof. Frank FU

Director, Dr. Stephen Hui Research Centre for Physical Recreation and Wellness, Hong Kong Baptist University

Frank H. Fu was born in Hong Kong in 1949 and received his BA from Dartmouth College in 1971 and his Master and Doctorate degrees from Springfield College in 1973 and 1975. He has worked in the Ottawa YM-YWCA (1975-77), University of Ottawa (1977-78), Springfield College (1978-83), The Chinese University of Hong Kong (1983-1992) and Hong Kong Baptist University (1992-present). He has served as Secretary General of the Asian Region of ICHPER.SD, Director of International Centre at Springfield College, Council Chairman and Executive Committee Chairman of the Hong Kong Post-Secondary Colleges Athletic Association, Chairman of the HKPSCAA World University Games Organizing Committee, and President of the Hong Kong Association of Sports Medicine and Sports Science.

He is presently the Associate Vice President, Dean of the Faculty of Social Sciences and Chairman Professor at Hong Kong Baptist University, the Director of Dr. Stephen Hui Research Centre for Physical Recreation and Wellness, President of the Society of Chinese Scholars on Exercise Physiology and Fitness, Supervisor of the J.C. Ti-I College, Supervisor of the HKBU Affiliated School cum Wong KM Primary and Secondary Schools, a Director of Hong Kong Sports Institute Board, Chairman of Hong Kong Coach Education Committee, and Vice-Chairman of the Elite Sports Committee. He was invited to join the Senior Professor Society of China in 2002 and was appointed Justice of Peace by the SAR Government of Hong Kong in 2004.

Professor Fu has published over 100 journal articles and has also published over 15 textbooks. He has travelled extensively and given lecturers and presentations all over the worked including Asia, USA, Canada, Australia, Latin America and the Middle East. He is presently an International Fellow of the American Academy of Kinesiology and Physical Education, a Fellow of the Research Consortium of the AAHPERD, and a Fellow of the Hong Kong Recreation Management Association.

Prof. Gabriel NG

Professor and Associate Head, Department of Rehabilitation Sciences, The Hong Kong Polytechnic University

Prof. Ng joined The Hong Kong Polytechnic University in 1995 as an assistant professor and was promoted to associate professor in 1998 and then full professor in 2003. His research interests include sports physiotherapy, knee joint rehabilitation and the basic sciences of soft tissue injury/repair. He is particularly interested in the therapeutic mechanisms of electrophysical modalities, Chinese herbal medication and exercise on tissue repair. Since joining PolyU, Prof. Ng has supervised about 30 graduate students, including master's, doctorate and postdoctoral students. Prof. Ng has received a number of personal awards, including the Young Investigator high commendation certificate from Sports Medicine Australia; Asics award for best research in a clinically relevant condition; the New Investigator Recognition award of the Combined Orthopedic Society of the USA, Canada, Europe and Japan; and the President's Teaching Award from PolyU. Prof. Ng is Vice-President of the Hong Kong Association of Sports Medicine and Sports Science. He is associate editor (Asia) of Physical Therapy in Sport and he also sits on the editorial committee of a few other journals such as the British Journal of Sports Medicine and Photomedicine and Laser Surgery.

Two months voluntary exercise does not alter the gene expression of ghrelin in rat cardiac muscle

Xiao-Meng PEI[1], Bee- Tian TENG[1], Joann W.Y. NG[1], Iris BENZIE[1], Yajun CHEN[2], Stephen H.S. WONG[2], Parco M.F. SIU[1].

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[2]Department of Sports Science and Physical Education, The Chinese University of Hong Kong

Introduction

Regular exercise has a key role in improving cardiac function in human. Ghrelin, a hormone isolated from stomach, has beneficial effects on cardiovascular system. Ghrelin improves cardiac contractility, left ventricle function in chronic heart failure and reduces mean arterial pressure. Ghrelin may be involved in the exercise-induced cardiac adaptation. Thus, the objective of this study was to investigate whether voluntary exercise, a more usual and practical form of physical activity in humans, can up-regulate ghrelin expression in cardiac muscles in a rat wheel running model.

Methods

Eighteen young adult female Sprague Dawley rats with similar bodyweight were randomly assigned to Control (CON) or Exercise (EX) groups. The EX animals were housed in cages with 24h free access to an in-cage running wheel with a magnetic digital counter for monitoring the daily running distance. The CON animals were housed in cages without running wheel. The bodyweight change and amount of food intake of rats were recorded weekly. After 8 weeks experimental period, animals were sacrificed and the cardiac ventricle was collected. Total RNA was extracted and cDNA was synthesized using decamer primers and Superscript III reverse transcriptase for analyzing the gene expression of ghrelin by real time PCR. Relative ΔC_T method was used to examine the difference between CON and EX samples with normalization to beta-2-microglobulin as housekeeping gene.

Figure 1. Rat running wheel setting

Results

The average daily running distance of EX animals was 4-6km during the 8-week experimental period. EX animals showed higher weekly food intake than CON animals but similar change in bodyweight was observed in EX and CON animals. According to RT-PCR analysis, the gene expression of ghrelin was not found to be significantly different between EX and CON groups in ventricle muscle (p>0.05).

Week	Body weight (g)		Food intake (g)		Distance (m)
	CON (n=9)	EX (n=9)	CON (n=9)	EX (n=9)	EX (n=9)
1	181±26	175±21	111±38	109±47	3455±1713
2	206±22	199±19	169±15	172±28	5402±2071
3	225±18	214±22	166±14	184±32	6340±2129
4	239±17	225±30	168±17	196±27*	6811±4056
5	253±17	235±36	182±20	212±26*	6262±4175
6	266±12	244±34	163±14	197±46*	6869±4695
7	270±12	257±35	167±8	215±40*	4842±1865
8	278±15	270±34	166±13	209±34*	4532±2359

No significant change between bodyweight of CON and EX rats but higher amount of food intake in EX rats than CON rats from week 4 to 8 (* p<0.05).

Table 1. Weekly body weight and food intake from CON and EX rats and running distance for EX rats over 8 weeks period

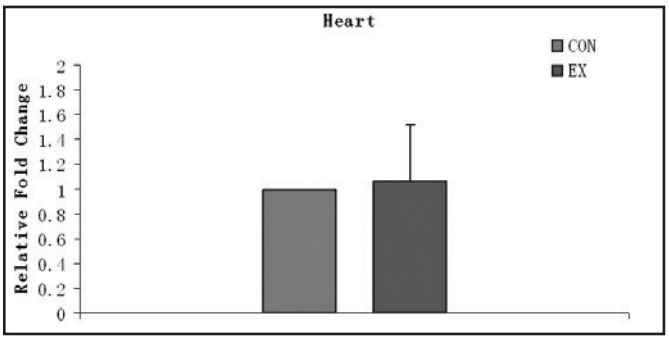

Figure 2. Ghrelin mRNA level normalized to β2M in the heart of EX rats showed no significant difference compared with CON rats (p>0.05).

Discussion and Conclusion

These results showed that two months voluntary exercise does not alter the gene expression of ghrelin in rat heart muscle. Acute exercise decreases plasma ghrelin level in healthy man whereas long term regular exercise increases plasma ghrelin concentration in adolescent girls. The alteration of ghrelin in cardiac muscle may be related to the intensity and type of exercise. The present findings suggested that short-term voluntary mode of exercise does not increase the gene expression of ghrelin in cardiac muscle.

The profile of the absolute power spectrums of the Chinese elite boxers before important competition

Feng-Hua SUN, Zhen-Min ZHANG

Department of Sports Science and Physical Education, The Chinese University of Hong Kong

Introduction

Monitoring brain function is critically important for boxers who are usually at high risk of brain injuries. The electroencephalogram (EEG) has been widely used in monitoring brain function since 1920's because of its convenience and non-invasiveness. Recently the application of the brain electrical activity mapping (BEAM) technology has made great progress in the development of EEG, and it can transfer the complex changes of the brain function to the images by modern computer technology and signal processing technology. It can display the position and area of the brain dysfunction, which is helpful for earlier diagnosis and earlier treatment of brain diseases. Spectrum analyzing technology is one of the core technologies in BEAM and it can reflect the changes of the brain energy. Since 1980's, some researchers applied the technology of BEAM to the research in exercise science. However, no reports about the spectrum analyzing in boxers have been found. Therefore, the purpose of this study was to examine the profile of the absolute power spectrums of the Chinese elite boxers before important competition.

Methods

The electroencephalograms (EEG) and the brain electrical activity mappings (BEAM) of the 20 Chinese elite boxers in resting, hyperventilation (HV) and recovery statuses were recorded with the monopolar recording methods two weeks before important competition. All the data were presented as mean ± SD, with the significance level set at $p<0.05$. Any significant F ratios were assessed using the post hoc Tukey test to locate any significant difference.

Results

1. No significant differences were found between the absolute power spectrums in the symmetrical parts of the boxers' left and right brain hemispheres in resting, HV and recovery statuses. The average absolute power of the different bands in the left and the right brain hemispheres were almost the same.
2. Compared with the resting status, the absolute power of the δ band in parietal region, occipital region, anterior temporal region, middle temporal region and posterior temporal region increased in HV status. The absolute power in anterior temporal region and posterior temporal region decreased obviously in recovery status, while decreased less in occipital region.
3. Compared with the resting status, the absolute power of the θ band in all brain regions in HV status increased obviously and that in prefrontal region, occipital region, anterior temporal region and posterior temporal region were still high in recovery status. Compared with the HV status, the absolute power decreased obviously in prefrontal region, middle frontal region and anterior temporal region in recovery status.
4. No significant differences were found among the absolute power of the α band in three statuses.
5. Compared with the resting status, the absolute power of the β band in all brain regions increased obviously in HV status and were still high in recovery status, but that of the β band in occipital region decreased in recovery status.
6. From the resting status to the HV status and the recovery status, the proportion of the absolute power of the β band increased in turn and that of the θ band increased firstly and decreased then. In prefrontal region the proportion of the absolute power of the δ band decreased in turn, but that of the α band decreased in turn, so the ratio of $(\delta+\theta)/(\alpha+\beta)$ decreased gradually. In occipital region the proportion of the absolute power of the δ band increased in turn, but that of the α band decreased in turn, so the ratio of $(\delta+\theta)/(\alpha+\beta)$ increased gradually.

Conclusions

1. The brain functions of the left and right brain hemispheres of the Chinese elite boxers developed equally.
2. The absolute power in different brain regions were not influenced equally by the transient less brain blood flow (i.e. HV test).
3. The Chinese elite boxers performed well at the regulations of the brain functions even during the less brain blood flow period. Complete recovery was observed soon after HV experiment.

Protein expression and transcriptional response of X-linked Inhibitor of Apoptosis Protein (XIAP) to two months voluntary exercise in rat striated muscle

Bee-Tian TENG [1], Xiao-Meng PEI[1], Joann W.Y. NG [1], Iris BENZIE[1], Yajun CHEN [2], Stephen H.S. WONG [2], Parco M.F. SIU [1]

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[2]Department of Sports Science and Physical Education, The Chinese University of Hong Kong

Introduction

Regular and moderate exercise plays a pivotal role in enhancing human health. Striated muscles, i.e., cardiac and skeletal muscle adapt dramatically to physical exercise. It has been demonstrated that forced treadmill exercise training can attenuate the extent of apoptotic development in striated muscles of both young and aged rats. However, the cellular apoptotic adaptation as induced by voluntary exercise, which is a more practical form of exercise performed by humans, has not been well investigated. Hence, this study aims to scrutinize the effect of two months voluntary exercise on an apoptotic protein namely X-linked Inhibitor of Apoptosis Protein (XIAP) in cardiac and skeletal muscles of adult rats.

Method

18 ad libitum fed young adult female Sprague Dawley rats with similar bodyweight were randomly assigned to Control (CON) or Exercise (EX) groups. EX rats were subjected to 24 hours free access to an in-cage running wheel (38cm in diameter) with a magnetic digital counter attached to monitor the daily running distance. CON rats were housed in cages without running wheels and served as controls. The bodyweight change and amount of food consumption were recorded weekly. After the 8 weeks experimental period, animals were sacrificed 24 hours after the last session of voluntary exercise.

Heart ventricular and soleus muscles were collected and quickly frozen in liquid nitrogen. Upon analysis, total RNA was extracted from both muscle samples. The gene expression level of heart and soleus XIAP, an anti-apoptotic regulatory factor, was determined using real time reverse transcript-polymerase chain reaction (RT-PCR). Protein expression of heart XIAP was determined by western immunoblot.

Independent t-test was used to examine differences between EX and CON groups. Statistical significance was accepted at $P < 0.05$.

Figure 1. Rat running wheel setting

Results & discussion

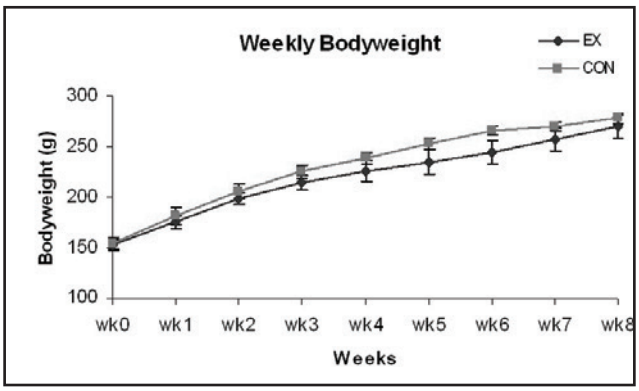

Figure 2. Significant increase of weekly bodyweight but no significant difference between CON and EX rats

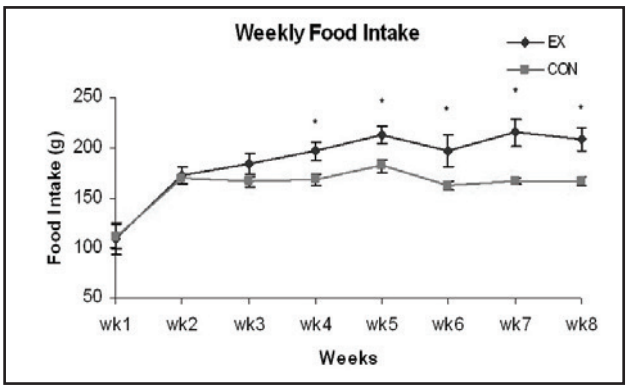

*Figure 3. Significant higher weekly food intake in EX rats for week 4 to 8 (*P<0.05)*

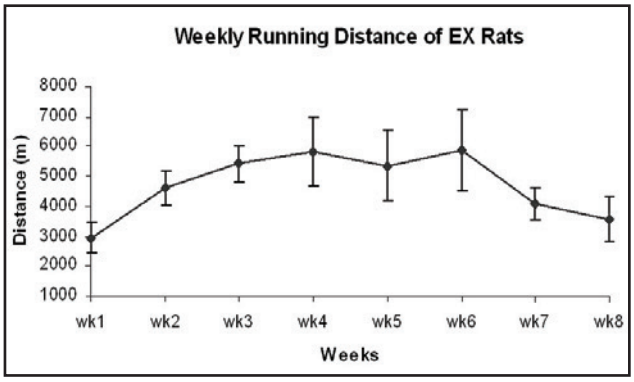

Figure 4. Weekly running distance for EX rats over 8 weeks period

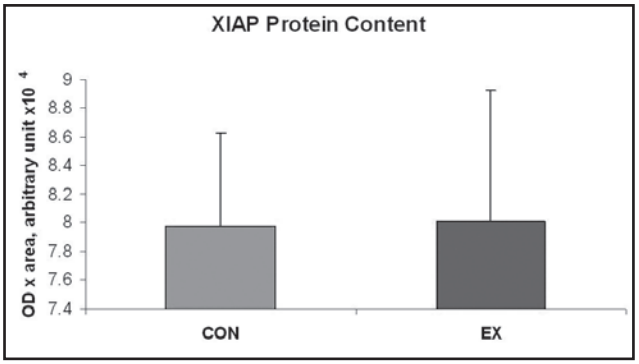

*Figure 5. XIAP transcript content in the muscle of EX rats increased by 48% (*p<0.05) but XIAP heart mRNA level showed no significant difference (p>0.05)*

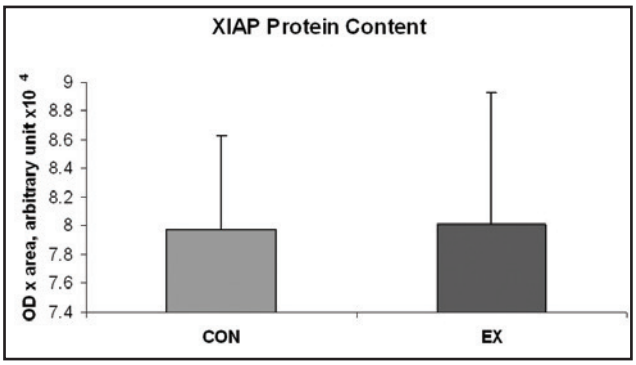

Figure 6. XIAP protein content in the heart of EX rats showed no significant difference (p>0.05)

Conclusion

These data suggest that the voluntary exercise-induced cellular adaptation in soleus muscle involves the upregulation of anti-apoptotic protein XIAP. This finding supports the idea that regular exercise may be of use to alleviate the adverse effects in striated muscle which are associated with accelerated rate of apoptosis, e.g. skeletal and cardiac muscle mass decline with aging.

