Mal J Nutr 20(1): 1 - 14, 2014

Association between Home Environment, Dietary Practice, and Physical Activity among Primary School Children in Selangor, Malaysia

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ABSTRACT

Introduction: The home environment plays an influential role in affecting dietary and physical activity practices of children. This study aimed to determine the association between the home environment, dietary practice and physical activity among primary school children in Selangor. **Methods:** This cross-sectional study was conducted in five primary schools selected using multistage stratified sampling. A total of 293 children (32.8% males and 67.2% females) (mean age of 11.0±0.9 years) and their parents (10.7% fathers and 89.3% mothers) completed the study. Dietary practice of the children was assessed using a two-day dietary recall. Energy expenditure and physical activity of the children were assessed using a two-day physical activity recall. Parents of the children completed the Home Environment Survey (HES). **Results:** The mean energy intake of the children was 1765±416 kcal/day with 75.0% not achieving the Malaysian Recommended Nutrient Intake (RNI) for energy. Almost all children (96.5%) were physically inactive, with a mean energy expenditure of 1269±342 kcal/day. High availability of fruit/vegetable at home was associated with high vegetable intake (r=0.128, $p<0.05$) and low fat intake (r=-0.115, $p<0.05$). High availability of fats/sweets at home (r=0.125, $p<0.05$) and parental role modelling of healthy eating (r=0.117, $p<0.05$) were associated with high fruit intake. High availability of physical activity equipment at home was associated with high energy expenditure (r=0.123, $p<0.05$). Parental role modelling of physical activity was associated with high energy expenditure (r=0.123, $p<0.05$) and high physical activity (r=0.123, $p<0.05$). **Conclusion**: The results indicate the important roles of parents in promoting healthy eating and active lifestyles among children.

Key words: Children, dietary practice, home environment, physical activity

INTRODUCTION

The home environment is the most influential environment that shapes children's eating and physical activity behaviours as children first establish their health-related habits at home (Golan, Kaufman & Shahar, 2006). For instance, availability of healthful food and physical activity equipment at home can help to promote healthy eating and active lifestyle among children (Spurrier *et al.*, 2008). In addition, the role of parents in providing support and encouragement at home exerts

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great influences on the eating and physical activity behaviours among children (Gattshall *et al.*, 2008).

According to Robert (2010), the home environment comprises both physical and social components that are related to dietary practice and physical activity of children. The physical components include the availability and accessibility of food and physical activity equipment. Availability is related to whether the food or physical activity equipment of interest are present in an environment, whereas accessibility is related to whether these food or physical activity equipment are easily approached or present in a location that facilitates their consumption or ease of use (Cullen *et al.*, 2003). On the other hand, the social components include parental role modelling and their policies to support a healthy lifestyle (Gattshall *et al.*, 2008). Parental role modelling is defined as the behaviour of the parents which stimulates similar behaviour in their children through an observational learning process (Rosenthal & Bandura, 1979). Parenting practices or parental policies to support a healthy lifestyle is defined as the specific act performed by the parents to socialize their children (Darling & Steinberg, 1993) such as rules for eating and exercise or verbal encouragement to practice a healthy lifestyle. The physical and social components of the home environment play a significant role in determining the child's dietary practice and physical activity (Gattshall *et al.*, 2008; Spurrier *et al.*, 2008). Assessing both the physical and social aspects of the home environment can provide a more comprehensive picture of the contribution of the home environment towards dietary practice and physical activity among children.

In Malaysia, there have been several studies reporting the influence of the home environment on body weight status of children (Tung, Shamarina & Mohd Nasir, 2011; Wan Abdul Manan, Norazawati & Lee, 2012). Wan Abdul Manan *et al.* (2012) reported that high parental restriction on unhealthy food consumption and low parental pressure on eating were associated with high body mass index (BMI) of the Malay primary school children in Kota Bharu, Kelantan. Tung *et al.* (2011) found that high parental BMI, high parental concern about child's weight, and low parental restrictions on unhealthy food were associated with high BMI among children in Selangor and Kuala Lumpur. Conversely, parents who exert more pressure on eating was associated with lower BMI in their children. However, no associations were found between availability of food at home, parental role modelling and encouragement in healthy eating and physical activity with body weight status of the children. These studies focused mainly on the influence of the home environment on body weight status of the children (Tung *et al.*, 2011; Wan Abdul Manan *et al.*, 2012). None of these studies have reported the influence of the home environment on dietary practice and physical activity of children. Hence, this study aims to determine the influence of physical and social components of the home environment on dietary practice and physical activity of children in the state of Selangor.

