

香港小学生体能活动伤害发生的初探

高 杨*, 卢煜明#, 段艳萍, 李啟乐

香港浸会大学社会科学院体育学系

摘要: **目的** 本研究旨在初步探讨香港地区小学生体能活动伤害的发生和相关危险因素,为将来进行较大规模的研究提供线索和依据。**方法** 用统一问卷收集小学生的社会人口学资料、体能活动水平和过去12个月体能活动伤害的发生情况。体能活动伤害被定义为任何在参加体能活动时发生的伤害。学生的体重状态根据实际测量的身高和体重来定义。卡方检验用来检验体能活动伤害发生的组间差异。鉴于本次研究属于初探性质,采用 $P<0.10$ 作为显著性检验的标准。**结果** 本研究共调查40人,其中男21人,女19人,年龄10~11岁。在过去12个月内,体能活动伤害人次发生率和事件发生率分别是32.4%和50.0%。多数的体能活动伤害并没有造成严重后果。从事球类运动可能最容易导致体能活动伤害的发生。父亲年龄较大(40岁或以上)、居住在私人住宅、相对富裕的家庭(家庭月收入大于20 000港币)、以及体能不活跃的儿童体能活动伤害的发生率较高。**结论** 本研究初步认为香港小学生的体能活动伤害的发生可能比较普遍,有必要采取适当措施降低香港小学生体能活动伤害的发生率。本研究结果有待较大样本的研究予以证实。

关键词: 体能活动伤害; 体能活动; 儿童; 社会人口学特征; 横断面研究

A Pilot Study on Physical Activity Related Injury (PARI) in Primary School Children in Hong Kong

GAO Yang*, LO Yuk Ming #, DUAN Yan-ping, LEE Kai Lok

Department of Physical Education, Faculty of Social Sciences, Hong Kong Baptist University, Kowloon Tong Hong Kong

Abstract: Objectives This pilot study aimed to preliminarily examine incidence rate of and risk factors for physical activity related injury (PARI) in a convenience sample of primary school children in Hong Kong. **Methods** Two self-administered questionnaires were used to collect information of children's socio-demographic characteristics, physical activity (PA), and PARI in the past 12 months. A PARI was defined as any injury resulting from participation in PE class, sports activities or leisure time PA. Body weight status was defined based on objectively measured height and weight. Chi-square test was performed to test between-group differences in PARI to identify possible risk factors. $P<0.10$ was adopted to define the significance level given the pilot nature. **Results** A total of 40 students (21 boys, 19 girls) aged 10~11 years participated into the study. The person- and episode-based incidence rates of PARI in the past 12 months were 32.4% and 50.0%, respectively. Most PARIs did not result in serious consequences. Ball games seemed to have the highest potential for PARI. Children having older fathers (aged 40 years or above), living in private housing, from relatively affluent families (monthly family income > HK \$20 000), and being physically inactive showed significantly higher incidence rates than their counterparts. **Conclusions** PARI seems to be prevalent in primary

基金项目: 香港浸会大学学术研究基金FRC2/13-14/032

通讯作者: 高 杨, E-mail: gaoyang@hubk.edu.hk

共同第一作者: 卢煜明

school children of Hong Kong. Actions should be taken to prevent children from PARI. Future research in a large-scaled random sample should be conducted to confirm the primary observations.

Key words: Physical activity related injury (PARI); Physical activity; Child; Socio-demographic characteristics; Cross-sectional study

INTRODUCTION

There has been increasing number of people participating in sports and recreational activities in recent years because sports industry becomes popular and people in all ages are encouraged to be physically active for health purpose. In Hong Kong, a study in 2008 revealed that around 65.0% of the local people participated in any sports or recreational activities at least once in the past three months prior to the survey^[1]. It revealed that 48.6% of the Hong Kong adults were physically active, defined with the criteria of “at least an accumulation of 30 minutes a day for at least three days a week in moderate or vigorous physical activities”^[1]. Participation rate was higher in child population (84.5%), though only 42.1% of them were physically active according to a commonly used classification (at least 30 minutes moderate-or-above intensity PA [MVPA] every day, 3 days per week) and even lower percentage of them (8.4%) met the new WHO’s recommendation of PA for children and adolescents (at least 60 minutes MVPA every day)^[1].

