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Association of Home Environment and Physical Activity among Pre-Schoolers in Malaysia: A Cross-sectional Study

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ABSTRACT

Background and Objective: Home environment is important in supporting children's physical activity level as young children spend more time at home. The aim of the study was to determine the association of home environment and physical activity levels among pre-schoolers. **Methods:** A cross-sectional study that involved a total of 107 subjects (male=61, female=46) aged between 4 to 6 years old was conducted. Data on socio-demographic factors (age, gender, ethnicity, height, and weight of the children) were collected. Home Opportunities for Physical Activity Check-Up (HOP-Up) questionnaire was utilised to evaluate the availability of physical activity equipment and the space inside and outside of the homes as well as in the neighbourhoods. Early Years Physical Activity Questionnaire (EY-PAQ) was used to measure the levels of physical activity. **Results and Conclusions:** Prevalence of overweight and obesity among the pre-schoolers were 13.1% and 11.2% respectively. The body mass index of the subjects was higher among males compared to females. More than half of the pre-schoolers (56.1%) were reported to have low physical activity level. The variables associated with physical activity levels were ethnicity and attending after school childcare. A significant association was found between body mass index and physical activity level ($p = 0.002$). Home environment has a significant positive correlation with physical activity level ($p = 0.011$). Parent-teacher education program is suggested to be implemented for home-based and school-based interventions to improve physical activity and to prevent further complications in child's life.

Keywords: Home environment, obesity, overweight, physical activity, pre-schoolers, Malaysia

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INTRODUCTION

Obesity is a result of unnecessary or abnormal accumulation of fats caused by an imbalance between energy intake and energy expenditure. Previous studies reported that obesity is the major cause of many serious health diseases among Asians. The prevalence of childhood obesity is increasing rapidly in Malaysia in tandem with increasing global prevalence (Nor, Ghozali & Ismail 2019). The rising numbers of pre-schoolers having childhood obesity will further lead to rising health issues among the children. Obese children will have the risk of having many health problems such as cardiovascular disorder, metabolic disorder as well as sleeping disorder. Thus, action should be taken for obesity prevention (Sahoo et al. 2015). In addition, children aged between 3 and 7 years old will undergo a second rise in adiposity or body mass index (BMI). This phenomenon can be defined as adiposity rebound (Cole 2004). Fatness in adolescence and adulthood can be predicted by the period of adiposity rebound (3 to 7 years old). Hence, if the children are obese during the adiposity rebound period, the children will have a high risk to be obese in later life. Meanwhile, Guo et al. (2002) reported that childhood obesity usually will persist to adulthood.

Therefore, it is important to know the prevalence of obesity among pre-schoolers since the adiposity rebound period is the critical period of growth; it will never be too late to teach and change the obese children's lifestyle to reduce their weight. However, most of the studies on physical activity (PA) were targeting children aged above 6, and only a few studies targeted preschool-aged children as their study population, especially in Malaysia. Hence, there is a lack of knowledge regarding PA among pre-schoolers in Malaysia. The physical activity among young children is sporadic and intermittent in nature. The pre-school children are known as the most active population but the PA of the young children are mostly consisting of short burst of moderate-to-vigorous physical activity (MVPA) accompanied with resting or activities with low intensity like walking (Cliff, Reilly & Okely 2009). Young children aged 3 to 5 years rarely involve in PA in a continuous period. According to Australian Government

Department of Health (2019) healthy young children have to perform at least 180 minutes (3 hours) daily or accumulation of 60 minutes (1 hour) of MVPA to maintain adequate PA level. Otherwise, the children will be considered having low levels of PA. Majority of preschool-aged children tend to be sedentary and inactive (Barros, Lopes & Barros 2012). Hence, healthy behaviour like PA is usually entrenched during early childhood since there is an evident state that behaviours will track into their later life. Thus, early childhood should be targeted as a significant time to foster PA among the children.