METHODS

Study setting and subjects

This cross-sectional study was conducted at five selected primary schools in Selangor. Schools were selected by using a multistage stratified sampling method. Ethical approval was obtained from the Medical Research Ethics Committee of the Faculty of Medicine and Health Sciences, Universiti Putra Malaysia. Permission to conduct the study was granted by the Ministry of Education, and the Selangor Department of Education.

Out of 630 schools that met the inclusion criteria (co-educational, non-religious, and non-residential), five schools (two Malay schools, two Chinese schools, and one Tamil school) were randomly selected. The minimum sample size required for the study was

227 students based on the formula by Green (1991). By taking into consideration a 25.5% response rate from parents (Tung *et al.*, 2011), a total of 601 students aged 11.0 ± 0.89 years (standard 4, 5 and 6) from the five schools and their parents were invited to participate in this study. Information sheets and consent forms were distributed to the students and their parents. A total of 293 students (32.8% males and 67.2% females) and their parents (10.7% fathers and 89.3% mothers) consented and completed the study (response rate was 48.8%). About half (53.9%) of the students were Malay, 34.8% were Chinese, and 11.3% were Indian. A majority of the parents had attained university education (father, 51.2%; mother, 45.0%) and the mean parental monthly income was RM 8221±6130 per month.

Measures

Data were collected using two sets of questionnaires: (a) Student-Version Self-Administered Questionnaire and (b) Parent-Version Self-Administered Questionnaire. Both sets of questionnaires were translated into three languages: Malay, Mandarin, and Tamil. Back-translation was conducted by experienced language experts. Questionnaires were pre-tested to determine the face validity and ease of understanding prior to data collection. During data collection, the Student-Version Self-Administered Questionnaire was completed by the students. Data on two-day dietary recall and two-day physical activity recall were obtained from the students through face-to-face interview. The Parent-Version Self-Administered Questionnaire was given to the students for completion by their parents at home.

Student-version self-administered questionnaire

Students were required to fill out the questionnaire to provide information on sex, ethnicity, age, and date of birth.

Two-day dietary recall

The students were interviewed twice to gather dietary data for one weekend day and one weekday. Students were first taught ways to estimate the portion sizes of the food and beverages they consumed using household measurements. Then, detailed descriptions of the food and beverages which include the cooking methods, brand names of the processed food, and quantities of the food they consumed were further obtained during the interview by the researchers. The dietary data were analysed using the First Data Bank Nutritionist Pro Nutrition Analysis Software to obtain the energy, macronutrient and sugar intakes. In addition, the number of servings for major food groups, namely (1) rice, bread, cereals, and cereal products, (2) vegetables, (3) fruits, (4) fish, poultry, meat, and legumes, and (5) milk and dairy products were obtained from the Food Guide Pyramid Analysis available in the Nutritionist Pro Nutrition Analysis Software. The Malaysian Nutrient Composition of Food database (Tee *et al.*, 1997) was used in the analysis. For food unavailable in the database, the USDA nutrient database (U.S. Department of Agriculture, 2009) was used in the analysis. The means and standard deviations for energy, nutrient intakes and serving sizes of food groups were reported. The energy and nutrient intakes were then compared with the Recommended Nutrient Intakes for Malaysians (RNI) (NCCFN, 2005) to determine the energy and nutrient intakes adequacy. The ratio of mean energy intake (EI) to basal metabolic rate (BMR) was calculated to determine under-, acceptable-, and over-reporting of energy intake (EI/BMR). The acceptable range of EI/BMR for males and females aged 6 to 18 years were 1.39–2.24 and 1.30–2.10 respectively (Torun *et al.*, 1996). An EI/BMR value below the acceptable range was categorised as under-reporting, within the acceptable range as acceptable-reporting, and above the acceptable range as over-reporting.