There is conclusive evidence that the physical fitness and health status of children and youth are substantially enhanced by frequent PA^[2]. However, negative effects may have also increased along with the global promotion of PA levels. Among them, physical activity related injury (PARI) may be one of the most important consequences. Conn et al^[3] estimated that seven million Americans received medical attentions for PARI annually, with an annual incidence rate of 25.9 episodes per 1 000 population. That research also revealed that children aged 5~14 were at the highest risk compared to the other age groups (59.3 episodes per 1 000 population). Similar results were also reported in other studies^[4].

Several factors have been associated with PARI in children. For example, risks for PARI may vary across

different types of activities, with higher likelihood being found in competitive sports, such as rugby and football games^[5,6]. A positive association was observed between weekly hours of participation in PA and the risk for PARI^[7]. Besides, a previous study revealed that high family income might be a risk factor for PARI^[7]. Recent research suggested a reversed “U” shape relationship between body mass index (BMI) and PARI occurrence^[8]. In that study, individuals with their BMI values below 21 kg/m² or above 27 kg/m² were less likely to suffer from PARI compared to those with BMI falling in the range of 21 and 27 kg/m²^[8]. The curvilinear relationship means that the relationship between two variables is graphically represented by a curved line. In addition, that study also illustrated that people living in small towns were at a lower risk for PARI than those living in central urban areas. Ethnicity might play a role in PARI occurrences, with Caucasian being found at a higher risk than non-Caucasian^[8]. However, results across studies are mixed. Some previous studies failed to relate those factors with PARI. Emery and Tyreman in their study indicated that there was no significant relationship between sex, age, ethnicity, BMI, parental education status, residential location and PARI occurrences^[5].

In Hong Kong, several studies have been conducted on sports or physical activity related injury. A retrospective hospital-based study revealed that ball games accounted for the largest number of sport injuries among children and playing basketball was the leading cause of PARI^[9]. However, most local studies were based on hospital or clinical records, there is a knowledge gap in understanding the situation of PARI occurrences in the general population, which may provide more information for developing effective strategies to reduce injury in the general population, especially in identifying and preventing people from minor injury occurrences, in which they may not seek medical care in health care

sectors. This pilot study aimed to preliminarily examine the incidence rate of PARI in the past 12 months and identify its risk factors among a sample of primary school children in Hong Kong. Findings provided important information to researchers about future research direction and study design.

METHODS

Participants

The pilot, with the cross-sectional study design, was conducted in April 2014 among primary school children in Hong Kong. Convenience cluster sampling method was adopted to recruit subjects. A primary school accepted our invitation to participate into the study. Two classes in P5 were selected and all students in the classes were invited into the study. Two self-administered questionnaires, the Student Questionnaire (SQ) and the Parent Questionnaire (PQ), were developed to collect the information of the participants. A written informed consent and the PQ were completed by their parents/guardians at home and brought back to the school on the next day. And then students whose parents/guardians agreed them to participate into the study completed the SQ in a class.

Measurements

The SQ focused on their PA levels as children at this age (10~11 years) can understand PA-related questions and provide more accurate information on their PA than their parents/guardians^[10]. The PQ consisted of the children's PARI in the past 12 months, as well as socio-demographic characteristics, including gender, age, date of birth, parental age, parental education level, parental longest occupation, parental marriage status, type of house, and monthly household income. In addition, data of children's height and weight were obtained from the study school.

Measurement of PA levels

A modified Chinese version of the Children's Leisure Activities Study Survey questionnaire (CLASS-C) was adopted to collect the children's PA^[10]. The CLASS-C, consisting of 31 activities and 14 sedentary

activities, requires child respondents to indicate whether they did that kind of physical activity during a typical week and answer the questions about the frequency and duration of participation on weekdays (Monday to Friday) and weekends (Saturday and Sunday). The CLASS-C holds a good reliability (with an intra-class correlation coefficient of 0.71) and a sound validity (a correlation coefficient of 0.48, with Actigraph Accelerometer-based PA levels) in Hong Kong primary school children^[11].