A good body of studies established the role of social, environmental factors and neighbourhood level and built environment affecting the PA level, but the home physical environment has been neglected (Ding et al. 2011). Young children spend a proportion of time at home; therefore, the home environment is very important in supporting children's PA level. Home environments like space of the house, yard directly outside of the house, and nearby playgrounds might also be elements that affect the children's PA level. Since the interaction of behaviours like PA and environment occur simultaneously and reciprocally, varying the home environment could increase or decline the PA level. It is very important to understand the correlates of the home physical environment and PA because children have less autonomy in their behaviour. Thus, this is an important issue to be focused to improve young children's PA level and prevent obesity. Therefore, the main purpose of this study was to investigate the association of home environment and PA level among pre-schoolers in Malaysia.

MATERIALS AND METHODS

Study design and sample selection

A cross-sectional study was conducted to determine the PA level and obesity among pre-schoolers in Kajang, Malaysia. The study focused on the association of the home environment to the level of PA among pre-schoolers. This study was conducted at eight pre-schools in Kajang. The target population in this study was pre-schoolers aged between 4 and 6 years. Since this is a proxy-reported study, the parents of the subjects completed the questionnaire. Sample size was calculated using G-Power. Convenient sampling method was used in this study.

Procedure

The questionnaires were distributed among the parents of pre-schoolers. A short briefing on the data protection and background of the study was carried out. This questionnaire took approximately three to five minutes to complete. This questionnaire consisted of three sections: socio-demographic data, Early Years Physical Activity Questionnaire (EY-PAQ), and Home Opportunities for Physical Activity Check-Up (HOP-Up).

Demographic data

The socio-demographic factors included the age, gender, and ethnicity of the children. The height and weight of the children was also included in this section and the BMI was calculated based on this information by dividing the body weight in kg by square of height in meters. Then the BMI was compared with the CDC growth chart. The child was considered as overweight if the BMI is in the range of 85th percentile to less than the 95th percentile based on the CDC growth charts. If the BMI is equal to or greater than 95th percentile based on CDC growth charts, the child was considered obese (Center for Disease Control and Prevention 2021).

Instruments

Early Years Physical Activity Questionnaire (EY-PAQ)

Early Years Physical Activity Questionnaire (EY-PAQ) is a proxy-reported questionnaire used to measure the levels of moderate-to-vigorous physical activity (MVPA) and sedentary time (ST) in young children (Bingham et al. 2016). The frequency and duration of different MVPA activities engaged by the child in the last seven days were reported by parents through the questionnaire. This questionnaire consists of 16 items. The items calculating the MVPA were: (1) playing actively in the house; (2) playing actively in the garden; (3) walking from place to place; (4) engaging in active play causing sweating and increased breathing; (5) playing in the park or playground, and (6) playing at indoor play facilities. Pre-schoolers should perform at least 60 minutes (1 hour) of MVPA per day. Thus, if the daily minutes of MVPA are equal to or more than 60 minutes, PA level was considered high. While if the daily minutes of MVPA was lesser than 60 minutes, the PA level of pre-schoolers was considered low.

Home Opportunities for Physical Activity Check-Up (HOP-Up)

HOP-Up (Home Opportunities for Physical Activity Check-Up) questionnaire was utilised to evaluate the availability of PA equipment and the space inside and outside of the homes as well as in the neighbourhoods. The frequency of equipment and space accessed also been asked in the questionnaire. This questionnaire consists of five scales: Scale A is Indoor Home Space & Supports for Physical Activity, Scale B is Outdoor/Yard Space & Supports for Physical Activity, Scale C is Outdoor Space & Supports for Physical Activity, Scale D is Neighbourhood Environment Safety and Scale E is Frequency of Active Play Outdoors. The minimum total score is 15 while maximum score is 90. Higher scores indicate higher availability of space, higher availability of PA supports, high positive parent policies toward physical activity, easier to access to physical activity, higher sense of safety for physical activity, and higher frequency of PA. Intra-class correlations (ICCs) examining HOP-Up item agreement between researcher and parents revealed slight to substantial agreement (range 0.22 to 0.81) for all items (Cheng et al. 2016).