Effect of environmental stress on heart rate response during submaximal exercise

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[2]Sports Science Department, Hong Kong Sports Institute

Introduction

Heart rate monitoring was widely used during exercise. However, heart rate was easily affected by environmental factor like temperature. Studying heart rate response during submaximal exercise in different environmental temperature was important for accurate exercise prescription. The aim of this randomized cross-over study was to investigate the effect of ESI on heart rate response during submaximal exercise.

Methods

Part 1: Maximal incremental cycle ergometry exercise test for VO_{2max} (MVO_2)

Each subject had 5-minutes cycling as warm-up exercise to familiarize with the use of cycle ergometer (Monark model 829E) and another 5-minutes stretching exercises. MVO_2 test started with 1-minute resting, followed by 3-minutes loaded pedaling in 25 Watts. The workload was increased by 25 Watts incrementally every three minutes afterward. At the end of the test, there was 3-minutes cool down period with workload in 25 watts.

Part 2: Cross-over exercise trials

Two parts were separated by at least two days. The sequence of three exercise trials was randomly assigned to each subject by drawing lots. Each subject had 5-minutes warm-up stretching exercises and at least 30-minutes time to familiarize with the exercise environment and to minimize the physiological response of the outdoor environment. They completed three 20-minute exercise trials on the cycle ergometer at their 70% maximal power measured and kept at 90 ± 2 repetition/minutes (RPM). They rest between each trial for at least one-hour as wash-out period. Exercise area was sheltered to resemble similar ventilatory condition in each trial. Environmental Stress Index (ESI) which included temperature (T) and relative humidity (RH) component was calculated [1]. The equation was modified with zero solar radiation in indoor environment as:

$$ESI = 0.63T - 0.03RH + 0.0054(T \cdot RH)$$

Results

20 young healthy male subjects were recruited. *(See Figure 1: Inclusion and exclusion criteria, Figure 2: Flowchart of the study, Figure 3: Demographic data of subjects)*

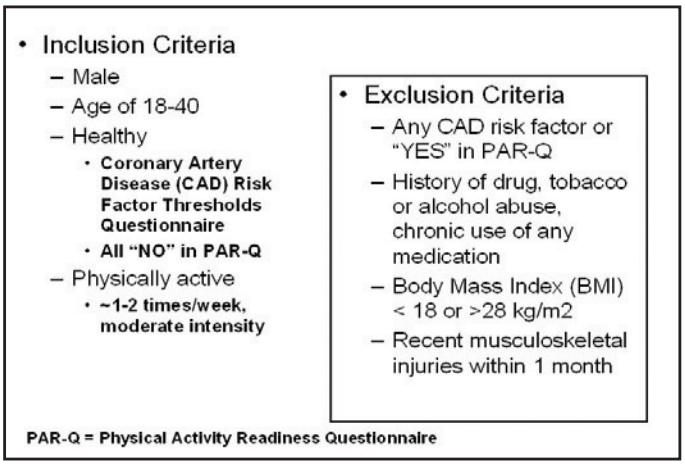


Figure 1. Inclusion and exclusion criteria

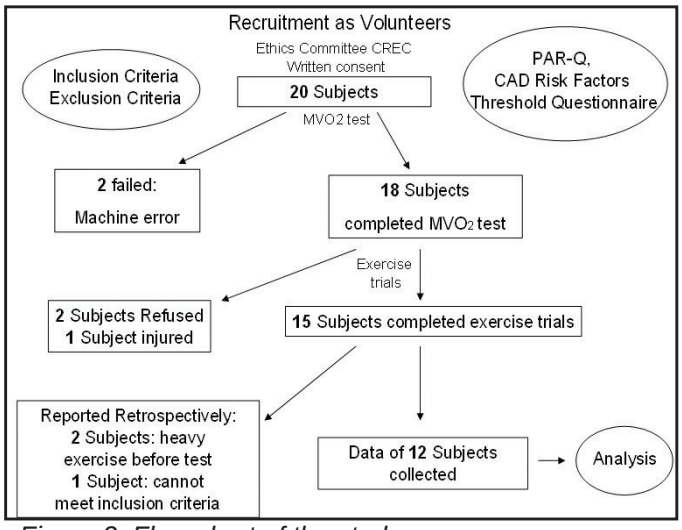


Figure 2. Flow chart of the study

Subject Characteristics	*Mean ± standard deviation (SD)*
Age	27.2 ± 6.7 years
Height	1.7 ± 0.05 m
Weight	66.2 ± 8.9 kg
Body Mass Index (BMI)	22.0 ± 2.0 kg/m^2
MVO_2	52.1 ± 8.9 ml/min/kg
Maximal power	212 ± 44.5 Watts
Maximal heart rate	190 ± 1.7 /min
Pre-exercise Hydration level	44.9 ± 3.0 %

Figure 3. Demographic data of subjects

Overall heart rate responses

Three ESI groups with mean (±SD) of 12.8±0.5°C, 16.2±0.2°C and 19.5±0.5°C were showed significant different ($p<0.05$).

There were similar patterns in heart rate response during submaximal exercise in 3 ESI groups. *(See Figure 4)* Heart rate response gradually increased towards plateau at 15-20 minutes. The difference in heart rate response between each time points decreased with time.

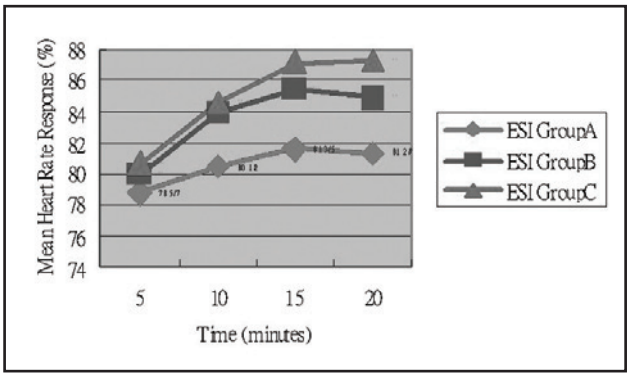


Figure 4. Overall heart rate response during submaximal exercise

Among four time points

There was significant difference in heart rate response among four time points ($p<0.05$).

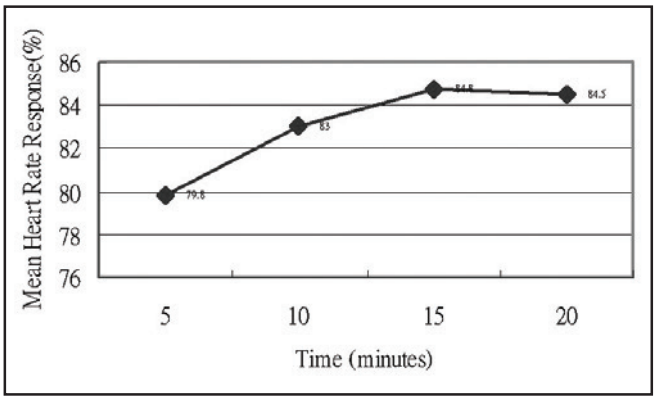


Figure 5. Heart rate response at 4 time points

Among three ESI groups

By repeated measure ANOVA, there was significant difference in heart rate response between three ESI groups ($p<0.05$).

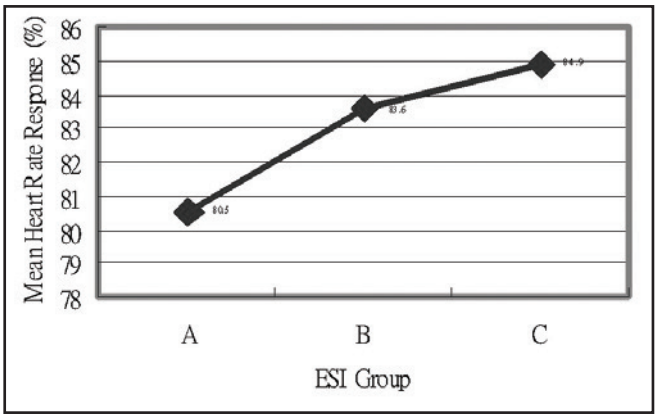


Figure 6. Overall heart rate response in three different ESI groups

Heart rate response in different ESI groups

By repeated measure ANOVA, there was no significant difference in heart rate response between three ESI groups at 5 minute. ($p=0.175$) Significant difference was seen in heart rate response between three ESI groups at 10, 15 and 20 minute ($p<0.05$) *(Figure 7).*

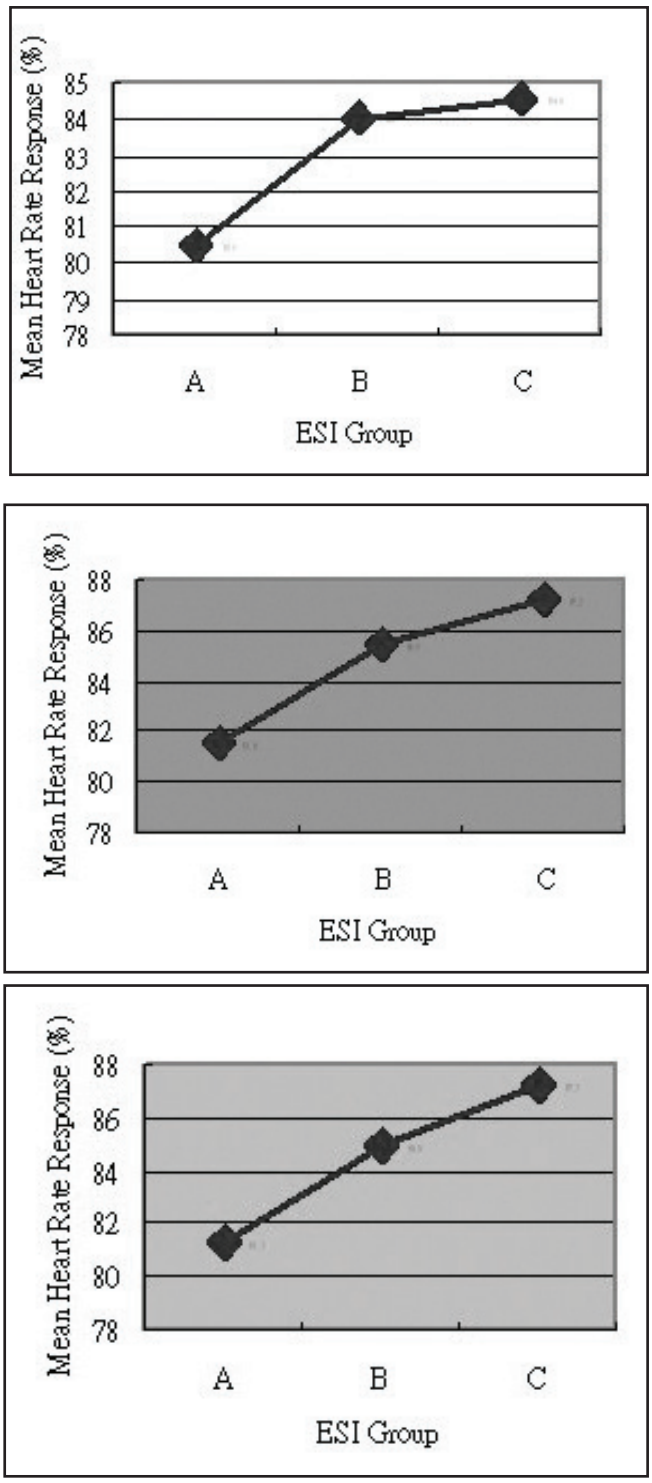


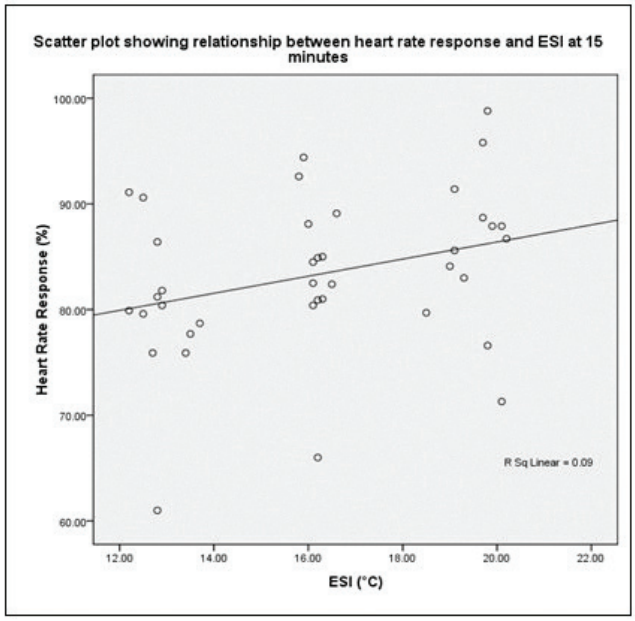
Figure 7. Heart rate response in 3 ESI groups at 10, 15 and 20 minute respectively (top to bottom)

Relationship between heart rate response and ESI

There was no significant linear relationship between heart rate response and ESI at 5 and 10 minute by linear regression. ($p=0.418$, $p=0.094$) There was significant linear relationship between three ESI groups at 15 minute ($p<0.05$) and 20 minute. ($p<0.05$)

At 15 minute: HR response (%)=72.0 + 0.79 ESI (°C)

At 20 minute: HR response (%) = 70.7 + 0.85 ESI (°C)



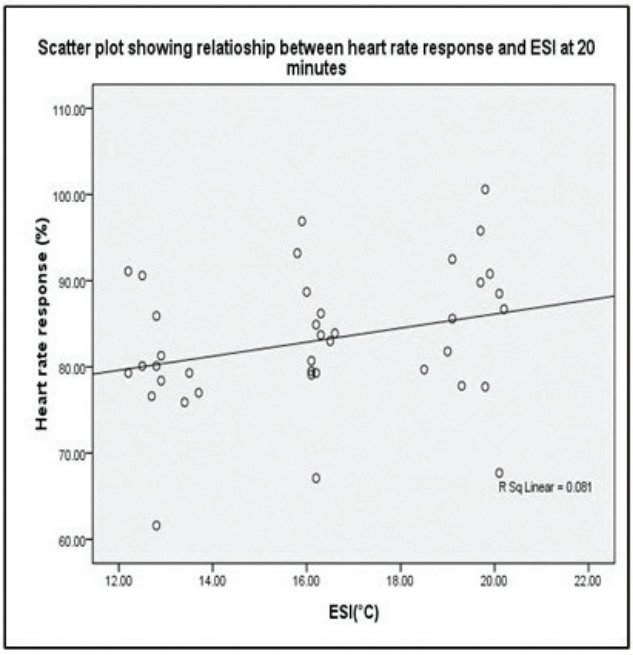


Figure 8. Scatter plot showing relationship between heart rate response and ESI at 15 and 20 minute (top to bottom

Discussion

In this study, heart rate response when comparing ESI group A with C was 4.06%, 5.58% and 5.96% at 10, 15 and 20 minute of exercise respectively. For higher ESI, heart rate was higher after 10 minute of exercise. The heart rate increased more towards the end of the exercise within 20 minute of submaximal exercise.