The WHO's global recommendation on physical activity for health for children was adopted to define the PA levels of the participants^[2]. Children having 60 minutes or above MVPA per day were classified as PA, whilst those who did not meet the requirement were defined as physical inactivity (PIA).

Measurement of PARI

In this study, a PARI episode was defined as any injury resulting from participation in PE class, sports activities or leisure time PA. Frequency and severity of children's PARI occurrences in the past 12 months were reported by their parents/guardians. In addition, detailed information was collected on the last (latest) episode, including time, place, activity in which the last PARI occurred, causes, types of the injury, injured body parts, treatments, as well as consequences of the last PARI.

Measurement of body weight status

Data of the participants' height (m) and weight (kg) were provided by the study school, which were objectively measured at the beginning of the academic year of 2013/2014. BMI (kg/m^2) was then calculated by dividing weight by height squared. Overweight and obesity would be defined using the classification criteria introduced by Cole, of which age- and gender-specific cut off points of BMI (kg/m^2) were used^[12].

Data analysis

Firstly, original data were organized into two categories according to their distribution if there were three or more categories. Percentages were used to present the distribution of all variables. Secondly, chi-square

tests were performed to examine whether there were significant differences in PARI (occurred or not in the past 12 months) by socio-demographic characteristics, PA levels (physically active vs. physically inactive), and body weight status (normal vs. overweight). The socio-demographic characteristics included gender (boys vs. girls), age (10 vs. 11 years old), parental age (< 40 years vs. 40 or above), parental education level (below tertiary education vs. tertiary education or above), father's longest occupation (white collar jobs vs. blue collar jobs), mother's longest occupation (housewife vs. non-housewife), parental marital status (married/cohabitated vs. divorced/widowed), type of house (public housing vs. private housing [including Home Ownership Scheme housing]), and monthly family income (HK\$ 20 000 or below vs. more than HK\$ 20 000). A loose criterion ($P < 0.10$) was adopted to define the significant level due to the pilot nature of this study. All data analyses were carried out using the IBM SPSS Statistic 21.

RESULTS

We conveniently chose one primary school in Hong Kong. A total of 40 participants in two P5 classes (21 males and 19 females, aged 10–11 years old) participated into the study, with a participation rate of 100.0%. Table 1 presents the distribution of socio-demographic characteristics, PA level, and body weight status of the participants. All of the students participated into at least one type of sports/recreational activities in a typical week and therefore were at potential risk for PARI.

There were six students (15.0%) whose parents did not remember if their children had a PARI occurred or not in the past 12 months. Of the others who responded the question with Yes or No, eleven ever suffered from at least one PARI episode in the past 12 months, with a person-based incidence rate of PARI of 32.4%. Among the PARI victims, six experienced PARI only once; four experienced twice; and the remaining one experienced three times, resulting an episode-based incidence rate of 50.0%. In addition, seven injured children had at least one PARI resulting in any of the following four consequences: to stop the activities they were

Table 1 Distribution of Socio-demographic Characteristics, PA Levels and Body Weight Status of the Participants

	N	%
Gender		
Male	21	52.5
Female	19	47.5
Age (years)		
10	20	50
11	20	50
Father's Age (years)		
Below 40	14	36.8
40 or above	24	63.2
Father's Education		
Below Tertiary Education	32	84.2
Tertiary Education or above	6	15.8
Father's Occupation ¹		
White Collar	22	57.9
Blue Collar	16	42.1
Mother's Age (years)		
Below 40	22	56.4
40 or above	17	43.6
Mother's Education		
Below Tertiary Education	35	92.1
Tertiary Education or above	3	7.9
Mother's Occupation		
Housewife	23	59
Non-Housewife	16	41
Parental Marital Status		
Married or Cohabitated	35	89.7
Divorced or Widowed	4	10.3
Type of House		
Public housing	27	69.2
Others	12	30.8
Monthly Family Income		
HK\$20 000 or below	23	62.2
Above HK\$20 000	14	37.8
Physical Activity ²		
Physical Inactivity	21	52.5
Physical Activity	19	47.5
Body Weight Status		
Normal weight	26	65.0
Overweight + Obesity	14	35.0

1. White collar included professional, pastor, service and retail, merchant, engineering, manager and administrator. Blue collar included worker and fisher or farmer.