Table I: Demographic data of subjects

Variable	n (%)
Age	
4 years old	27 (25.2)
5 years old	41 (38.3)
6 years old	39 (36.4)
Gender	
Male	61 (57.0)
Female	46 (43.0)
Ethnicity	
Malay	8 (7.5)
Chinese	82 (76.6)
Indian	16 (15.0)
Others	1 (0.9)
Attending after school child care	
Yes	35 (32.7)
No	72 (67.3)
Numbers of children in the family	
Only 1	17 (15.9)
2 to 3	79 (73.8)
4 to 5	10 (9.3)
More than 5	1 (0.9)
Both parents are working	
Yes	81 (75.7)
No	26 (24.3)

Data analyses

Data analyses were performed using IBM Statistical Package for the Social Sciences-version 24. The level of significant difference was set at ($p<0.05$). Descriptive analysis and correlation analysis such as chi-square test and Spearman correlation were used in this study.

Ethical consideration

Ethical approval was obtained for this study from the Scientific and Ethical Review Committee (SERC) of Universiti Tunku Abdul Rahman (UTAR). Informed consent was obtained from the participants. Moreover, the participants were notified of the confidentiality of the information given by them and the right to withdraw from the study at any given moment.

RESULTS

A total of 107 subjects' parents completed the questionnaire. The responses of the questionnaire were collected by paper form through face to face survey. The age range of the subjects is 4 to 6 years. Out of 107 subjects, 27 (25.2%) were 4 years old, 41 (38.3%) were 5 years old, 39 and (36.4%) were 6 years old. Among 107 subjects, there were 61 males (57.0%) and 46 females (43.0%). Most of the subjects were Chinese (n = 82, 76.6%), followed by Indians (n = 16, 15.0%), Malays (n = 8, 7.5%) and another ethnicity (n = 1, 0.9%). Most of the subjects did not attend after school child care (n = 72, 67.3%). Only 35 (32.7%) subjects were attending after school child care. 79(73.8%) subjects live in a family with 2 to 3 children (including subject), 17 (15.9%) subjects have no siblings since the subjects were the only one child in the family, 10 (9.3%) subjects live in a family with 4 to 5 children and 1 (0.9%) subject live in a family with more than 5 children (Table I). Height, weight, BMI and classification of BMI of subjects are shown in Table II.

Table II: Height, weight, BMI and classification of BMI of subjects

Variable	n (%)	Mean (SD)
Height (cm)		108.78 (11.34)
Weight		18.62 (4.72)
BMI (kg/m^2)		15.67 (2.98)
Classification of BMI		
Underweight	22 (20.6)	
Healthy weight	59 (55.1)	
Overweight	14 (13.1)	
Obesity	12 (11.2)	

Table III: Total duration of different activities (mins/wk), total duration of MVPA (mins/wk) and daily minutes of MVPA

Variable	Mean (SD)
Total duration of different activities (mins/wk)	
Playing actively inside the house	151.64 (171.80)
Playing actively in the garden/yard	54.86 (61.46)
Engaging in physical activity/active play that makes them sweat or breathe harder	53.78 (57.77)
Walking	112.64 (162.42)
Playing at the park/playground	43.39 (43.45)
Playing at Indoor play facilities	30.30 (50.32)
Total duration of MVPA (mins/wk)	446.61 (303.17)
Daily minutes of MVPA (mins/day)	63.80 (43.31)

Table V: Association between attending after school childcare and PA level

Attending after school childcare	Physical activity level		χ^2	df	*p-value*
	Low n (%)	High n (%)			
Yes	25 (71.4)	10 (28.6)	4.978*	1	0.026
No	35 (48.6)	37 (51.4)			

*Chi-Square test was performed, df = degree of freedom, Level of significance at $p < 0.05$