Gonzalez-Alonso et al [2] performed studies and found heart rate increase in hot condition. Heart rate was higher at the same exercise intensities and shown to be about 10 beats/minute more [2,3]. It resulted as an overestimation. However, these studies [2-6] focused on the absolute values of heart rate increase. It is more accurate and practical to calculate heart rate response in term of exercise heart rate over maximal heart rate. This firstly studied result could be generalized to different subjects. When exercise at intensity of 70% of VO_{2max}, we would apply above two equations to adjust the heart rate response in term of percentage by calculated ESI. Adjusting the indoor training environment was alternative.

Strength of this study

This was a cross-over study that decreased the number of subjects. The recruited subjects were quite homogeneous and the variability was low. Subjects were randomized and got different sequences of ESI in three exercise trials. This would minimize the effect of fatigue during exercises. During exercise, the testing environment was the same for three exercise trials to minimize other environmental effect. Hydration was also one of the important factors that would affect heart rate response during submaximal exercise. Therefore, pre-exercise hematocrit level was measured.

Limitation of this study

More time points or longer exercise duration may give us more information on heart rate response. The testing exercise intensity was 70% of VO_{2max}. The heart rate response at other submaximal exercise intensities would be investigated. If the result was similar, these adjustment equations would be used generally at submaximal intensity. More ESI points could also be investigated for colder and hotter condition.

Conclusion

The result of this study showed heart rate response increased with time during submaximal exercise. The difference of increase in heart rate response decreased with time and reached plateau at 15-20 minute of exercise. There was temperature effect in heart rate response during submaximal exercise. This effect appeared after 10 minute of exercise. Two equations were found to adjust heart rate monitoring at 15 and 20 minute of submaximal exercise.

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The association between body mass index, physical activity, and mental health in Hong Kong children and adolescents

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Aim

Prevalence of depression and anxiety is increasing in children and adolescents. Depression and anxiety was associated with increasing mortality rate. The effect of physical activity (PA) on mental health in adults has been examined by many researchers. However, studies that investigating the association between these factors on Chinese children and adolescents is lacking. The objectives of the present study were

1) to examine the association between PA, body mass index (BMI), depression, and anxiety in Hong Kong children and adolescents;
2) to identify the unique contribution of PA and BMI to children's depression, and anxiety;
3) to investigate the group differences in children's gender and age in their PA , depression, and anxiety.

Methods

A cross-sectional survey was conducted. Students aged between 9 and 18 were recruited from three primary schools and four secondary schools in Hong Kong. Data was collected by a set of self-reported questionnaire. Mental health was measured by General Health Questionnaire (GHQ) and Hospital Anxiety and Depression Rating Scale (HAD); PA was assessed using Physical Activity Questionnaire for Older Children (PAQC).

Results

A total of 924 participants completed the questionnaire of whom 7.5% were overweight and 3.2 % were obese. PA was significantly correlated with anxiety ($r=-0.19$, $p<.01$), and depression ($r=-0.19$, $p<.01$). BMI was associated with anxiety ($r=.11$, $p<.01$), but not with depression. Significant difference was found between the two age groups. Secondary school students had a lower PA. Higher prevalence of anxiety and depression ($p<.01$) was found in secondary students when compared to primary school students.

Conclusion

The findings of the present study suggested that PA may reduce the self-reported anxiety in children and adolescents in Hong Kong. Higher BMI is associated greater anxiety but the relationship between BMI and depression was not significant in this study. The interaction among BMI, PA, mental health in children and adolescents need further investigation. Moreover, mental health education and strategies specifically targeted to secondary school students should be considered.

Children's play choice and physical activity levels between active and seated media

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Introduction

Only one third of children worldwide are found to have sufficient levels of physical activity for health benefits [1]. Use of electronic media such as viewing television and playing computers and electronic games are the main sedentary activities children engage during leisure time [2–4]. There is widespread concern that this kind of electronic media contributes to childhood obesity problems. Contemporary researchers have attempted to make use of different physical activity games as effective strategies to develop and encourage children to adopt a more active lifestyle. The purpose of the present study was to examine children's play choice between active and seated media, and to identify if there were any gender differences in play choice, duration and intensity of physical activity.

Methods

A total of 81 children (42 boys and 39 girls) aged 9 to 12 years (*M*=11.28, *SD*=0.82) in Grades 4, 5, and 6 were invited to participate in a 2-hour laboratory session. An active media game and the same physical activity on a seated media game were set up in the laboratory. The interactive electronic games, XAviX bowling and Aerostep developed by Shinsedai (SSD) Company, were selected. The seated version of the bowling and running games were downloaded from the internet. Each participating child was given the XAviX bowling and seated bowling game in the first hour, and the Aerostep and seated running game in the second hour. The child was free to choose, stop or resume playing between the two games in each hour session. A triaxial accelerometer (RT3) and heart rate monitor were used to assess children's physical activity levels in the seated and active game settings.

Results

When given the choice children spent approximately half of the available time playing the active media (XAviX bowling: *M*=27.97 minutes ±13.78; Aerostep: *M*=29.30 minutes ±7.71). No significant differences were found in time spent playing active or seated media between boys and girls ($p>0.05$). With reference to the newly established calibration of RT3 for children [5], accelerometer counts indicated that the active bowling game was equivalent to low intensity activity (*M*=8.38 counts.s^{-1} ±4.35), whilst the Aerostep to moderate intensity (*M*=59.06 counts.s^{-1} ±17.39). Boys demonstrated significant higher levels of intensity in both the XAviX bowling (*M*=10.47 counts.s^{-1} ±4.71 Vs. *M*=6.35 counts.s^{-1} ±2.76) and Aerostep (*M*=65.83 counts.s^{-1} ±14.09 Vs. *M*=51.94 counts.s^{-1} ±17.83) than girls (all $p<.001$). Results from heart rate monitor showed that activity levels of children during Aerostep reached moderate intensity, with boys having higher heart rate per minute than girls (*M*=141.57 bpm ±19.66 Vs. *M*=130.72 bpm ±14.85) ($p<.01$). No significant gender differences were found in heart rate during the other games.

Conclusion

Interactive electronic games were able to encourage children to spend a half of otherwise seated time on active gaming. Boys tended to play more vigorously than girls during interactive electronic games. This study suggests that interactive games may reduce children's sedentary screen time and help accumulate low to moderate physical activity.

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Association between physical activity, sleep duration and obesity in Hong Kong Chinese adults

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Background

Obesity rates in Hong Kong have risen dramatically, which is of immense public health concern because large increases in mortality and morbidity due to chronic diseases have been predicted as a consequence. Recent epidemiological evidence suggests an association between short sleep duration and obesity. To our knowledge, however, no studies have examined this relation in Hong Kong Chinese.

Objective

To determine the association between physical activity, sleep duration and obesity in Hong Kong Chinese adults.

Methods

A total of 4,225 Hong Kong Chinese adults participated in a citywide physical fitness and activity survey. Participants were asked to perform a series of physical fitness tests including body weight and height, as well as a questionnaire on sleep duration, PA level, educational level and lifestyle behaviors *et al*. Chi-square test was applied to compare the prevalence of overweight and obesity in different PA level or sleep duration groups. Logistic regression was used to determine the odds ratio (OR) of short or long sleep duration groups and physically inactive group as compared to the normal sleep duration group and physical active group for having overweight and obesity.

Results

Compared with normal sleep duration group, the prevalence of overweight and obesity in both men and women with short or long sleep duration was higher (the difference in some groups were not significant). Risk for obesity was increased in the men with only 6 hours' sleep (OR = 1.91, 95% CI: 1.18, 3.11) and the men with sleep duration less than 6 hours (OR = 2.57, 95% CI: 1.33, 4.98). The women who sleep more than 9 hours a day also had higher risk for overweight when compared with the women with normal sleep duration (OR = 1.90, 95% CI: 1.00, 3.61). Compared with physical active men, the OR for obesity and overweight was higher in inactive men (for obesity: OR = 1.91, 95% CI: 1.04, 3.49; for overweight: OR = 1.41, 95% CI: 1.02, 1.95), however, the difference was not significant in women.

Conclusion

Both short/long sleep duration and physical inactivity are risk factors for obesity. Keeping appropriate sleep duration and increasing physical activity could be effective methods for weight control.

Effects of a structured soccer training program on motor performance in students with intellectual disability: an exploratory study

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Introduction

A number of research suggested that delays in motor development are common in persons with intellectual disability and hence their performance in motor skills and motor fitness lags behind that of their counterparts [1-3]. This observation directed a strand of research aiming to examine the effect of intervention on inducing a change in motor performance in individuals with intellectual disability. For example, Yang and Porretta (1999) reported that after 46 sessions of training, improvement in motor skill performance in the range of 18% to 56% was observed in a group of individuals with mild intellectual disability [4]. Marchewka, (2002), in an exercise versus controlled group design, also found a significant improvement in motor fitness performance in participants of the exercise group after they underwent a prescribed training program [5]. This study attempted to follow a similar research trend by examining the effect of a structured soccer training program on several measures of motor fitness performance and a motor skill related to soccer.

Methods

Study Design

This study utilized a pre- and post-test study design for a single group. Hence 3 time points to collect data were designed. The first time point (Reference test) was set at 4 weeks prior to the second time point (Pre-test) of collection. The third time point for data collection was 6 weeks after the second time point.

Participants

Participants were 18 students attending a school for persons with intellectual disability. Of the 18 students, 7 were females and 11 were males. The chronological ages of the students were from 7 to 10 (Mean = 8.4, SD =.98).

Content of the Structured Soccer Training Program

The soccer training program was developed by the investigator and six HKBU undergraduate students who are currently studying in Sport and Recreation Leadership program.

The program contained the following activities and sections: 1) a led general warm-up and stretching section [5-10 minutes], 2) a soccer drill teaching/learning section [20-25 minutes], 3) a modified soccer game section [10-15 minutes], and 4) a led cool-down section [5-10 minutes]. Progression of task and drills difficulty will be developed and delivered according to students' response and ability level.

Duration

The program consisted of 12 sessions and was delivered at 2 sessions a week for 6 weeks (excluding holidays). Each session was 1 hour in duration and was delivered after the students had finished school. The study was carried out from May to July in 2008.

Instruments

Eight tasks to evaluate motor coordination capacity were selected from the Motor Coordination Test for Children (KTK), Movement ABC, and the Special Olympics individual soccer test [6]. The test items were as follows:

1. *Minnesota dexterity test:* for testing eye-hand coordination
2. *On Leg Stand (eye opened):* for testing static balance
3. *Toe-Heel Walk:* for testing dynamic balance
4. *Hopping on Square:* for testing dynamic balance
5. *Beanbag Throw:* for testing aiming and accuracy
6. *Platform Transfer:* for testing side movements and space-time organization
7. *Side jump:* for testing strength and speed in side jump
8. *Soccer kick:* for testing whole body coordination and accuracy

Procedures

The investigator contacted the principals of special schools which have working relationship with the University to see if they were interested in this study. After the first contact, a meeting with the school principal and teachers was held to describe the details of the study to them. Arrangement of the motor coordination testing and soccer training schedules also need to be approved by them before the actual planning of the study.

A letter describing the project was sent to each parents/ guardians of all potential participants. Risks and benefits of the study will be explained in great details. The parents / guardians were required to complete a consent form if they were willing to let their child to take part in the study.

The investigator was the designer and the monitor of the program, 6 teaching assistants were recruited to facilitate the program. These teaching assistants were trained for carry out the motor coordination tests and coaching the soccer skill program. The teaching assistants were recruited from Sports and Recreation Leadership undergraduate students who have experiences in teaching activities to students with intellectual disabilities.

In each test, 18 participants were divided into four groups and randomly assigned to start with one of the tests. Each group rotated to another test without specific order until they finished all tests.

The testers introduced the tests to participants slowly and clearly. They demonstrated the correct use and technique of each test to each group. Participants were given a practice phase to familiarize with each test protocol. The attempts for each practice phase were varied with different tests. The tester reminded or re-demonstrated to the participant if he / she did not perform the test correctly. During the formal trials of each test, no assistance should be given to the participants. The results were recorded immediately as the participant performed.

Data Analysis

The Student Package of Statistical (SPSS) 14.0 for windows (SPSS, Chicago, IL) was used to analyze the data. Differences in pre- and post- motor coordination tests were analyzed using the analysis of variance (ANOVA). A linear regression was used to test for the correlations between soccer kick test from other motor coordination tests.

Treatment of Data

The results of the research may be published but the identities of the participants will not be revealed. All records of the test data were destroyed after the completion of the project.

Results

From the 18 participants, only 15 attended all of the three tests so that only their test results were used for data analysis. Participants of the program showed little to no improvement in terms of their motor coordination tests. Only the soccer kick test showed a significant improvement (Wilks' Lambda = .608, $p<.05$). However, the Bonferroni multiple comparisons showed that there was no significant mean difference between pre- and post test.

Result of the linear regression analysis showed that the platform transfer and side jump tests were significant contributors to the soccer kick test scores.

Discussion

Although the results of this study did not show a positive training effect of motor coordination in students with intellectual disability, five (toe-heel walk, beanbag throw, platform transfer, side jump, and soccer kick) out of the eight tests had positive mean differences between pre- and post-test. From a qualitative measure, participants were observed as more active in participation of soccer skill training after the first four sessions. Participants also showed improvement in cooperation with teammates and understanding of soccer game structure in the last two training sessions as observed by the investigator and all teaching assistants. Those findings may give an insight for further study.

Limitation of the Present Study

1. There is not a single motor coordination test instruments were widely used for students with intellectual disabilities, so it is difficult to identify which tests should be applied.
2. The test environment for soccer test was too noisy and hot on the reference-test day. It may affect on the accuracy of the result.
3. The training period of 12 sessions might be too short in order to see a significant result.
4. The training effect was only measured by a quantitative data analysis, so it may miss out some positive effects for the students in a qualitative way.

Suggestions for Future Study

1. Use of the motor tests with proved validity and reliability.
2. Strict control of the test environment.
3. Use of control group to measure the training effects.
4. The training period should extend to longer time in order see positive training effect.
5. A qualitative measure can be employed to see other benefits of a structured soccer program to students with intellectual disability.