Two-day physical activity recall

The students were also interviewed to recall all the activities they performed including their body postures (sitting, standing, or walking) for every 15 min over a 24-h period for two days (one weekend day and one weekday, on the same day as dietary recall). Each activity performed was assigned a MET value (1 MET = 3.5ml of oxygen/ kg body weight/ min or resting metabolic rate) based on the Compendium of Physical Activities (Ainsworth *et al.*, 1993). The energy expenditure of each activity was calculated by multiplying the MET value with the duration of the activity (hour) and body weight (kg) (Ainsworth *et al.*, 1993). Total daily energy expenditure (TDEE) was calculated by summing up the energy expenditure for each activity done in one day. Physical activity level (PAL) value was calculated by dividing the total daily energy expenditure (TDEE) with the basal metabolic rate (BMR) (FAO/WHO/UNU, 2005). The physical activity level was further classified into four categories: sedentary (<1.40), light activity (1.40–1.69), moderate activity (1.70–1.99), and vigorous activity (2.00–2.40) (FAO/WHO/UNU, 2005)

Parent-version self-administered questionnaire

The parents were requested to fill in a parent-version self-administered questionnaire which consisted of four sections: (i) Socio-demographic background: The parents were required to fill in their socio-demographic information including education level, occupation, and monthly income. (ii) Home Environment: The home environment in this study consisted of a physical activity-related dimension and diet-related dimension. Both dimensions were further made up of their physical and social components. For the physical activity-related dimension, the physical components include physical activity equipment availability and physical activity equipment accessibility and the social components including parental role modelling of physical activity and parental policies around physical activity. As for the diet-related dimension, the physical components include fruit/vegetable availability, fat/sweet availability, fruit/vegetable accessibility, and fat/sweet accessibility, and the social components include parental role modelling of healthy eating and parental policies around eating. The Home Environment Survey (HES) (Gattshall *et al.*, 2008) was used to assess both physical activity-related and diet-related dimensions of the home environment of the students. The HES consisted of 126 items divided into 10 dimensions, namely (i) fruit/vegetable availability (26 items), (ii) fruit/vegetable accessibility (1 item), (iii) physical activity availability (22 items), (iv) physical activity accessibility (4 items), (v) fat/sweet availability, (17 items), (vi) fat/sweet accessibility (4 items), (vii) parental role modelling of healthy eating (12 items), (viii) parental role modelling of physical activity (6 items), (x) parental policies around eating (10 items) and (xi) parental policies around physical activity (5 items). Each dimension of the HES was scored on a 5-point Likert scale ranging from "never" (0) to "always" (4). For the dimension of availability of physical activity equipment (iii), response options were either "yes" (1) or "no" (0). Reverse scoring was assigned to negative items in each dimension indicating negative influence of the home environment on the physical activity and dietary intake of the students. The score of each item was then summed up and divided by the number of items answered in each dimension to obtain an average score for the respective dimension. For the dimension of availability of physical activity equipment (iii), a total score was obtained by summing up the score of all items in this dimension. A higher mean score for each physical component indicates higher availability and accessibility of physical activity equipment and food at home. In addition, a higher mean score for

each social component indicates that parents were more frequently good role models and supported a healthy lifestyle of their children. The internal consistency (Cronbach's alpha) for each dimension of the HES in this study ranged from 0.62 to 0.86.

Statistical analysis

Data were analysed using IBM SPSS Statistics 19 software (SPSS Inc., Chicago, IL, USA). Descriptive statistics such as frequencies and percentages were reported for categorical variables, while mean and standard deviations were reported for continuous variables. Pearson's product-moment correlation was used to determine association between continuous variables. Statistical significance was set at $p < 0.05$.

RESULTS

Dietary practice

Table 1 presents the distribution of students by energy, nutrient intakes, and food groups. The mean energy intake of the students was 1765±416 kcal/day which achieved 86±20% of the RNI for energy. A majority of the students (75.0%) did not achieve the RNI level for energy intake (NCCFN, 2005). No significant difference was found in energy intake between males and females. Table 2 shows that about two in five (39.0%) of the students under-reported their mean energy intake. More than half of the students (56.5%) reported their mean energy intake within the acceptable range and 4.5% over-reported their mean energy intake. No significant difference was found in under-reporting between males and females (t=4.000, p>0.05).