The association between gender and classification of BMI was calculated. Female subjects have higher prevalence of healthy weight (n = 27, 58.7%) compared to male subjects (n = 32, 52.5%). Female subjects also have higher prevalence of underweight (n= 13, 28.3%) compared to male subjects (n= 9, 14.8%). In contrast, the prevalence of overweight (n = 10, 16.4%) and obesity (n = 10, 16.4%) among the male subjects were higher than prevalence of overweight (n = 4, 8.7%) and obesity (n = 2, 4.3%) among the female subjects. The difference of the prevalence of classification of BMI among different gender was not statically significant since p = 0.069 which was greater than 0.05. Hence, there was no association between gender and classification of BMI. A total of 60 (56.1%) subjects were having low PA level (<60 minutes MVPA) while there were 47 (43.9%) of subjects having high PA level (>60 minutes MVPA). Table III shows the mean of total duration of different activities per week. The association between age and PA level was calculated.

Table IV: Association between ethnicity and PA level

Ethnicity	Physical activity level		χ^2	df	*p-value*
	Low n (%)	High n (%)			
Malay	4 (50.0)	4 (50.0)	9.463*	3	0.024
Chinese	52 (63.4)	30 (36.6)			
Indian	4 (25.0)	12 (75.0)			
Others	0 (0.0)	1 (100.0)			

*Chi-square test was performed, df = degree of freedom, Level of significance at $p < 0.05$.

The prevalence of low physical activity level among 6 years old (n = 26, 66.7%) subjects was the highest, followed by 4 years old (n =12, 44.4%), then 5 years old subjects (n = 19, 46.3%). There was no association between age and PA level. The association between gender and physical activity level was also calculated.

Table VII: Correlation between daily minutes of MVPA and frequency of active play outdoors

	Mean (SD)	N	r_s	*p-value*
Daily minutes of MVPA	63.80 (43.31)	107	0.201*	0.038
Frequency of active play outdoors **	4.26 (1.20)			

*Spearman correlation analysis was performed, r_s is the correlation coefficient, level of significance at $p < 0.05$.
**The maximum of the score was 10, while the minimum score was 2. The higher the total score, the more frequency of active play outdoors.

There was no association between age and physical activity level (p-value = 0.207). The association between ethnicity and physical activity level was calculated by chi-square test (Table IV). The prevalence of low PA level among Chinese (n = 52, 63.4%) was the highest, followed by Malay (n = 4, 50.0%) and Indian (n = 4, 25.0%). The difference of the prevalence of low PA level and high PA among different ethnicities was statically significant since $p = 0.024$ which was lesser than 0.05. Hence, there was an association between ethnicity and PA level. The association between attending after school childcare and PA level was calculated. (Table V). The difference of the prevalence of low PA level and high PA among different groups of subjects who were attending or not attending after school childcare was statically significant (p = 0.026). Hence, there was an association between attending after school childcare and PA level. The association between number of children in the family and PA level was calculated. There was no statistically significant association between number of children in the family and PA level (p = 0.289). There was no association between number of parents working and PA level (p= 0.241).

Association between PA level and classification of BMI

As shown in Table VI, the prevalence of obesity and overweight were higher among subjects with low PA level, 91.7% (n = 11) and 78.6% (n = 11) respectively compared to prevalence of obesity (n = 1, 8.3%) and overweight (n = 3, 21.4%) among subjects with high PA level. Besides, the prevalence of underweight among subjects with high PA level were 68.2% (n = 15) which was higher than prevalence of underweight among subjects with low PA level 31.8% (n = 7). Meanwhile, the prevalence of healthy weight among high PA level was 47.5% (n = 28), lower than the prevalence of healthy weight among the subjects with low PA level 52.5% (n = 31). The association between PA level and classification of BMI of subjects was statically significant (p = 0.002).