Conclusion

Lack of improvement on motor coordination development was noted after a 12-sessions structured soccer training program in students with intellectual disability. A longer training period and strict control of test environment are recommended for future studies.

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Validity and reliability of skinfold measurement in assessing body fatness of Chinese children in Hong Kong: using Air Displacement Plethysmography as a criterion measure

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Introduction

The prevalence of childhood obesity in Hong Kong has increased closed to 70% in the past 13 years. For tracking the childhood obesity level effectively, there is an urgent need to evaluate the obesity level of children in Hong Kong using objective and practical measurement. Using Air Displacement Plethysmography (ADP) as a criterion, we evaluated the validity and reliability of skinfold (SKF) measurement in predicting percent body fat of Chinese children in Hong Kong.

Methods

A heterogeneous sample of healthy voluntary Chinese children (142 boys and 88 girls) with a wide age range (9-19 years) and body composition was recruited through stratified purposeful sampling.

Results

The internal consistency of SKF and ADP measurements were very high ($r \geq .988$). Repeated t-test showed no significant difference between %fat measured by ADP ($\%fat_{ADP}$) and that measured by dual X-ray absorptiometry in a sub-sample (N=41), and significant difference was found between percent fat estimated by the Slaughter equations ($\%fat_{Slaughter}$) and $\%fat_{ADP}$. The Slaughter equations slightly underestimated %fat of Hong Kong children, in which 1.52% for boys and 1.84% for girls. Despite the high R squares (.81 for boys and .64 for girls), the slope of the regression line for boys was significantly different from the line of identity. Subsequent stepwise regression analyses found three alternative SKF prediction models for estimating percent body fat of Chinese children in Hong Kong, which combining waist circumference, height and children's age.

Discussion

The most accurate model for boys was %fat=22.091 -0.147 (height) + 0.760 ($\sum$3SKF) - 0.003 ($\sum 3SKF)^2$ (R square=.88, SEE=3.70%), and that for girls was %fat=17.539 + 0.303 ($\sum$2SKF) + 0.516 (height) -0.175 (waist circumference) (R square=.71, SEE=3.38%). The third model for boys and girls was the convenient model, as only triceps SKF and age is required for the estimation. The equation for boys was %fat=14.405 + 1.479 (triceps) - 0.856 (age) (R square=.81, SEE=4.67%), and the equation for girls was %fat=13.936 + 1.170 (triceps) - 0.502 (age) (R square=.63, SEE=3.77%).

Conclusion

The accuracy of these models is comparable to the Slaughter equations, but the estimated %fat by these new models were less deviated from $\%fat_{ADP}$ than that estimated by the Slaughter equations.

Associations between the perceived neighbourhood environment and objectively-measured physical activity of adult residents of Hong Kong

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Introduction

Physical activity reduces the risk of diabetes, cardiovascular diseases, and obesity [1]. Despite this well-known fact, physical inactivity is increasing in Hong Kong [2].

The current literature informs us that physical activity patterns are influenced by both psychosocial and environmental factors [3]. It is believed that aspects of the built environment are important determinants of physical activity and, especially, walking behaviour [4]. Neighbourhood aesthetics has been found to be significantly correlated with walking [5], while proximity of facility is positively correlated with transport-related walking, leisure-time physical activity and total physical activity [6]. In addition, environmental interventions are believed to influence a large proportion of the population for a long period of time. Consequently, it is worth to investigate the relationship between perceived neighbourhood environment and physical activity of the residents in Hong Kong.

Methods

A hundred and six Hong Kong residents aged between eighteen and sixty-five were recruited. Residents were recruited from four different neighbourhoods representing different socioeconomic status (SES) and walkability index. Area SES was assessed based on information on median household income provided by the Statistics Department of the Hong Kong SAR. The walkability of an area was assessed using a composite measure of household density (census data) and intersection density per area unit (computed using geographical maps). The four neighbourhoods represent: high walkability and high SES; high walkability and low SES; low walkability and high SES; low walkability and low SES.

Perceived neighbourhood characteristics were measured by Cantonese version of the Neighbourhood Environment Walkability Scale- Abbreviated (NEWS-A). It is an interviewer-administered questionnaire. Physical activity of the residents was measured by three models of accelerometers from the same manufacturer (Actitrainer, GT1M and MTI). Participants were asked to wear the accelerometers on their right hip for consecutive seven days except for the time when they were sleeping, bathing and swimming. Daily minutes of moderate and vigorous physical activities, as well as the step counts were measured.

Instruments

The NEWS-A is a 76-item questionnaire which measures perceived neighbourhood environment characteristics. The questionnaire focuses on eighteen areas: household density; distance to destinations; access to services; physical barriers; non-direct access; street connectivity; indoor walking places; man-made barriers; traffic hazards; place for pedestrians; traffic safety; green areas; building aesthetics; litter; crime; social environment; fences separating traffic; and places for resting.

Accelerometers were used to measure daily steps of walking, as well as daily minutes of moderate and vigorous intensity physical activities. They are light, small and portable devices which cause minimum invasion to the participants. They measure physical activity by detecting acceleration due to body movement of the participants. The accelerometer was first initialized by the Actigraph software, which the start date and time of data collection and epoch length were set. In this research, we set the epoch length as one minute, which means activity counts detected by the accelerometer were summed in each minute. Total activity counts in each minute were then converted into corresponding intensity of physical activity according to the published cut points. For each participant, average minutes of moderate and vigorous intensity physical activities and number of steps of walking were computed using data from all valid days, which is defined as day with more than 10 hours of data recorded.

Data analysis

Mean, standard deviation, median and inter-quartile range were used to summarize the scores on the NEWS-A subscales, minutes of moderate and vigorous intensity physical activities, and step counts. Generalized linear models with gamma variance function and logarithmic link were used to analyze the associations between perceived neighbourhood characteristics and physical activity of the participants. The models were adjusted for participants' age, gender, educational attainment, monthly household income, total time of accelerometer wearing and number of weekend/holiday days during which accelerometer data were collected.

Results

Residents from high walkable area reported higher household density ($p<.001$), shorter distance to destinations ($p<.001$), better direct ($p<.001$) and indirect access to services($p<.05$), higher street connectivity ($p<.001$), more indoor walking places ($p<.001$), more man-made barriers ($p<.01$), more places for pedestrians ($p<.01$), better traffic safety ($p<.001$), more litter ($p<.001$) and more crime ($p<.001$) than they were in low walkable areas. However, average ratings for green areas ($p<.001$) and building aesthetics ($p<.05$) were lower in high walkable than they were in low walkable areas. See Table 1.

The mean daily minutes of moderate, vigorous intensity

physical activities and step counts were higher in high walkable areas than that in low walkable areas. However, the difference was not statistically significant. See Table 1.

Moderate intensity physical activity was positively related to perceived places for pedestrians (p<.05), social environment (p<.05) and fences separating traffic (p<.05). These perceived neighbourhood characteristics in addition to the perceived traffic safety were also positively related to step counts, except for the perceived social environment. Perceived green areas was positively associated with vigorous intensity physical activity, with a 1 unit increment on the 'green areas' subscale, it was associated with 90% increase in average daily minutes of vigorous intensity physical activity. Negative associations were found between vigorous intensity physical activity and household density (p<.05), man-made barriers (p<.05), traffic hazards (p<.001), litter (p<.05) and crime (p<.001).

Discussion

This study has several limitations. Three different models of the accelerometers were used in this study (Actitrainer, GT1M and MTI). Despite the manufacturer claims on the high reliability between different models, no published papers can verify the inter-instrument reliability of these three models. Another limitation is that the participants were recruited from a small number of areas may limit the variability of some environmental aspects. Mong Kok and Nam Cheong represent high walkable areas. However, their street patterns are very similar (grid-like street system). This is likely to limit the variability of the 'sample' of environments. Further, the characteristics of the selected areas in our study do not generalize to all areas of Hong Kong.

Conclusion

Neighbourhood environments which give a perception of more places for pedestrians, better social environment and more fences separating traffic were positively related to moderate intensity physical activity. Perceived green areas was positively associated with vigorous intensity physical activity. These perceived neighbourhood characteristics in addition to the perceived traffic safety were positively related to step counts, except for the perceived social environment and green areas. Negative associations were found between vigorous intensity physical activity and household density, man-made barriers, traffic hazards, litter and crime. Further research should be conducted to find out the specific environment characteristics which are associated with the increase in overall physical activity level of Hong Kong residents.

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Table 1

NEWS-A subscale (range)	Low walkable areas	High walkable areas
	Mean (SD)	Mean (SD)
Household density (5-1275)	564.68 (31.26)	833.78 (16.16)***
Distance to destinations (1-5)	2.93 (0.14)	2.03 (0.05)***
Access to services (1-4)	3.29 (0.11)	3.77 (0.04)***
Physical barriers (1-4)	1.79 (0.12)	1.56 (0.09)
Non-direct access (1-4)	2.55 (0.09)	2.79 (0.07)*
Street connectivity (1-4)	3.12 (0.11)	3.54 (0.05)***
Indoor walking places (1-4)	1.87 (0.16)	2.55 (0.12)***
Man-made barriers (1-4)	1.79 (0.10)	2.18 (0.10)**
Traffic hazards (1-4)	1.96 (0.08)	2.02 (0.07)
Places for pedestrians (1-4)	3.53 (0.12)	3.88 (0.05)**
Traffic safety (1-4)	2.67 (0.11)	2.99 (0.06)***
Green areas (1-4)	3.55 (0.09)	2.58 (0.12)***
Aesthetics (1-4)	2.79 (0.13)	2.46 (0.10)*
Litter (1-4)	2.04 (0.09)	2.67 (0.11)***
Crime (1-4)	1.36 (0.08)	1.87 (0.10)***
Social environment (1-4)	3.33 (0.10)	3.32 (0.07)
Fence separating traffic (1-4)	2.49 (0.19)	2.68 (0.13)
Places for sitting/resting (1-4)	2.85 (0.19)	2.80 (0.13)
Accelerometry-based physical actvity		
	Mean (SD) Median (IRQ)	Mean (SD) Median (IRQ)
Moderate intensity physical activity min / day	43 (26) 41 (26)	46 (24) 42 (25)
Vigorous intensity physical activity min / day	1.17 (2.30) 0.30 (1.00)	1.28 (3.28) 0.14 (0.71)
Steps / day	9753 (3783) 9299 (3703)	10324 (3579) 10238 (4708)

Note: SD= standard deviation. IQR= inter-quartile range. Range=possible range in scores. All models adjusted for age, gender, educational attainment, household income and cluster effects. *p<.05; **p<.01; ***p<.001

Development of a questionnaire to examine the socio-environmental correlates of physical activity and sedentary behavior in primary schoolchildren in Hong Kong

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Introduction

Understanding factors that influence children's physical activity and sedentary behaviors is important in order to develop effective strategies to promote an active lifestyle. Although individual characteristics have been widely investigated during the last few decades, these factors are able to explain only a limited part of the total variance in children's activity. Recently, concerted focus has been made in determining how the socio-environment might affect health-related behaviors. Most of the published literature has relied on the self-reported perceptions of the social and physical environment to establish the relationships between predictors and activity behaviors. Few studies, if any, have addressed in their designed questionnaire a broader range of potential concurrent influencing factors, which include intrapersonal characteristics, family and peers' influences, and the social and physical environment in the community. Moreover, no study has ever considered the socio-environmental factors for physical activity and sedentary behaviors in a separate manner. Therefore, the purpose of the study was to develop an instrument based on the social ecological model to evaluate the socio-environmental correlates of the children's physical activity and sedentary behavior.

Methods

The instrument was developed based on social ecological theory and consisted of segments that incorporated reports from both the children and their parents. Children were asked about intrapersonal factors and perceived environments at home and in the neighborhood. Corresponding parents reported demographic information (age, education, occupation, income, and weight status), their physical activity and sedentary behavior habits, the control on their child's sedentary behavior, and perception of physical environment in the neighborhood. The questionnaires were administrated in a group of 160 primary schoolchildren aged 10 to 14 years and their parents on two occasions with 8 to 10 days apart. The test-retest reliability of each individual item was determined using percent agreement and kappa statistics for the categorical variables and intraclass correlation coefficients (ICCs) for the continuous variables.

Results

The overall missing rates were 2.5% to 5.6% for children- and parent-reported items. The ICC values for continuous variables in children-reported individual and familial factors ranged from 0.66 to 0.79. For self-reported categorical variables, kappa values ranged from 0.27 to 0.76, and all percent agreement statistics were greater than 80%. Meanwhile, reliability statistics for parent-reported home and environment variables showed acceptable consistency with most of the ICC values greater than 0.70.

Discussion

A broad range of environmental variables has been identified to have potential influences on children's activity behavior based on the ecological framework. However, there is a lack of generally used classification or definition for specific variables. As a result, most of the items established in the questionnaire were adopted from several published studies, with an attempt of putting these factors, which have been relatively well identified according to the ecological theory, into the study's consideration. The study likewise revealed that most of the child-reported items showed at least an acceptable consistency between the test and retest. However, the questions which have been adopted from published literature in the West might not have been completely appropriate for the local situation.

Conclusion

The findings suggested that the developed questionnaire was feasible and reliable in examining environmental correlates at home and in the neighborhood for the 10- to 14-year-old Chinese children.

Examining the association between indoor environment variables and the physical activity level in Hong Kong

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Objectives

This study is to develop a self-completed questionnaire examining the indoor environmental quality variables. The second objective is to examine the association between indoor environmental quality variables and the physical activity levels of residents by using accelerometers.

Introduction

The built environment encompasses all buildings, spaces and products that are created or modified by people. It impacts on both the indoor and outdoor physical environment (e.g. climatic conditions and indoor /outdoor air quality), as well as the social environments (e.g. civic participation, community capacity and investment) and subsequently our health and quality of life [1]. A Half century ago, the American Public Health Association issued a set of standards, *Planning the Neighborhood*, that addressed the "physical setting in which homes should be located." More recently, urban planners have recognized the implications of their work for public health [2].

Recent reviews show consistent association between neighborhood design and walking [3-5]. From the result of this research, people who live in neighborhoods with a "walkable" design would often report to have higher physical activity levels. A "walkable" neighborhood is defined by residential density, mixed land use, and street connectivity [6]. From the original perspective, these studies mainly put focus on the external living environment, which meant how the design of community affected physical activity. However, all of these studies failed to examine the association between indoor built environment and physical activity levels. The main objective of our research was to fill the important knowledge gap through developing a self-report measure of indoor environment variables. After examining the validity and reliability of the self-report questionnaire, we will further investigate if there is an association between indoor environment variables and the physical activity level of residents (using accelerometers).

Methods

The research was divided into two parts, the preliminary one and the core one.

The preliminary one was a collaboration between our department, and the Building Health and Hygiene Index (BHHI) team from the Real Estate and Construction Department of The University of Hong Kong. Since 2004, after the outbreak of SARS, Ho et al developed a semi-objective building health and hygiene index (BHHI) for classifying buildings in terms of their health and hygiene conditions [7].

We followed the study of Ho et al to develop a self-completed Building Environment Quality Questionnaire (BEQQ) suited to Hong Kong with aid from another indoor quality survey [8]. The first step was to conduct a pilot interview of residents in different quality buildings. The second step was to select significant aspects of the indoor environment in dwellings, based on the information obtained from the qualitative interviews. The construction of the interview questions used answers on a 6-point Likert scale, from very satisfactory; satisfactory, normal; unsatisfactory; very unsatisfactory; no opinion, after this we selected the most appropriate questions for Hong Kong and transformed them into a standardized questionnaire. The final step was to examine the validity and reliability of the BEQQ in 12 buildings with different BHHI gradings (low, medium, and high), from the Western District of Hong Kong.