In terms of macronutrient intakes, the mean intakes for carbohydrate, protein, and fat were 220.0±71.7g, 72.4±25.2g, and 66.2±24.2g respectively. A majority of the students (72.0%) consumed less than 55.0% of their energy from carbohydrates.

Conversely, three in five of the students had total energy intake exceeding 15.0% from protein (62.0%) and exceeding 30.0% from fat (65.1%). Thus, the diet of the children in this study consisted of a low carbohydrate but high fat and protein diet. No significant difference was found in carbohydrate intake between males and females (t=1.111, p>0.05). However, protein intake of males (79.0±23.8g) was significantly higher compared to females (69.1±25.2g) (t=3.180, p<0.01). Similarly, fat intake was higher among males (71.7±26.3g) than in females (63.4±22.6g) (t=2.788, p<0.01).

Based on the number of servings recommended for food groups in the Malaysian Dietary Guidelines (MDG) for children and adolescents, the mean intakes for rice, bread, cereals, and cereal products were 4.8±2.1 servings which did not meet the MDG recommendation (Table 1). Males (5.8±2.1 servings) had significantly higher intakes of rice, bread, cereals, and cereal products compared to females (4.4±2.0 servings) (t=4.572, p<0.01). While the mean intake for fish, poultry, meat, and legumes (1.7±1.0 servings) met the MDG recommendation, the mean intakes of vegetables (0.9±1.1 serving), fruits (0.4±0.6 serving), and milk and dairy products (0.1±0.3 serving) were less than one serving per day, which did not meet the MDG recommendation. Females (0.5±0.6 serving) had significantly higher fruit intake (0.3±0.6 serving) compared to males (t=2.434, p<0.01).

Physical activity

The mean total energy expenditure of the students was 1269±342 kcal/day and no significant difference was found in the energy expenditure between males (1324±387 kcal/day) and females (1244±315 kcal/day) (t=1.784, p>0.05). A majority of the students practised a sedentary lifestyle (96.5%), followed by light activity (3.5%). None of the students were engaged in moderate and vigorous physical activity. No

Table 1. Distribution of students by energy, nutrient intakes and food groups (n = 293)

Energy, Nutrients	*Male Mean ± SD*	*Female Mean ± SD*	*Total Mean ± SD*	*Male n(%)*	*Female n(%)*	*Total n(%)*
Energy (kcal/day)	1868 ± 378	1717 ± 426	1765 ± 416			
% RNI	85 ± 17	86 ± 21	86 ± 20			
< RNI				70 (72.9)	149 (76.0)	219 (75.0)
≥RNI				26 (27.1)	47 (24.0)	73 (25.0)
Carbohydrate (g/day)	226.6±55.1	216.8 ± 78.5	220.0 ± 71.7			
Protein (g/day)	79.0 ± 23.8**	69.1 ± 25.2	72.4 ± 25.2			
% RNI	175.5 ± 53**	150.3 ± 54.8	158.6 ± 55.4			
< RNI				5 (5.2)	23 (11.7)	28 (9.6)
≥ RNI				91 (94.8)	173 (88.3)	264 (90.4)
Fat (g/day)	71.7 ± 26.3**	63.4 ± 22.6	66.2 ± 24.2			
% of energy from carbohydrate	48.9 ± 8.4	50.4 ± 8.4	49.9 ± 8.4			
< 55%				73 (76.0)	137 (69.9)	210 (72.0)
55 – 75%				23 (24.0)	58 (29.6)	81 (27.7)
> 75%				0 (0.0)	1 (0.5)	1 (0.3)
% of energy from protein	17.0 ± 3.8	16.4 ± 4.2	16.6 ± 4.1			
< 10%				2 (2.1)	5 (2.6)	7 (2.4)
10 – 15%				31 (32.3)	73 (37.2)	104 (35.6)
> 15				63 (65.5)	118 (60.2)	181 (62.0)
% of energy from fat	34.1 ± 7.5	33.2 ± 7.9	33.5 ± 7.8			
< 20%				1 (1.0)	7 (3.6)	8 (2.7)
20 – 30%				28 (29.2)	66 (33.7)	94 (32.2)
> 30%				67 (69.8)	123 (62.8)	190 (65.1)