Table VIII: Correlation between daily minutes of MVPA and home environments

	Mean (SD)	N	r_s	*p-value*
Daily minutes of MVPA	63.80 (43.31)	107	0.245*	0.011
Home environments **	56.67 (8.38)			

*Spearman correlation analysis was performed, r_s is the correlation coefficient, level of significance at $p < 0.05$.
**The maximum of the score was 10, while the minimum score was 2. The higher the total score, the more frequency of active play outdoors.

Association between home environment and PA level in daily minutes of moderate to vigorous physical activity

The mean scores of indoor home space and supports for PA was 18.53 (4.58). There was a positive correlation between indoor home space and supports for physical activity and daily minute of MVPA as r_s was 0.375. The strength of the positive relationship was fair. Therefore, there was an association between indoor home space

Table VI: Association between PA level and BMI

Physical activity level	Classification of BMI				χ^2	df	*p-value*
	Under-weight n (%)	Healthy weight n (%)	Overweight n (%)	Obesity n (%)			
Low	7 (31.8)	31 (52.5)	11 (78.6)	11 (91.7)	14.603*	2	0.002
High	15 (68.2)	28 (47.5)	3 (21.4)	1 (8.3)			

*Chi-Square test was performed, df = degree of freedom, Level of significance at $p < 0.05$

and supports for PA and daily minutes of MVPA ($p < 0.001$). There was no association between daily minutes of MVPA and outdoor or yard space and supports for PA ($p = 0.062$). There was no association between daily minutes of MVPA and outdoor space and supports for physical activity ($p = 0.192$). There was no association between daily minutes of MVPA and neighbourhood environment safety ($p = 0.168$).

As shown in Table VII, the mean score of frequency of active play outdoors was 4.26 (1.20). There was a positive correlation between daily minutes of MVPA and frequency of active play outdoors as r_s was 0.201. The strength of the positive relationship was relatively weak. The correlation was statistically significant ($p = 0.038$). Table VIII presents the mean score of home environments was 56.67 (8.38). There was a positive correlation between daily minutes of MVPA and home environment as r_s was 0.245. The strength of the negative relationship was fair. The correlation was statistically significant ($p = 0.011$).

DISCUSSION

The results of the study show that the prevalence of overweight among the pre-schoolers is 13.1% and the prevalence of obesity is 11.2%. The prevalence of obesity among the pre-schoolers is almost similar to the findings of a previous study conducted among pre-schoolers in the United States which was 13.9% (Hales et al. 2017). However, according to another study the prevalence of overweight and obesity among adults in Malaysia are 30.0% and 17.7% respectively which is different with the results of this study (Institute for Public Health Malaysia 2015). Meanwhile, the prevalence of overweight (16.4%) and obesity (16.4%) among the males are higher than prevalence of overweight (8.7%) and obesity (4.3%) among females. However, it is found that there is no statistically significant association between gender and overweight and obesity. This finding is supported by a study conducted in Malaysia that stated the prevalence of obesity was not statistically significant with gender (Zainuddin 2016). In addition, the results of this study revealed that the prevalence of overweight and obesity in Malaysia is high. One of the factors that cause obesity among pre-schoolers is the high screen time among children. According to a previous study, at least two-thirds of children have high screen time which exceeded two hours per day (Atkin et al. 2014). A laboratory-based experimental study suggested that exposure to media screen would increase food intake without increased appetite sensation (Chaput et al. 2011). Therefore, it can be concluded that the high screen times among pre-schoolers will lead to increase in energy consumption and further leads to overweight and obesity among pre-schoolers. Interventions that may change behaviour and/or body composition direct participants to substitute activities, such as active gaming for sedentary gaming, or to earn TV time by participating in PA. However, the acceptability of these changes in the home is debatable, with the need for space, boredom and disruption of other family members.