2. Physical activity was defined as children who had 60 minutes or above of middle to high intensity physical activity per day. Physical inactivity was defined as children who did not meet the recommendation of having 60 minutes or more of middle to high intensity physical activity per day.

participating in ($n=4$), unable to join in next planned activities ($n=2$), absent from school at least one day ($n=2$), or to seek medical care ($n=1$). Further, the six students were asked about the details of their last injury causing the four consequences. Of them, three students reported that they were playing handball, football and dancing when the PARI occurred, whilst the others failed to provide such information. All of the last episodes were new injuries. In terms of injury type and injured body parts, four students suffered from spring/string, one student suffered from cut/laceration and bruise/contusion for each; four students injured their lower extremities (feet/knees) and the other two injured their upper extremities (hands/arms).

Table 2 compares children suffered from PARI with their counterparts by socio-demographic characteristics, PA levels and body weight status. Children with older fathers (aged 40 years or above), living in a private house, or having a higher monthly family income (more than HK\$20 000), and those being physically active, had significantly higher incidence rates compared to their counterparts using the significant criteria of $P < 0.10$.

DISCUSSION

Forty P5 students (21 boys and 19 girls aged 10–11 years) in a chosen primary school participated in this study, with a participation rate of 100%. The person-based and episode-based incidence rates of PARI in the past 12 months were 32.4% and 50.0% respectively. The PARI related activities were ball games (handball and football) and dancing. Seven victims had a certain consequence, including absence from regular PA, absence from school, and seeking medical care. Higher family monthly income, older father, living in private housing, and being physically active might be the risk factors of PARI.

The person-based incidence rate of PARI in this study was 32.4%, lower than findings from similar studies conducted in western countries^[5, 8]. Of the possible reasons, age difference may make a contribution to the discrepancy. The participants in this study were younger than those in those two studies. Another possibility is that

Table 2 Comparisons of Children Suffered from PARI in the Past 12 Months or Not by Socio-Demographic Characteristics, PA levels and Body Weight Status

	Non-PARI / %	PARI / %	P Value
Gender			0.885
Male	66.7	33.3	
Female	69.2	30.8	
Age(years)			0.339
10	76.9	23.1	
11	60.0	40.0	
Father's Age(years)			0.087
Below 40	90.0	10.0	
40 or above	58.8	41.2	
Father's Education Level			0.334
Below Tertiary Education	73.9	26.1	
Tertiary Education or above	50.0	50.0	
Father's Occupation ¹			0.472
White Collar	64.3	35.7	
Blue Collar	76.9	23.1	
Mother's Age(years)			0.58
Below 40	62.5	37.5	
40 or above	72.7	27.3	
Mother's Education			0.603
Below Tertiary Education	68.0	32.0	
Tertiary Education or above	50.0	50.0	
Mother's Occupation			0.586
Housewife	71.4	28.6	
Non-Housewife	61.5	38.5	
Parental Marital Status			0.233
Married or Cohabitated	66.7	33.3	
Divorced or Widowed	100	0.00	
Type of House			0.099
Public housing	77.3	22.7	
Private housing (including Home Ownership Scheme housing)	40.0	60.0	
Monthly Family Income			0.031
HK\$20 000 or below	81.2	18.8	
Above HK\$20 000	40.0	60.0	
Physical Activity ²			0.077
Physical Inactivity	53.3	46.7	
Physical Activity	84.6	15.4	
Body Weight Status			0.657
Normal	64.7	35.3	
Overweight (including Obesity)	72.7	27.3	

1 White collar included professional, pastor, service and retail, merchant, engineering, manager and administrator. Blue collar included worker and fisher or farmer.

2 Physical activity was defined as children who had 60 minutes or above of middle to high intensity physical activity per day. Physical inactivity was defined as children who did not meet the recommendation of having 60 minutes or more of middle to high intensity physical activity per day.

the definitions of injury used across studies varied remarkably. Cultural difference might alter the participation in physical activity as well. Students in western countries might prefer participating in competitive sports^[13], at least partly resulting in the higher risks than our participants^[14].