After the examination of the validity and reliability of the BEQQ, we selected new participants from four different areas in Hong Kong to conduct the core study. The selection criteria of the four areas were determined by socio-economic status (SES) and walkability. Median monthly household income was used as a measure of neighborhood SES. Household density (household/km^2) and intersection density (number of true intersection/ km^2; a true intersection has three or more legs) were used as the measure of neighborhood walkability [4].

Participants of the core study were asked to wear an accelerometer (MTI Actitrainer) over 7 consecutive days, together with the completion of BEQQ. Participant received supermarket cash vouchers on completion of the research (at least 5 days completed accelerometry data, together with the completion of the BEQQ). This study was approved by the Research Ethics Committee of The University of Hong Kong.

Results

Preliminary study of the validity and reliability of BEQQ

One hundred and eighteen participants (47 men and 71 women; age: M=41.9 years; range 16-81 years) completed the preliminary study. The sample sizes per BHHI grading: 43 (low); 40 (medium); 35 (high). Twenty participants took part in the retest component of the study (17% of the total sample size).

Test-retest for the BEQQ showed good reliability with ICC's greater than 0.70 for most subscales. For the validity, the BEQQ was summarized into an average score (average score of each subscales), and the overall score (the last question of the BEQQ required residents to give an overall score to the building). The BEQQ was highly correlated with the BHHI; the Spearman's correlation coefficient was -0.67 for both the average

score and the overall score. The negative correlation coefficient was desirable since the smaller number in the BEQQ Likert scale indicated higher satisfaction (1=very satisfactory, and 5=very unsatisfactory). Since the lower score of a building reflected a better quality, whilst the BHHI scale used higher scores to indicate higher quality, a negative correlation was hypothesized.

Core study of the association between BEQQ and the physical activity level

Eighty eight (39 men and 49 women; age: M=41 years; range=16-66 years) out of one hundred and two participants completed the whole research. The sample sizes per neighborhood stratum were: 22 (HiWalk-HiSES); 24 (HiWalk-LowSES); 21 (LowWalk-LowSES); 21 (LowWalk-HiSES).

The result will be analyzed by two levels. The first level is to use the Spearman correlation to examine if there is an association between BEQQ and the accelerometry data. The second level is to use an ANOVA test to examine differences in the physical activity level of residents within three different grading of buildings. However, the analysis is still in process. It is expected there is an association between BEQQ and the physical activity level. Residents from buildings of lower grading are expected to have a higher physical activity level.

Discussion

The BEQQ is a valid and reliable self-report measure of residential building quality and hygiene in Hong Kong. Residents with poor indoor environment are expected to be more active as the poorer indoor environment may encourage people to spend less time inside their apartment or building; consequently these people will spend less time being sedentarily within their building compared to residents living in high quality buildings. As the final analysis is still under processing, the true effect of the indoor living conditions on physical activity levels of residents is not yet known (but will be presented).

Conclusion

It is concluded that BEQQ is a valid and reliable self-report questionnaire that can be used in estimating the indoor environmental quality, which paves the way to examine the relationship between indoor environment variables and the physical activity levels of residents.

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A comparison of functional exercise progression program and Tai Chi for balance control and plantar pressure distribution in health individuals

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Introduction

A randomized controlled trial was performed. After a baseline assessment, 43 healthy individuals were randomized into three groups, with post-training follow-up assessment 8 weeks later.

Objectives

To compare the efficacy of functional exercise progression program, Tai Chi and common activity training for the balance control patterns and plantar pressure distribution in health individuals.

Methods

Forty-three healthy young people were randomly assigned to three groups: functional exercise progression program group, FEP, (n=17, mean 21.0±1.0 years); Tai Chi group, TC, (n=16, mean 20.9±0.9 years); and control group, (n=10, mean 22.0±1.2 years). FEP group and TC group subjects practiced for 60 min 3/wk for 8 weeks. The Gaitview ™ 1.1 System was used to examine the balance control and planar pressure of subjects in the three groups when neutral standing (static stage) and normal walking (dynamic stage). Clinical balance control was also assessed. Statistical analysis was performed by using Independent sample t-test, one-way ANOVA and paired Student's t-test where appropriate.

Results

Clinical and experimental characteristics were similar among groups at baseline. Platform planar pressure measures and balance control tests revealed very similar levels of improvement after training among subjects in the FEP and TC groups but no change in control group, including both side great toe and 2nd-5th metatarsal head pressure (static stage); ($p<0.05$), etc. There were no significant differences between FEP and TC group ($p>0.05$).

Conclusion

Regularly functional exercise progression program and Tai Chi exercises may improve the balance control and the planar pressure distribution of healthy young people. Additional studies with more subjects will be needed to determine the optimal protocol of functional exercise progression program for different people.

The surgical outcome of immediate arthroscopic Bankart repair for first time anterior shoulder dislocation in young active patients

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Introduction

To evaluate the surgical outcomes of young active patients with arthroscopic Bankart repair within one month after first time anterior shoulder dislocation.

Methods

From July 2002–Oct 2004, patients presented with first time traumatic anterior shoulder dislocation and treated with arthroscopic stabilization within one month of injury were retrospectively reviewed. Magnetic resonance imaging and computed tomography were performed in all cases. Cases with contralateral shoulder multidirectional instability or glenoid bone loss of more than 30% on preoperative computed tomography on the injury side were excluded. All patients were treated with arthroscopic Bankart repair, using metallic suture anchors or soft tissue bioabsorbable anchors by same group of surgeons and followed the same rehabilitation protocol. Recurrence, instability signs, range of motion, WOSI score, Rowe score and complications were assessed.

Results

38 patients were recruited, the average age was 21 (16-30). All patients had definite trauma history. Radiologically, all patients had Bankart/ Hill-Sachs lesion. All the operations were done within 1 month after injury (6-25 days). The average hospital stay was 1.2 days (1-5 days). The average follow up was 28 months (24-48 months). There were 2 cases of posttraumatic redislocation (5.2%). The average external rotation lag was 5 degrees (0-15) in 90 degrees shoulder abduction when compared with contralateral side. 95% of patients had excellent or good Rowe score. The average WOSI score was 83%. There was one case of transient ulnar nerve palsy and one case of superficial wound infection.

Conclusion

Immediate arthroscopic Bankart repair plus an accelerated rehabilitation program is an effective and safe technique for treatment of young active patients with first time traumatic anterior shoulder dislocation.

Effect of duration and intensity of training, skill level and body fatness of children on rope skipping injuries

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Introduction

Rope skipping benefits health and improves motor skills and coordination of children. It is also able to increase gymnastics and acrobatic skills, as well as the strength and endurance of children. The inexpensive sports facilities and equipments are the factors making rope skipping to become one of famous sports in Hong Kong primary schools.

However, Ollivierre (1994) reported that too frequent intensified rope skipping training will increase the risk of having chronic injuries in children [1]. Chan et al (2000) stated that "Sports-related Injury" accounted for the second most frequent injuries in Hong Kong [2]. Hence, reviewing the benefits of rope skipping becomes necessary so as to provide a more safety activity environment for children.

Methods

This is a retrospective cross-sectional study to primarily find out the common sites of pain in rope skippers and to identify the risks of having back, knee, ankle and metatarsal bones injuries from rope skipping, thus to weigh the suitability of rope skipping exercise to children. The study was comprised of three parts: epidemiology of rope skipping, risk estimate of back, knee, ankle and metatarsal bones pain in rope skippers and regression analysis of back, knee, ankle and metatarsal bones pain.

Results

In this study, it had been found that metatarsal bones (13.5%), patella bone (12.9%), Achilles tendon (12.9%), tarsal bones (8.9%) and gastrocnemius muscles (7.1%) are the common pain sites for rope skippers. Overweighted children are more susceptible to get pain in back (OR=4.4, $p<0.05$) and metatarsal bones (OR=2.66, $p<0.05$). Longer duration of training may lower the possibility in having knee pain (Medium: OR=0.28, $p<0.05$; Long: OR=0.36, $p<0.05$), but heighten the chance in having metatarsal bones pain (Long: OR=2.86, $p<0.05$). Training intensity may not be a factor for pains at four body sites. Skillful rope skippers seems more likely to have ankle (OR=3.96, $p<0.05$) and metatarsal bones pain (OR=3.2~3.5, $p<0.05$) than intermediate and beginner-level skippers.

In the part of regression analysis of pain symptoms, high training intensity seems to be one of risk factors for back pain (R^2=0.08). For the knee (R^2=0.137), long duration of a single training session and male seems to be the factors to lower the chance in getting pain here. For ankle (R^2=0.179), low BMI, C an-can jump and elder age may be the risk factors of getting ankle pain. For metatarsal bones (R^2=0.297), doing kick-jump, backward jump, not-doing jump-on-heel and long duration of a single training session may have high chance in having pain here.

Discussion

Knee pain was considered to be associated with the gender of skippers and the duration of a training session, because the patella tendon was strengthened after a long duration of training, thus enable to withstand a greater load in the landing phase of rope skipping [3-4].

Body fatness was a risk factor for the pain in metatarsal bone, ankle pain and back pain because overweighted people have poor cardiovascular endurance [5-6]. When they tired, they might not able to land softly and hence produce more stress on hips, knees, ankles and metatarsal bones [7].

Skillful rope skippers are more likely to suffer the metatarsal bone pain and the ankle pain. It is because they always perform advanced skills, what requires them to jump off over the safest jump-off height (1/2 to 3/4 of and inch) as suggested by Lee (2003) [7]. Jumping over this range of heights was failed the rope skippers to land lightly on the balls of the feet and thus subject the metatarsal bones, where are the first landing bones to bare the body weight, to have a greater risk of injury.

Conclusion

Rope skipping is still suitable for children only if protective measures, pre-screening tests, adaptive workouts for overweight children and regular rests in training sessions were adopted.

Pre-screening exercises or examinations should be done for rope skipping team selection. Minimizing friction force and ground reaction force by wearing proper footwear and jumping on a cushioned surface is a good way to prevent the rope skippers from injuries. Children should not try or perform too difficult tricks such as Can-can jump. Overweight children should have adaptive workouts before starting to train rope skipping tricks. Should the above suggestion have successfully executed, the efforts to minimize the rope skipping injuries are much warranted both to ensure the cardiovascular improvements of children and to reduce physical damage to them, notably of epiphysis, apophysis and growth plates.

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Quantitatively measuring proximal plantar fascia microcirculation by Power Doppler ultrasonography

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Introduction

Plantar fasciitis is a common condition in general population as well as elite athletes, but of unclear pathogenesis [1]. Histological studies have shown an increased vascularity in plantar fasciitis [2], and clinically, the circulation of plantar fascia are normally assessed qualitatively or semi-quantitatively [3].The objective of this study is to identify a quantitative method to assess the microcirculation of plantar fascia (proximal insertion) in healthy volunteers by using Power Doppler, so that it can apply to patients with chronic plantar fasciitis.

Methods

Twenty healthy subjects between 18 and 61 years old, volunteered to participate in this study. Real-time ultrasonography was performed by My Lab70 ultrasound unit (Biosound Esaote, Indianapolis, USA) in connection with a 7.5-12MHz linear array transducer (LA523, Biosound Mylab70, USA). Subjects were in prone lying during examinations, with full knee extension and 90° dorsiflextion of the ankle. Evaluations were done bilaterally. Power Doppler imaging was performed by selecting a 1.5cm X 1cm area around the calcaneal insertion of the plantar fascia. The region of interest (ROI) is defined as the plantar fascia area within this selected area. Power Doppler ultrasonography (PDU) was activated to detect the blood signal of plantar fascia in ROI by using the following machine setting: Pulse repetition frequency of 370 Hz, wall filtering 1, color gain was set at the level that is originated from highest signal level gradually turning down until the colour noise just disappears. Five representative power Doppler images, which have the most repeatability and vascularity power Doppler signal in ROI, were acquired for each foot. These images were analyzed by a self-written software program (Matlab 7.0.1). All the subjects came twice within one week for the intra-tester reliability. There are two testers. For the inter-tester reliability, the second tester did 11 subjects. Finally, the quantitative value of proximal plantar fascia microcirculation is expressed as a percentage, which is the ratio of the number of pixels painted by PDU signals to the number of pixels of the whole ROI. Intra-class correlation coefficients (ICCs) were calculated to estimate the intra-tester and inter-tester reliability. The average value of all five images of each foot, average value of the first three images as well as the maximum microcirculation value was computed respectively for comparison of the reliability. Paired t-test was used to compare the difference between right and left foot in terms of proximal plantar fascia microcirculation value.

Results

Findings from this study indicated that the intra-tester reliability is good with the average value of all five images, but not with the average of the first three and the maximum value. With average of all five images, ICC (2, 1) =0.70 and 0.78 for the first and second tester respectively. And with average of first three images, ICC (2, 1) =0.65 and 0.48, and the ICC (2, 1) =0.62 and 0.83 with the maximum value. Second, the inter-tester reliability is moderate with the average of all five images, ICC (2, 2) =0.62. But with the average value of the first three images, ICC (2, 2) =0.41, and the ICC (2, 2) with the maximum value is 0.34. There is no significant difference between right and left, mean value is 4.08$\pm$ 1.2%, 4.48$\pm$ 1.26% for the right and left foot respectively ($p>.05$).

Discussion and conclusion

From the results, after comparing the reliability of the average value of all the five images, the average value of first three images and the maximum value, we recommend to use all the five images average value as the outcome measurement in the further study. The fair inter-tester reliability result support the PDU operation is high operator related [4], and suggest that one sonographer should examine all the patients in the following section. Second, there is no difference between right and left side, which can support us to propose that in the unilateral plantar fasciitis patients, the microcirculation value of the healthy side can be used for comparison.

We concluded that use this non-invasive Power Doppler ultrasonography method can quantitatively measure the proximal plantar fascia microcirculation, which will help us to draw a more clearly quantitative picture of the plantar fasciitis patients and quantify the microcirculation changes before and after treatment.

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The relationship of swimming stroke and shoulder laxity among elite college swimmers of Hong Kong – a retrospective cohort study

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Introduction

The shoulder is considered the most mobile joint in the body. This mobility comes with a price of its stability. Swimming is not as injury-free as most people believe, particularly in the elite group. In the review by Chalmers et al (2003) [1], the likely incidence of injuries in competitive swimming would be around 1.2 per 1000 hours of training. Shoulder movement is considered peculiar as the repetitive movements of the upper limbs provide up to 90% of total propulsion in swimming as compared with most other sports that rely heavily on the lower limbs. Upper extremity injuries are more common to occur at a 3:1 ratio to lower limb injuries in swimming. This was so common that Kennedy et al (1978) [2] coined the term “swimmer’s shoulder”, describing a “common, painful syndrome of repeated shoulder impingement in swimmers” While being one of the most important factors that cause a swimmer to dropout from training or competition [3], it was believed to be an overuse – dysfunction syndrome which itself and its mechanism were not clearly defined. The true incidence of shoulder laxity amongst elite swimmers is still not known, but was supposed to be high. Laxity is commonly misinterpreted as instability or the other way round in the literature. The presence of a significant difference in shoulder laxity comparing elite to recreational swimmers or non-swimming individuals and the association of laxity or instability with injury are still highly debatable with contradicting results seen in the literature. Data on incidence of shoulder injuries prevalence of shoulder laxity are lacking for elite young adult swimmers. Chalmers et al’s (2003) [1] review on epidemiology of aquatic injuries postulated several risk factors for shoulder laxity including stroke, female sex, increasing training distance, year round swimming and use of training aids, notably paddles, but these were only briefly mentioned. The aim of this study is to investigate the incidence of shoulder laxity and instability in Hong Kong college team swimmers with emphasis on the differences in major strokes of the swimmers. On the scale of a pilot study, this project also aims to look for any possible association between generalized and GH laxity and instability with the proposed risk factors like training distances and paddle use and shoulder injuries, in the context of the whole college-swimmer population as well as in the swimmers of different major strokes.