Another factor that causes obesity among pre-schoolers is dietary intake. A previous study showed that infants with high energy density dietary patterns such as sweet desserts and French fries from 9 months, will have a higher chance to be overweight at 6 years old (Rose, Birch & Savage 2017). Thus, parents should offer healthy food like fruits and vegetables for children. Furthermore, a cross-sectional study conducted in Japan reported that there is an association between the lifestyle behaviour of the pre-schoolers and overweight (Watanabe et al. 2016). In July 2019, a news report from Malaysia reported that a 12-year-old boy with right leg infection passed away due to the complications. that arose by obesity (Bernama 2019). This news report highlighted the severity and fatality of obesity among children. Therefore, parents should play their roles in monitoring children's BMI since young and foster good lifestyle behaviors among children. In a nutshell, the prevalence of obesity and overweight is high among the pre-schoolers in this study. Furthermore, gender is not associated with overweight and obesity in this study. As the lifestyle patterns adopted in childhood are likely to continue in adulthood, analysis of diet or dietary patterns is also among the approaches that can be performed.

The findings of this study revealed that 56.1% of subjects are having low physical activity level, that is having less than 60 minutes of moderate to vigorous physical activity (MVPA) daily. These results show more than half of the subjects did not meet the physical activity guideline that the pre-schoolers should achieve i.e., at least 60 minutes of MVPA daily. This finding is in accordance with a previous study that reported 65.3% (95% CI: 9.4-70.8) of pre-schoolers are having a low level of PA which was less than 60 minutes of outdoor PA daily. Conversely, another study reported that the PA level of pre-schoolers aged between 2 to 6 years old was adequate (Schmutz et al. 2018). One of the possible reasons for the difference in findings is due to the recommended guideline of the previous study used was at least 180 minutes per day of PA while this study is based on the recommendation guideline from the Australian Government Department of Health which is at least 60 minutes of MVPA. Furthermore, the study was conducted in Switzerland. Switzerland has different cultures, seasons and weather compared to Malaysia. Meanwhile, a few studies conducted in Malaysia on the PA level among children reported low PA levels (Sharif et al. 2016; Wafa et al. 2014). It was found that the prevalence of low PA level among 6-year-old children is the highest (n = 26, 66.7%) compared to 4 and 5-year-old children. However, there was no statistically significant association between age and PA level. In addition, high PA level was reported among male subjects (49.2%) than female children (37.0%). However, there is no association between gender and PA level. Meanwhile, the results of this study show that ethnicity is associated with the PA level ($p =$

0.024). The prevalence of low PA among Chinese is the highest, followed by Malays and Indians. Previous studies reported the association between ethnicity and PA which supports the findings in this study (Lee et al. 2017; Ying et al. 2015). The study reported that the prevalence of physical inactivity among Chinese (47%) was the highest. Moreover, the results of this study revealed that there is an association between attending after school childcare and PA level. The results showed low PA levels among subjects attending after school childcare (71.4%) which is much higher than subjects not attending after school childcare (48.6%). This finding was supported by a similar study that reported pre-schoolers had a significantly low PA during childcare hours (Hinkley et al. 2016). This finding may be explained by parents' belief that their children perform enough physical activity in childcare centres and not prioritise PA after childcare hours. Hence, parents should pay more attention to PA in children even if they are attending the after school childcare centres. The findings of this study showed that the prevalence of low PA levels in families with 4 to 5 children is the highest. However, no statistically significant difference is found between the number of children. The results of this study revealed the importance of PA since the low PA level is associated with overweight and obesity. This is in line with another study which reported that MVPA was significantly associated with adiposity among children (Marques et al. 2015). Moreover, a study on parenting practices on affecting the adiposity and physical activity has revealed that parental influences play important roles in children's BMI and lifestyle such as having high physical activity levels (Lloyd et al. 2014). Obesity or high BMI is due to uneven intake and expenditure of energy. Since physical activity is one of the methods for energy expenditures by promoting fat oxidation, parents should foster physical activity behaviour among children since young for obesity prevention.