This study showed that older children (aged 11) had a higher PARI incidence rate (40.0%) than the younger (aged 10) (3.1%), though the difference did not achieve significance, at least partly due to the small sample size. Our results are in line with most previous studies^[8, 14, 15], suggesting that the risk for PARI increases along with the age in children and adolescents. However, we did not observe any trend of gender difference, as suggested by other studies^[5, 8, 14]. This difference might be due to the lack of power in this study. In addition, less participating in competitive sports in the boys might also play a role in the reduced gender difference, if existing, in this study. Interestingly, we found children with older fathers (40 years or above) were at elevated risk for PARI compared to their counterparts (41.2% vs. 10.0%, Table 2). The reasons are unclear. Further studies should be conducted to confirm the finding.

Another factor significantly associated with PARI was family income. Participants whose monthly family incomes were more than HK \$20 000 had a higher risk for PARI (60.0% vs. 18.8%, $P=0.031$), suggesting that family income may be a risk factor, which is consistent with other studies^[7]. In terms of house type, children who lived in private housing also suffered from more PARI episodes, also pointing out that family type may put children at high risk.

Interestingly, physically inactive participants in this study had triple of incidence rate of PARI than those being physically active, with the difference reaching significance according to our criterion of $P<0.10$. The reason for the negative relationship might be due to relatively low fitness or skill level of the inactive children. For example, inactive children may have poorer balance and flexibility than those being active. And research has proved that balance and flexibility are critical elements associated with PARI^[7]. However, there were some previous studies suggesting reversed relationship

between PA levels and PARI^[5, 8, 14]. One supportive point of that suggestion is that active children expose more and therefore are more likely to suffer from PARI^[8]. More studies are needed to determine the role of PA levels on PARI. The relationship between body weight and PARI is another area that needs to be clarified, as existing evidence is mixed. In this study, we did not find any relationship between overweight/obesity and PARI^[5, 8, 14-16].

Our findings have to be interpreted with cautions. One major limitation of this study was the pilot nature. Due to the small sample size ($n=40$), we therefore had very limited power to identify a real difference/relationship if existing. We were also unable to do multivariate analysis to examine the relationship between risk factors and PARI after controlling for potential confounders. However, one major purpose of pilot studies is to explore possibilities rather than confirm outcomes. In light of this point of view, our pilot did provide a rough picture of the PARI situation in Chinese child population and suggested several promising risk factors. This is of importance to conceive and conduct a large-scale study in the near future based on these findings. We adopted a loose significance criterion ($P<0.10$) in order to explore the possibilities, and therefore increased chances to make type I errors in this study, that is, to incorrectly reject a true null hypothesis. In addition, this study also encountered similar limitations like other cross-sectional questionnaire surveys, such as recall bias, reporting bias, unable to display cause-effect relationship. A wide definition of PARI (without considering the consequences of an injury) was adopted in this study, which may have resulted in report bias as parents may have interpreted injury differently. Furthermore, cautions should also be paid when comparing with other studies due to discrepancies in the injury definition. Further studies should apply a definition with consideration of minimum severity criteria, such as activity restriction for more than four hours or any medical treatment caused by the injury. Last but not the least, children's height and weight were measured by the school at the beginning of this academic year, around 10 months before this study. Children may have grown in different rates and therefore biased the relationship between body weight status and PARI.

In conclusion, PARI seems to be prevalent in primary school children Hong Kong. Ball games might have the highest potential for PARI. Family affluence, older fathers (aged 40 or above), private house type, and physical inactivity might be the risk factors for PARI. Future research with a large-scaled random sample should be conducted to confirm our findings. Effective interventions should be developed to prevent children from PARI.

CONTRIBUTORSHIP

Dr. Gao conceived the study, analyzed the data, and wrote up the manuscript. Mr. Lo collected and analyzed the data and wrote up the manuscript. Dr. Gao and Mr. Lo equally contributed to this manuscript. Dr. Duan and Mr. LEE seriously contributed to this study by providing valuable comments on stages of study design, data collection, data analysis, and manuscript writing.

ACKNOWLEDGEMENTS

We would like to thank the participants and the school teachers. Our study would have not been conducted smoothly without their participations and supports.

COMPETING INTERESTS

None.

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