Methods

College swimming team members who are served within 5 years were included. Those who had shoulder injury or new onset of pain within 3 months were excluded. Swimmers who are also involved in other sports team at college level or regular training and/ or competition were excluded. Ethics approval was obtained and an approved information leaflet was given to the subjects with a formal written consent signed before participation. Data collection in form of a questionnaire and simple clinical examination were performed by the first author. The questionnaire included General Demographics, Medical History, Training Practices, Major and Minor Strokes, Level attained and also injury history. In training practices, the risk factors postulated before including warm up/ warm down times, training distances, year round training and use of paddles were explored. In level attained, personal best times were used to calculate best FINA points [4]. Major stroke was the stroke that scored the highest FINA points. Demonstrations of generalized joint laxity and specific tests for the GH joint laxity in the anterior, posterior and inferior directions and GH instability were performed and scored.

Subjects are grouped according to their major stroke. Descriptive statistics were used to summarize all demographic variables (mean +/- SD) and that was compared with independent T-tests to ensure homogeneity of the groups. Relation between general and GH laxity scores is determined by Spearman correlation. Generalized, GH laxity and instability scores from different strokes were compared with independent T test with each other stroke and all other strokes combined. Relation of generalized laxity, GH Laxity and instability with each other demographic items are done with spearman correlation.

Results

20 college swimmers who fulfilled both inclusion and exclusion criteria were successfully recruited. 4 of them major in backstroke, 6 in breaststroke, another 6 in butterfly and the remaining 4 in front crawl. 1 swimmer of each stroke reported history of shoulder injury that required them to rest or reduced training load more than one month. 6 of the twenty swimmers fulfilled criteria for generalized laxity, making a 30% being positive for generalized laxity. 14 from the group showed signs of increased GH laxity, making 70% being positive. Only one swimmer showed signs GH instability without GH laxity. Baseline demographics were not significant different for each of the items comparing between each different stroke and all other strokes combined. Female swimmers have a statistical significantly higher generalized laxity score compared with males ($p= 0.041$). The sex difference of GH laxity score was not statistical significant but a trend was shown ($p=0.061$). GH instability carries no significant difference between the sexes. GH laxity does not correlate with generalized laxity ($p=0.152$). Both GH laxity and generalized laxity showed no significant correlation with shoulder injury history ($p=0.889$ and 0.097). However, if considering

instability only, it tends to correlate with injury (p =0.077). Maximum sessions of land training per week correlated significantly with history of shoulder injury (p=0.009) and generalized laxity scores (p=0.034). GH laxity scores showed no significant differences between the strokes. Backstrokers showed a trend to have increased GH laxity compared to all other strokes combined (p=0.060). In terms of generalised laxity, breaststrokers and butterfly swimmers showed a significant difference in general laxity (p=0.016, 95% CI -6.81 to -1.53). There were no statistically significant differences between other strokes individually. Breaststrokers, interestingly, also showed a significantly lower generalized laxity compared to all other strokes combined (p=0.004, 95% CI 0.20 to 6.32). In backstroke swimmers, GH Laxity showed a tendency to correlate with maximum distance per session ever attained and warm up time (both p=0.051). For Breaststroke swimmers, General Laxity score is correlated with Best FINA score (p=0.039). In Butterfly swimmers, General Laxity score is found to correlate with age (p=0.040) and GH Laxity score is found to correlate with maximum paddle use per session (p=0.026). History of injury correlates significantly with instability (p=0.038). For Front Crawl swimmers, GH Laxity seems to correlate with BMI, maximum distance per session and maximum paddle use per session (p=0.051).

Discussion

This is a retrospective cohort study. While a prospective study of the same title may take well more than 10 years, they do have the advantage of reducing recall bias for injuries and best times and have more accurate recordings of the training details. This is a small scaled study. There can be sampling error and there is no equal representation for the strokes. With the standard deviations from the data obtained, the number of swimmers to differentiate the most similar strokes in terms of GH laxity and generalized laxity will require a sample of about 1300 and 1950 swimmers per stroke. For the physical examination measurements, it too may suffer from biases as it is only done by a single observer. The GH laxity scoring system, though widely use in scoring shoulder laxity, is a subjective scoring method and have at best around 80% test-retest reliability. Furthermore, the observer is not blinded to the results of the questionnaire. It is best to have two independent clinicians who do not have access to the questionnaire findings to perform the physical examination separately. Another point of concern is that swimmers do not just train by their major stroke. In fact the most common stroke during training for all swimmers is front crawl and concomitantly training time for their minor strokes may be quite significant. The major stroke of the swimmer was defined in this study by the FINA points according to the swimmers' best times; some swimmers are not that believed by the swimmer him- or her-self. Also to be noted is that more than half of the swimmers recruited in this study already stopped regular training and many of them have voiced out a decreased range of movement during the testing. The results echoed some of the previous cited literature. For females having a higher general laxity than males, it was a general presumption, but in terms of GH laxity it was previously shown in the studies done by McFarland et al (1996) [5] on asymptomatic athletes for posterior laxity and Borsa et al (2000) [6] on general GH laxity comparing healthy males and females. The near statistical significance correlation between maximum distance per session and maximum paddle use per session with laxity in the different strokes were similar to the findings of Chalmers et al (2003) [1]. Some of the results found in this study were not previously known from existing literature. Our swimmers demonstrated that instability rather than laxity alone is correlated with their history of injuries. Though one might argue in the study by McMaster et al (1993) [7], his scoring of heavily weighted for instability might give the same results, but he simply ignored that fine difference between instability and laxity. No other had then since bother to separate the two entities in studies involving the swimming sport. However, in this small sample of swimmers, it might just be the one swimmer that had a significant history of injury also turned out to have instability. Breaststroke swimmers have a significantly lower generalized laxity compared to swimmers of butterfly and all other strokes combined. It was previous thought that breaststroke contributed to less shoulder laxity only. The maximum session of land training per week correlated significantly with history of injury and generalized laxity in this study. Resistant land training was previously cited as a risk factor for shoulder pain, but no formal relation with generalized laxity was known before. Other correlations of BMI to GH laxity in front crawl, Best FINA points in breaststroke and age in butterfly to generalized laxity was not previous noted as well. They might just represent some sampling error.

Conclusion

Swimming athletes of Hong Kong college team swimmers have a high prevalence of shoulder laxity, up to 70%. The prevalence for shoulder injuries in the studied group was 20%. While clinically significant instability is much less common (20%) than laxity, it correlates significantly with the history of shoulder injury or problems. Female swimmers have more generalized laxity and marginally have more GH laxity compared with their male counterpart. The volume of land training correlated significantly with history of shoulder injury and generalized laxity. This study, though small scaled with a group of swimmers of heterogeneous levels, revealed that there are differences in terms of laxity between the different strokes. Part of the results reiterated previously known results showing there may be some similarities between Asian and Caucasian swimmers. Larger scale studies involving more active swimmers, independent observers and if possible of prospective design will be required to better define such correlations.

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Test Aim	Scoring	Inferior laxity (0°)	Grade 1 = no or minimal movement
Anterior laxity	Grade 1 – no or minimal movement		Grade 2 = partial movement
	Grade 2 – up but not over rim of glenoid		Grade 3 = sign. movement but less than 2cm
	Grade 3 – over glenoid rim		Grade 4 = movement more than 2cm
	0 = Both sides Grade 1		0 = Both sides Grade 1
	1 = One side Grade 2 the other Grade 1		1 = One or both sides Grade 2
	2 = Both sides Grade 2		2 = One side Grade 3 and the other Grade 2
	3 = Any side Grade 3		3 = Both sides Grade 3
Posterior laxity	Grade 1 – no or minimal movement		4 = Any Grade 4
	Grade 2 – sign movement no dislocation	Inferior laxity (45°)	Grade 1 = no or minimal movement
	Grade 3 – frank dislocation		Grade 2 = movement less than 2cm
	Scores as Anterior Laxity		Grade 3 = movement more than 2cm
Instability	0 = Both sides negative		Scores as Anterior Laxity
	1 = Either side positive		
	2 = Both sides positive		

Table 1. Scoring for shoulder laxity and instability

	Backstroke		Butterfly	Front crawl
Age	23.5	25.1	23.3	24.5
BMI	20.68	20.76	20.67	21.66
Years in Training	9.75	11.83	12.33	8.75
Best FINA points	565.406	529.823	566.875	505.148
Max pool sessions/ week	7.31	6.50	7.50	6.25
Max distance (m)/ session	5452	5667	6833	5250
Max paddle use (m)/ session	1400	2050	1717	1775
Warm up + warm down time (min)/ session	22.5	23.3	32.5	35.0
Max land sessions/ week	2.25	1.42	2.17	1.88

Table 2. Demographics and training habits of swimmers

Effects of laser and stretching exercise in the prevention of tendon degeneration

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Introduction

Tendinosis describes degenerative changes in tendon with minimal signs of inflammatory response [1,2]. This condition may be managed clinically with a therapeutic laser and stretching exercise but there is not enough scientific evidence to prove the effects of these treatments. Therefore, this study examined the effects of a therapeutic laser and stretching exercise on the biomechanical properties of degenerative Achilles tendon in a rat model.

Methods

Table 1. The groupings of the animals

Group	Treatment
1 (n=5)	Running with Laser therapy
2 (n=5)	Running with stretching
3 (n=5)	Running with laser and stretching
4 (n=5)	Running without treatment
5 (n=5)	No running control

Twenty-five 3-month-old Sprague-Dawley rats were used in this study. The animals were randomly assigned into 5 groups as Table 1. The rats in group 1-4 were subjected to eccentric running on a treadmill at 20 m/min and a 20° decline. In order to increase the loading on the hind limbs, bipedal running model was developed by restraining the trunk of the rats with a cylindrical restrainer, putting at 60° to the vertical on the treadmill with extra loading of a mini backpack equivalent to about 10% of their bodyweight. The rats exercised for 1 hour per day, 7 days per week for 8 weeks.

Animals in the laser group received a transcutaneous therapeutic laser over the Achilles tendon of both legs for 50 seconds everyday after exercise using a therapeutic laser unit at the dosage of 3.5 Jcm^{-2} (Omega Laser System Ltd., West Sussex, Great Britain).

Animals in the stretching group received passive stretching to Achilles tendon on both legs after every exercise session. The stretching was applied with the knees extended, ankles passively plantar flexed to the maximum, maintained for 10 seconds and repeated for 20 times on each leg.

Animals in the combined treatment group received both laser and passive stretching with the protocol same as Group 1 and Group 2. The other groups of animals served as running control (Group 4) without any treatment and also the no running control (Group 5).

One animal in Group 4 died prematurely and was not tested. All other animals were sacrificed on the first day of week 9. Both lower limbs were harvested for testing. Each leg specimen was carefully dissected to remove all soft tissues at the ankle joint, leaving only the Achilles tendon and calcaneus intact. The Achilles tendon-calcaneus complex was mounted on a material testing machine (MTS Synergie 200, MTS System Corporation, Seine Cedex, France). An extensiometer (MTS model 634.12F-24, MTS System Corporation) was attached onto the Achilles tendon for measuring the local strain of the tendon. The specimen was pre-conditioned with 10 oscillation cycles of 2.5% strain at a 10 mm per minute [3,4]. After pre-conditioning, the specimen was stretched to 2.5% strain and maintained for 5 minutes. The loads were recorded at 5 Hz throughout the test. The percentage change in load represents the load-relaxation property.

Afterwards, the tendon was subjected to ultimate tensile testing at the strain rate of 500 mm per minute with sampling rate of 50 Hz [5]. The maximum load represents the ultimate tensile strength (UTS) and the gradient of the linear portion of the load-deformation curve represents the structural stiffness.

One-way analysis of variance (ANOVA) was used to analyze the load-relaxation, ultimate tensile strength and structural stiffness, with grouping as the factor. Post-hoc least squared difference (LSD) test was used to further analyze significant ANOVA results. The significance level was set at 0.05.

Results

The ANOVA results showed significant difference in UTS ($p=0.07$) and stiffness ($p=0.01$), but no significant difference in load-relaxation between the 5 groups. Post-hoc LSD testing revealed that UTS of the stretching group and the exercise control group were significantly lower than the no exercise control group ($p<0.01$). UTS of the exercise control was also lower than the laser group ($p=0.09$) (Fig.1). The mean stiffness of all the 4 groups were significantly lower than the no exercise control group ($p<0.01$) (Fig.2). Such decrease in mechanical strength implied that the 8-week, bipedal, eccentric running protocol had induced degeneration thus weakening in the Achilles tendon.

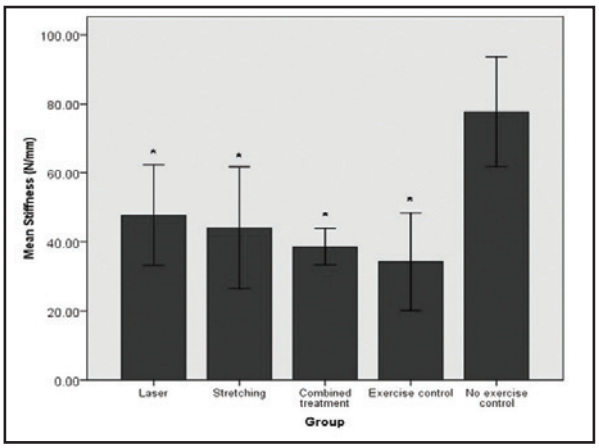

Figure 1. Mean and standard deviation of the load-relaxation for the five groups. Symbols a and b indicate significant difference from exercise control group and no exercise control group respectively.

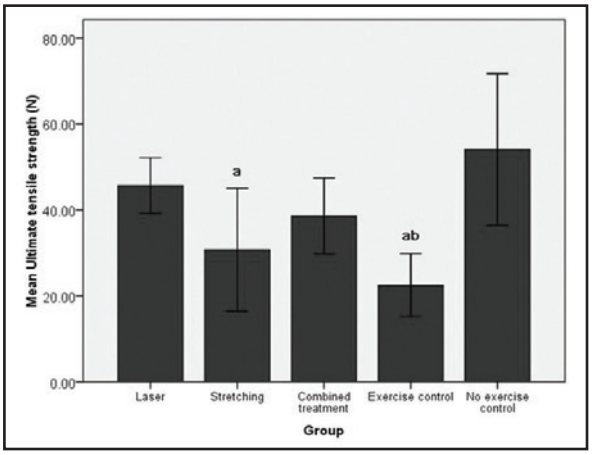

*Figure 2. Mean and standard deviation of the stiffness for the five groups. * indicate significant difference from no exercise control group.*

Discussion

There have been no similar studies that investigated the effect on laser and passive stretching on tendon degeneration in rats. In this study, we found that therapeutic laser and combined treatment had significantly improved the tensile strength of tendon with overuse in rats. The group that received stretching exercise also showed a sign of improvement in its strength profile as compared with the control group, but it did not reached statistical significance.