The main finding of this study was that home environment attributes were significantly associated with children's physical activity level. The finding revealed a significant positive correlation between the home environment and the pre-schoolers' physical activity level (p=0.011). This finding is supported by a cross-sectional study that used direct observation methods in the home environment which had more reliability compared to other studies (Nicola et al. 2008). Besides, a study on the relationship between home environment and children's after school PA reported that the home environment is associated with boys' PA level (Lau et al. 2015). Another previous study also supports that home environment such as home spaces were associated with PA level (Sirard et al. 2010). The home environment is an important influence on the sedentary behaviour and physical activity of children, who have limited independent mobility and spend much of their time at home.

The present study utilized HOP-Up questionnaire to access the home physical environment. This questionnaire includes different subscales such as indoor home space and supports, outdoor or yard space and supports for physical activity, outdoor space and supports for physical activity, and neighbourhood environment safety. The correlation of each subscale is analysed independently with the PA level of the subjects to obtain more specific and detailed results. There is a significant positive correlation between indoor home space and supports for physical activity and PA level ($p < 0.001$). The finding shows that the larger home spaces and the more physical support in the house, the higher the PA level among pre-schoolers. In terms of physical activity supports, current findings are aligning with several previous studies that suggest the availability of home physical activity resources are positively associated with PA levels among children and adolescents (Lau et al. 2015; Sirard et al. 2010). This is because the availability of home physical supports will improve the children's motivation in engaging in physical activity with physical support equipment such as toys and active video games.

A previous study on active video games suggested that active video games are able to promote light to moderate PA among children (Biddiss & Irwin 2010). Thus, parents could consider providing active video games at home as an appealing option to motivate children involving PA in leisure time. Meanwhile, no significant correlation is found between outdoor or yard space and supports for physical activity and PA level among pre-schoolers ($p = 0.062$). In this subscale, the outdoor space is representing space that is immediately outside the house or yard. In addition, both outdoor space and supports for physical activity and neighbourhood environment safety were not significantly correlated to the PA levels among pre-schoolers. A previous study suggested that parents of the subjects, who perceived a high crime rate in the neighbourhood, allowed the subjects to play more in the yard instead of the outdoor (Veitch, Salmon & Ball 2010). Thus, the children's PA level still remains constant no matter the children were playing in the neighbourhood or in the house yard. However, the present study showed that the frequency of active play outdoors is positively correlated with children's physical activity level, but the strength of the relationship is relatively weak. Thus, the explanation is still acceptable since it is not mandatory to let children be physically active outdoor instead of indoors. In summary, this study found a statistically significant association between home environment and physical activity levels among pre-schoolers.

Limitation and recommendations

This study provides preliminary evidence on the link between home environment and PA behaviours of pre-schoolers in Malaysia. However, the results of the current study should be interpreted with caution because of its cross-sectional study design, which limits the ability to make causal inferences. In addition, both the home environment characteristics were proxy-reported and, as such, may have been vulnerable to bias. Therefore, the correlation of the home and neighbourhood environment with children's PA needs to be studied further with increased specificity and improved measures to improve

the quality of evidence. Future research should explore the relationships between parental behaviour, family rules, equipment, and arrangement of the home space, to better understand how physical activity is influenced by the home environment.

CONCLUSION

This study concluded that the prevalence of overweight and obesity are high among pre-schoolers. However, no statistically significant association was found between gender and obesity. Furthermore, the prevalence of PA among pre-schoolers is relatively low. There are no associations found between age, numbers of siblings and numbers of working parents with physical activity levels among pre-schoolers. Meanwhile, the prevalence of low PA level among subjects attending after school childcare is higher than subjects who are not attending after school childcare. A significant positive correlation is found between the home environment and PA level among pre-schoolers. Parents should encourage outdoor activities of children and take steps to decrease screen time of pre-schoolers. More research is needed on correlations between the home environment and PA in Malaysia, particularly using objective measures of the built environment and longitudinal cohort studies to better guide effective health promotion interventions and policies.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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