The finding showed UTS of laser group was significantly higher than control group, but lower than no exercise control group suggested that a laser therapy could slow down degeneration of the tendon, but not cure the condition.

Load-relaxation represents the viscoelastic properties of the tissues. A higher load-relaxation indicates poorer mechanical performance of the tissue. In the results, though not significant, it demonstrated a higher mean load-relaxation in all treatment groups than control group. This result is different from previous study done by Ng [6], which showed less load-relaxation in injured Achilles tendon in rats after laser treatment. Since load-relaxation is a viscoelastic property controlled by the interaction between the large and small collagen fibrils within the tendon matrix [7], the finding of an improved structural properties but not viscoelastic properties in the treatment group could be suggestive of a selective stimulation on the large fibrils. However, in the light that we had not performed any histomorphological analysis, this notion remains to be a speculation until we have ultrastructural morphological data to support the hypothesis.

The small number of animals in this study with large variance limited the statistical power of this study. Future study with larger sample is needed for drawing conclusive results.

Conclusion

Findings of this study suggested that a therapeutic laser and combined treatment of laser and passive stretching improves the tensile strength of Achilles tendon tendinosis in a rat model.

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A biomechanical study of anterior cruciate ligament deficient knee during landing and pivoting movements

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Introduction

Information of rotational stability is insufficient since assessments for ACL injury such as KT1000 only measure anteroposterior laxity. Moreover, dynamics stability during high demanding movement is not well documented since stability evaluation has been focused on passive clinical test. This study is to investigate the hypothesis that by means of optical motion analysis, tibial rotation of the ACL deficient knee will be greater when compared with contralateral intact knee during a pivoting task.

Method

Kinematics data of 16 contralateral ACL deficient patients were collected using 8-carema motion analysis system (VICON) while the patients performed a high demanding pivoting task: the subject jumped and landed with both legs from a 40cm height platform, pivoted to either right or left at 90 degree direction and ran away. Both directions were tested and each knee was tested individually. Eight skin markers on one side were used to record three-dimensional coordinates (Figure 1). The data was trimmed from the landing touchdown to the takeoff of the tested leg. Kinetics and kinematics during the pivoting movement as well as clinical evaluation was identified for statistical analysis.

Results

Tibia internally rotated during pivoting movement. Statistical significant difference was found in the range of tibial rotation between deficient (12.7 degree) and intact knees (8.0 degree) (Figure 2). The results of knee stability were similar between dynamics evaluation of high demanding movement and passive clinical tests.

Discussion and conclusion

The movement in the current study involved pivoting task which highly required knee rotational stability. We focus on the pivoting movement as it gives a high rotational stress on the knee. When it starts to pivot, the upper body with the femur will externally rotate. Meanwhile, the fore foot of the pivoting leg is sticking on the ground, the tibia then internally rotates to a maximum point as a result (Figure 3). Kinematics data provided the evidences that ACL deficient knee with tibia internally rotated in a greater extent when compared with the contralateral intact knee. Motion analysis during pivoting task would be useful for comparing the long term outcome between anatomical double-bundle ACL reconstruction and traditional single bundle ACL reconstruction.

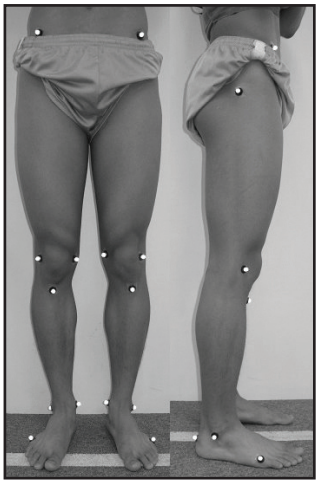

Figure 1. Marker set of motion analysis (Right: anterior view, Left: lateral view)

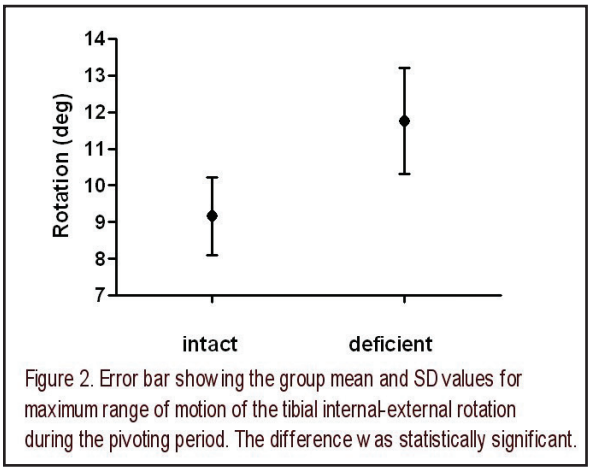

Figure 2. Error bar showing the group mean and SD values for maximum range of motion of the tibial internal –external rotation during the pivoting period. The difference was statistically significant.

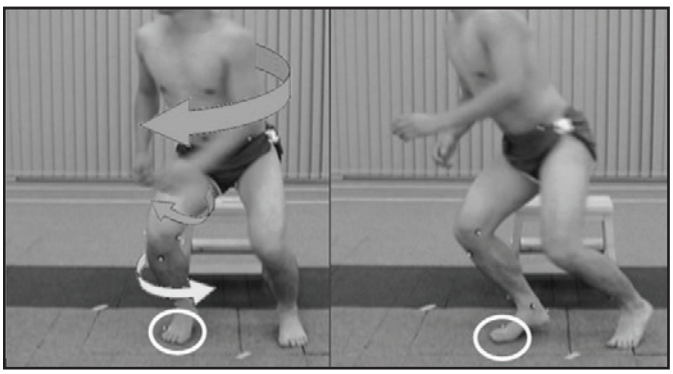

Figure 3. Rotation mechanism during pivoting movement: The upper body and femur externally rotate during the start of pivoting. While the fore foot is sticking on the ground, the tibia internally rotates as a result.

A kinetic comparison of running on treadmill and overground surfaces: An analysis of plantar pressure distribution

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SYMPOSIUM IV

Introduction

Treadmill running is widely adopted by researchers, rehabilitation specialist and physical trainer. In experimental studies investigating running gait, especially in locomotion studies on sagittal-plane kinematic, researches used it as an instrument because of its user friendly and flexible characteristics; the speed and slope can be easily controlled and data of repeated running cycle could be obtained [1].

Several studies reported that there are differences in different biomechanical aspects, such as 3D kinematics, kinetics and electromyography (EMG) between treadmill running and overground running [2-4]. However, the results are often conflicting and inconclusive.

Treadmills are commonly used for research on sport shoes and orthotics. Based on the conflicting finding in the literature, it's suitable to ask if treadmill is a good tool to help answering those research questions. The aim of the investigation is to find out the effects of difference running surface on plantar pressure during level running with a controlled running speed.

Methods

Fourteen male volunteers (age: 22.8±4.4 years; height, 169.2±4.78cm; weight, 62.7±9.7kg) were requested to run on four different running conditions i.e. treadmill, tartan, grass, and concrete with controlled running speed.

Every subject wore a standard running shoe model (TN 600, ASICS, Japan) with size 41. And the same running shoes were used for all subjects. A mobile plantar pressure measuring system (Novel GmbH, Munich, Germany) was employed. Kinetic parameters, such as peak pressure, pressure-time integral were measured in five successful trials.

Six minutes of warm up and familiarization with treadmill was carried out by each subjects. After warm up, subjects were instructed to run at a speed of 3.8m/s for 2 minutes on treadmill with the mobile measuring system. One successful 2-minute trial was taken for each subject. The data of the last minute was used for data analysis.

Standard tartan track, grass and concrete were chosen as the running surfaces of overground running. Figure 1 illustrates the experimental setting of the run way. Controlled speed was any between 3.6 and 3.8 ms^{-1}. An infrared timing system (Brower, US) was used to monitor the running speed of each trial. One trial was regarded as finishing the 8m runway once. After completed 6 trials for one surface, subjects were requested to do another running surface. The sequence of testing was randomized for all subjects.

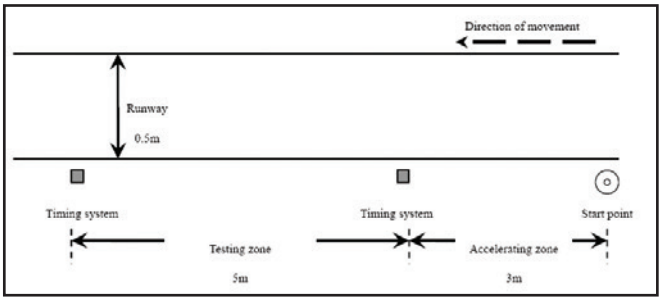

Figure 1. Experimental setup of overground running, i.e. tartan, grass and treadmill

All the data would be analyzed by Novel Pedar analyzing software (Germany). The insole was divided into 9 recorded areas as shown in Figure 2. Using Novel Database-Pro software, peak pressure, pressure-time integral were extracted as kinetic parameters from each step.

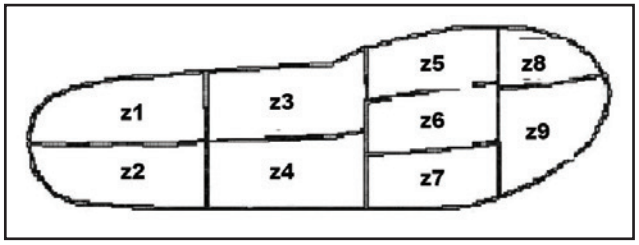

Figure 2. Zones (z1-z9) on the plantar pressure surface, z1 (medial heel), z2 (lateral heel), z3 (medial midfoot), z4 (lateral midfoot), z5 (first metatarsal head), z6 (second metatarsal head), z7 (third, fourth and fifth metatarsal head), z8 (great toe), z9 (lesser toe).

Statistical tools SPSS 12 (SPSS, USA) was used. A repeated-measures analysis of variance (ANOVA) was performed on the parameters. The assumption of sphericity was checked using Mauchly's test, and the LSD method was used to perform pairwise comparisons following a significant overall test result. The level of significance was set at an α level of 0.05 and data are presented as mean (SD).

Results and discussion

The aim of the study is to investigate the effect of different running surface on the plantar pressure in a controlled running speed. The results showed that the plantar pressure of treadmill running was significantly lower than that of overground running in total foot, medial midfoot, lateral midfoot and lesser toes $p<0.05$. In total foot, peak pressure in the trials of treadmill running was found smaller when compared with that of concrete. It's shown that a 15% greater plantar pressure was found when running on concrete compared with that of treadmill, $p<0.05$. Similarly, in zone 3, 4 and 9, which

represent the medial midfoot, lateral midfoot and lesser toes respectively, running on treadmill showed a lesser plantar pressure than that of concrete. For a heel-toe runner, it may imply that running on treadmill requires a smaller propulsion force compared with that of concrete during the toe off phase.

The data indicated that there may be a different running mechanism for treadmill running than overground running. In specific, it suggested that runners may exert a smaller propulsion force on treadmill during takeoff phase compared with that of overground. Assuming no changes in the vertical forces, a smaller horizontal ground reaction force may be required to run on treadmill in the take off phase. The overall resultant ground reaction forces would be smaller of treadmill running which accounts for the lower plantar pressure of total foot in treadmill running compared with overground running. A lower extremity kinematics investigation is needed if there is different running gait pattern between treadmill and overground running. According to Wank (1998) [5], there is a lower electromyography (EMG) signal of vastus lateralis explained the less vertical displacement in treadmill running. And the higher EMG signal of biceps femoris in the take off phase might be caused by a greater forward lean of the trunk compared to overground running.

Sports shoes mainly designed for sports activities in outdoor condition. However, owing to create a well-controlled testing environment, biomechanical test of shoe cushioning was carried out on treadmill instead of overground. Systematic errors may be introduced in the experiment design according to our finding. The absolute forefoot cushioning properties of the sports shoes may be overestimated when the test is done on treadmill. It is because treadmill running may require a smaller propulsion force which produced by forefoot compared with overground running. Moreover, it is not accurate to compare the forefoot cushioning properties of different sports since there may be a different running mechanism of treadmill running compared with that of overground running, especially for the take off phase.

Conclusion

Based on the results of the study, we conclude that:

1) The plantar pressure in treadmill running was found to be different to overground running i.e. tartan, grass and concrete. In specific, the difference was found in total foot, mid foot and lesser toes.
2) There were similar results in the comparison of plantar pressure distribution among the overground surfaces.

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Medial arch-heel support in inserts reduces ankle eversion in running in pronators

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Introduction

Excessive ankle pronation in a gait cycle is related to various lower limb injuries. Insert is a common intervention for treating or preventing symptoms caused by pronated feet. Numerous studies had proved the association between inserts and ankle biomechanics among adult. However, there was a lack of evidence on the effect of inserts on maximum ankle eversion among children.

Methods

This was a cross-sectional study with repeated measures investigating the effect of inserts with medial arch-heel support on ankle eversion during running among children with pronated feet (n=13; aged 6.6±0.5 years; right ankle eversion 16.1± 2.1 degrees). Subjects preformed running in five conditions: (1) barefoot, shod condition with inserts with (2) no, (3) low, (4) medium and (5) high medial arch-heel support. A 3-dimensioanl motion capture system was employed to capture and process the motion. The raw coordinates of 15 anatomical positions were incorporated to a self-compiled Matlab program with kinematics equations to calculate the maximum ankle eversion.

Results

The maximum ankle eversion was significantly decreased in the condition of insert with low medial arch-heel support ($p < 0.05$) but not in medium and high support when compared with the insert with no support. The mean ankle eversion of all inserts conditions were within the normal range (< 13 degrees).

Discussion and conclusion

Our findings suggested that inserts with medial arch-heel support were able to restore ankle eversion within the normal range during stance phase of running.

Electromyographic analysis on lower extremity muscles during overground surfaces and treadmill running

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Introduction

Treadmill is a common instrument in research in kinematics analysis. Many running scientific investigations, including running pattern at different speeds and sports shoes research, have been performed on treadmill [1-5]. However, whether the running performance on treadmill can be applied to overground surfaces is still unknown. Therefore, the aim of this study was to compare the lower extremities EMG patterns between overground surfaces and treadmill running. Overground surfaces including tartan, grass and concrete are tested to investigate if treadmill testing can reflect the muscle performance on overground surfaces.

Methods

Thirteen male subjects (age=22.4±3.9 years, body mass =63.6±9.2kg, body height=170.6±6.2cm) with no known running gait disorders were recruited. They were all heel-toe runners and familiar with treadmill running. All of them did not have running abnormalities and with shoe size 40 (EURO Standard). The standard running shoes (TN 600, ASICS, Japan) were provided for them. Bipolar surfaces electrodes (Noraxon Dual #272, USA) were used to attach to the subject's muscles including Rectus Femoris, Tibialis Anterior, Biceps Femoris and Gastrocnemius [6]. Four controlled reference postures including squatting, dorsiflexion, lower leg raised to 90° and plantar flexion were selected for normalization [7]. Each subject was requested to perform 5 trials of running on each of the four situations with controlled speed of 3.8 ms^{-1} on treadmill and 3.6 ~ 4.0 ms^{-1} on overground surfaces. In each of the trial, data of two running gait cycles were recorded and only the one of the complete cycle was trimmed for analysis. The magnitude of signal recorded from each of the channel was normalized to the maximum magnitude obtained from the submaximal isometric contraction tests. Also, time normalization of stance and swing phase was performed separately for each of the running trials and each cycle was divided into four phases (Stance phase, Early swing, Middle swing and Late swing). All the EMG raw data were processed by the NORAXON EMG system. An One-way repeated measure analysis of variance (ANOVA) was used to compare a muscle's activity level at the four different running conditions.

Results

Rectus Femoris (F=4.426, p=0.009) and Biceps Femoris (F=3.214, p=0.032) in stance phase of the cycle were found to be significantly different between treadmill and overgrounds running. Statistical analysis showed that no significant difference was found on the muscle activity parameters in the swing phase.

Discussion

From the graph in Figure 1, general similarities in EMG pattern can be observed from overground running and some special differences can be found. The muscle activity of Rectus Femoris and Biceps Femoris showed lower magnitude during the stand phase in treadmill running as compared with overground. When running on treadmill, no forward movement of the trunk is needed and the running speed is led by the treadmill belt. During the heel touch down to toe off period in treadmill running, not much energy is needed to provide forward body movement comparing with overground running [8]. Also, the muscle activity of Rectus Femoris and Biceps Femoris showed lower magnitude during the stand phase in grass running as compared with concrete running. The differences in muscle activity level may due to the surface stiffness of the ground. The hard surface with higher stiffness leads to increased touch down impact force [9,10]. Therefore, greater force is transmitted to leg and a greater contraction is required to give the support. Overload injuries in lower extremity will cause excessive pronation [3]. The risk of running increases with the stiffness of surfaces. Therefore, the muscle activity performance reflected from the treadmill running during shoe testing should not be directly utilized for overground running reference as it may underestimate the effect of overground running.

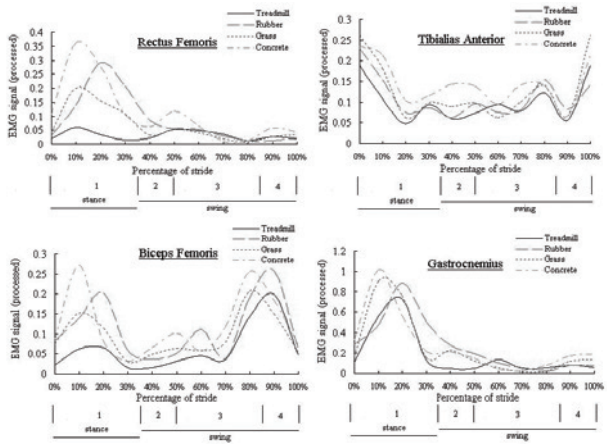

Figure 1. The EMG profile of four muscles of one cycle

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Identification system to distinguish simulated ankle supination sprain from other normal motions by gyrometers and accelerometers

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Introduction

Ankle sprain is one of the most common ankle injuries in sports. We would like to develop an intelligent sprain-free mechanism that protects the ankle from sprain when the ankle is endangered and provides freedom of motion during normal condition. In order to achieve this goal, gyrometers and accelerometers were used to sense and identify ankle supination motion from other normal motions. If the ankle is endangered from ankle supination sprain, a protection mechanism will be activated to protect the ankle from injury. In this paper, a sensing and identification system was presented. Gyrometers and accelerometers work together with the learning and classification system to achieve this goal.

Methods

Twelve male subjects (age=21. 21.6±1.7 yr, height=1.73±0.05m, body mass=65.9±5.1kg, foot length=258.7±10.4mm) with healthy ankle were recruited. The university ethics committee approved the study. Each subject performs a total of 100 trials: 50 trials of simulated supination sprain motion and 50 trials of non-sprain motion. Simulated supination sprain motions were performed on the supination sprain simulator [1]. Platform angle were set at 0 degree, 23 degrees, 45 degrees, 67 degrees and 90 degrees. Each platform angle contributed to 10 trials respectively. The sequences of data collection different angles were random. After collecting data for simulated supination sprain motion, non-sprain motions data would be collected: walking, running, cutting, walking downstairs and jumping/ landing. Each motion contributed to 10 trials respectively. These motions were chosen because they are common in human daily activities. The sequences of data collection different non-sprain motions were random. During data collection, a wired tri-axial accelerometer and gyrometer, with a sampling frequency of 500Hz (Sengital Ltd., Hong Hong, China) were attached to the right foot at the medial calcaneus. Six channels of signals were collected simultaneously: Gx, Gy, Gz, Ax, Ay, Az.

Learning and classification system were adopted. Support Vector Machine (SVM) was chosen for the development.The learning theory of the Support Vector Machine can be expressed as a function $f:\Re^n \rightarrow \pm 1$ where $y = f(x)$. This function maps patterns x to the classification y. The function $f(x)$ can be expressed as:

$$f(x) = \sum_{i=1}^{N} y_i \alpha_i k(x, x_i) + b \quad \text{- (1)}$$

where N is the number of training patterns, (xi , yi) is training pattern i with its classification as y_i, α_i and b are learned weights, and k is a kernel function $K(\bar{x}_i, \bar{x}) = \Phi(\bar{x}_i) \cdot \Phi(\bar{x}_j)$ [2]. k can be any symmetric kernel function that satisfy the Mercer's condition corresponds to a dot product in some feature space [3]. (x_i, y_i) with $\alpha_i > 0$ are denoted as support vectors. The surface where $f(x) = 0$ is a hyperplane through the feature space as defined by the kernel function. Optimal parameters α_i and b are selected to minimized the number of incorrect classifications by maximizing the distance of the support vectors to the hyperplane $f(x) = 0$. $y_i > 0$ indicate a simulated supination sprain trail, where $y_i < 0$ indicate a non-sprain trial.

Maximize:

$$L_D \equiv \sum_{i=1}^{N} \alpha_i - \frac{1}{2} \sum_{i=1}^{N} \sum_{j=1}^{N} y_i y_j \alpha_i \alpha_j k(x_i, x_j) \quad \text{-(2)}$$

subject to:

$$0 \le \alpha_i \le C, \quad \sum_{i=1}^{N} y_i \alpha_i = 0 \quad \text{-(3)}$$

The constant C denotes the penalty to errors, therefore it affects the tolerance to incorrect classifications. After solving the equation (2) and find α_i, we can use any other support vector (x_i, y_i) to find b.

In the training process, six out of twelve subjects were chosen randomly. Therefore, there were 600 trials for the training process. For each trial, one second of data of all the six channels (three dimensions of linear acceleration and three dimensions of angular velocity) were cut. Then the data undergoes discrete Fourier transform (DFT). All the data are therefore converted to frequency domain. The converted data was then used for training the Support Vector Machine [4].

The data of the other six subjects (therefore excluding the data used in training the SVM) were used to verify the accuracy of detection. Same process was applied to cut and convert the data to frequency domain. The converted data was then fed into the model of SVM to check if the model can classify simulated supination sprain and non-sprain motion correctly or not.

Results

After training the SVM with the 600 trials of data from sensor located at the medial calcaneus, 521 support

vectors, with threshold b=0.46397071, were selected to build the SVM model in equation (1) for classification.

The rest of 600 data were then fed to the SVM model for verification. Among the data, 548 were correctly classified while 52 were classified incorrectly. Therefore the accuracy on the test set was 91.3%.

The details of the verification result were shown in Table 1 and Table 2. Within 300 simulated supination sprain trials, the SVM model could correctly identify 291 trials, therefore 97% of simulated were identified correctly. Among the 9 simulated supination sprain trials that cannot be classified correctly, 8 of the trials are recorded when the fall platform angle was 90 degrees, while the other one trial was with platform angle set at 67 degrees. All the simulated supination sprain trials with platform angle at 0 degree, 23 degrees, 45 degrees were identified correctly. For the 300 non-sprain trials, 43 trials were identified incorrectly, therefore the rate of false alarm was 14.3%.

	Number of correctly identified trials	Number of incorrectly identified trials
Simulated supination sprain trials	291	9
Non-sprain trials	257	43

Table 1. Results of verification of the Support Vector Machine model.

	Subject	#1	#2	#3	#4	#5	#6	Sub-total	Total
Simulated supination sprain trials	**0**	0	0	0	0	0	0	0	9
	23	0	0	0	0	0	0	0	
	45	0	0	0	0	0	0	0	
	67	0	0	0	1	0	0	1	
	90	0	0	2	5	1	0	8	
Non-sprain trials	**Cut**	0	1	2	2	0	6	11	43
	Down stairs	0	6	0	5	0	3	14	
	Jump	0	7	4	0	0	0	11	
	Run	0	0	2	0	0	0	2	
	Walk	0	5	0	0	0	0	5	

Table 2. Number of incorrect identified trials during the verification process.

Discussion

After training the SVM with the sensor data in medial calcaneus, a result of 91.3% accuracy was obtained. With only one sensor data for training, the result is very good. From the result shown in Table 1, the SVM model can recognize 97% of the simulated ankle supination sprain motions from non-sprain, while 14.3% of non-sprain trials were misclassified as supination sprain motion. This result is desirable, as the aim of this research is to protect the ankle from ankle supination sprain, and would like to identify some vigorous “tends to injury” motion. Therefore a high power to identify simulated ankle supination sprain and misidentify some vigorous non-sprain motions, such as cutting, walking downstairs and jumping, are acceptable.

There were several limitations in the experiment. Firstly, all the supination sprain data were simulated supination sprain obtained by falling on the supination sprain simulator. These simulated supination sprains were not real sprain case. The subjects were only in sub-injury level instead of ligamentous injury. Real sprain is not ethical and is not reproducible in laboratory. Therefore the simulated supination sprain motion may be less vigorous than real sprain. However, this kind of sub-injury supination sprain is also undesirable and therefore has to be identified from other non-sprain motion.

Also, the current system can only allow data processing followed by data collection. No real time classification can be made. This is due to the manual trimming of data and discrete fourier transform (DFT) by Matlab. Besides, the whole system now is wired. Sensors were connected to laptop computer for data collection by USB port. Sliding window allows real time trimming of data at different time point. However, the size of the window, therefore number of data required for classification of simulated supination motion, has to be further investigated. The SVM model can be built in on a PCB with DC power supply. The PCB can be located near the ankle, so that the system can become wireless. The final process time for real time classification of the system would mostly depends on the window size and also the performance of the hardware on the PCB.

Conclusions

This research introduce a method to classify tends to sprain injury motion from non-sprain motion using one motion sensor with 500Hz sampling frequency at 91.3% accuracy. Future work of the study include minimize the window side, therefore the time frame for real time detection, this is important in reducing the processing time for classification. Also the sampling frequency of the motion sensors should be minimized, this can reduce the cost of sensors, which is currently US$100 each. This can also minimized the amount of data to be processed. Hence, the time for data processing can be further reduced to make real time classification more feasible. In the near future, the system can be built for supintion sprain detection, at a low cost.

References

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3. Bernhard S et al (1998). Advanced in kernal methods support vector learning.Cambridge, MIT Press
4. Joachims T (1999). Making large-scale SVM learning practical. Advances in lernel methods- support vector learning, MIT Press

Time	Program
0830-0900	**Registration**
	Symposium 1: Exercise Physiology Moderator: Mr Raymond SO / Miss Karly CHAN
0900-0915	**Two months volunraty exercise does not alter the gene expression of ghrelin in rat cardiac muscle** Xiao-Meng PEI / HTI, PolyU
0915-0930	**The profile of the absolute power spectrums of the Chinese elite boxers before important competition** Feng-Hua SUN / SSPE, CUHK
0930-0945	**Protein expression and transciptional response of X-linked inhibitor of apoptosis protein (XIAP) to two months volunraty exercise in rat striated muscle** Bee-Tian TENG / HTI, PolyU
0945-1000	**Effect of environmental stress on heart rate response during submaximal exercise** Angela WY LEE / O&T, CUHK
1000-1030	**Opening Ceremony**
1030-1100	**Keynote Lecture 1: Augmenting the sensori-motor control mechanisms of the patellofemoral joint by weight training** Speaker: Prof Gabriel YF NG Moderator: Dr Patrick YUNG / Dr Lobo LOUIE
	Symposium 2: Health and Fitness, Motor Learning Moderator: Prof Stanley HUI / Dr Clare YU
1100-1115	**The association between body mass index, physical activity, and mental health in Hong Kong children and adolescents** Erica YY LAU / PE, HKBU
1115-1130	**Childern's play choice and physical activity levels between active and seated media** Jessica WK LAM / IHP, HKU
1130-1145	**Association between physical activity, sleep duration and obesity in Hong Kong Chinese adults** Xu WEN / SSPE, CUHK
1145-1200	**Effects of a structured soccer training program on motor performance in students with intellectual disability: an exploratory study** Peggy HN CHOI / PE, HKBU
1200-1215	**Validity and reliability of skinfold measurement in assessing body fatness of Chinese children in Hong Kong: using air displacement plethysmography as a criterion measure** Daniel CS YEUNG / SSPE, CUHK
1215-1230	**Associations between the perceived neighbourhood environment and objectively-measured physical activity of adult residents of Hong Kong** Ka-Yiu LEE / IHP, HKU
1230-1245	**Development of a questionnaire to examine the socio-environmental correlates of physical activity and sedentary behavior in primary schoolchildren in Hong Kong** Yajun HUANG / SSPE, CUHK
1245-1300	**Examining the association between indoor environment variables and the physical activity level in Hong Kong** Anson KC CHAN / IHP, HKU
1300-1400	**Lunch**

Time	Program
1400-1430	**Keynote Lecture 2: The challenges to be a sports manager in the 21st century** Speaker: Prof Frank HK FU Moderator: Prof Stephen WONG / Prof Gabriel NG
Symposium 3: Sport Medicine and Sport Rehabilitation Moderator: Dr Parco SIU / Dr Hok-Ming HO	
1430-1445	**A comparison of functional exercise progression program and Tai Chi for balance control and plantar pressure distribution in health individuals** Yuling WANG / RS, PolyU
1445-1500	**The surgical outcome of immediate arthroscopic Bankart repair for first time anterior shoulder dislocation in young active patients** Yuk-Wah HUNG / O&T, CUHK
1500-1515	**Effect of duration and intensity of training, skill level and body fatness of children on rope skipping injuries** Hoi-Wai WONG / EPCLN, HKIEd
1515-1530	**Quantitatively measuring proximal plantar fascia microcirculation by power doppler ultrasonography** Hong-Ying CHEN / RS, PolyU
1530-1545	**The relationship of swimming stroke and shoulder laxity among elite college swimmers of Hong Kong - a retrospective cohort study** Xina LO / O&T, CUHK
1545-1600	**Effects of laser and stretching exercise in the prevention of tendon degeneration** Polly YM CHUNG / RS, PolyU
1600-1630	**Tea Break**
Symposium 4: Sport Biomechanics Moderator: Prof Youlian HONG / Dr Eric HO	
1630-1645	**A biomechanical study of anterior cruciate ligament deficient knee during landing and pivoting movements** Mak-Ham LAM / O&T, CUHK
1645-1700	**A kinetic comparison of running on treadmill and overground surfaces: An analysis of plantar pressure distribution** Justin WY LEE / SSPE, CUHK
1700-1715	**Medial arch-heel support in inserts reduces ankle eversion in running in pronators** Chad WN CHAN / O&T, CUHK
1715-1730	**Electromyograpic analysis on lower extremity muscles during overground surfaces and treadmill running** Mandy ML CHUNG / SSPE, CUHK
1730-1745	**Identification system to distinguish simulated ankle supination sprain from other normal motions by gyrometers and accelerometers** Yue-Yan CHAN / O&T, CUHK
1745-1800	**Closing Ceremony**