Food groups	Male Mean ± SD	Female Mean ± SD	Total Mean ± SD	Male n(%)	Female n(%)	Total n(%)
Sugar (mg/day)	32.8 ± 20.1	36.4 ± 21.8	35.2 ± 21.3			
Rice/ bread/ cereals/ cereal products (servings)	5.8 ± 2.1**	4.4 ± 2.0	4.8 ± 2.1			
Vegetable (servings)	0.7 ± 0.9	0.9 ± 1.2	0.9 ± 1.1			
Fruit (servings)	0.3 ± 0.6	0.5 ± 0.6*	0.4 ± 0.6			
Fish/ poultry/ meat/ legumes (servings)	1.7 ± 1.0	1.4 ± 1.1	1.5 ± 1.1			
Milk/ dairy products (servings)	0.1 ± 0.3	0.1 ± 0.3	0.1 ± 0.3			

Note. ** $p < 0.01$, * $p < 0.05$

Table 2. Distribution of respondents by under-reporting, acceptable-reporting, and over-reporting of energy intake (n=293)

	Energy intake / basal metabolic rate (EI/BMR)		
	Under-reporting n (%)	*Acceptable-reporting n (%)*	*Over-reporting n (%)*
Male	39 (40.2)	57 (58.8)	1 (1.0)
Female	75 (38.5)	108 (55.4)	12 (6.1)
Total	114 (39.0)	165 (56.5)	13 (4.5)

Note: Significant difference was determined by χ^2 analysis (χ^2 = 4.00, p> 0.05)

significant difference was found in the physical activity level among males and females (χ^2=0.038, p>0.05). The physical activities that were commonly practised by the students included playing computer games, watching television, playing badminton, bicycling, and playing football.

Home environment

Table 3 presents the mean scores of the physical activity-related dimension (two physical and two social components, respectively) and diet-related dimension (four physical and two social components, respectively) in the Home Environment Survey (HES). There is no total score for HES as each dimension in HES measures different components of the home environment. A higher score for each dimension indicates higher availability and accessibility of physical activity equipment and food at home. It also indicates that parents were more frequently good role models who supported a healthy lifestyle of the students.

For the physical activity-related dimension, the students obtained a mean score of 8.1±2.8 for physical activity equipment availability and 2.7±0.7 for physical activity equipment accessibility. Meanwhile, the students obtained a mean score of 2.4±0.6 for parental role modelling of physical activity and 2.5±0.8 for parental policies around physical activity. On the other hand, the mean score obtained by the students for physical components of the diet-related dimension was 2.0±0.5 for fruit/vegetable availability, 3.2±0.9 for fruit/vegetable accessibility, 2.3±0.5 for fat/sweet availability, and 2.8±0.7 for fat/sweet accessibility, respectively. As for the social components of the diet-related dimension, the mean score obtained was 2.8±0.5 for parental role modelling of healthy eating and 2.4±0.5 for parental policies around eating, respectively. No significant difference was found in the mean score for each dimension in HES between male and female students.

Association between diet-related dimensions of home environment and dietary practice of students

Table 4 shows the association between diet-related dimensions of HES and dietary practice of the students. For the physical components, availability of fruits or vegetables at home was significantly associated with vegetable intake of the students (r=0.128, p<0.05), and availability of fat or sweet at home was significantly associated with fruit intake of the students (r=0.125, p<0.05). In contrast, the availability of fruits or vegetables at home was negatively associated with fat intake of the students (r=-0.115, p<0.05). For the social components, parental role modelling of healthy eating was significantly associated with fruit intake of the students (r=0.117, p<0.05). No association was found between the remaining dimensions with dietary practice of the students.

Table 3. Distribution of students according to mean score for each dimension in HES

Dimensions of home environment	*n*	*Possible score range*	*Student's score range*	*Male Mean ± SD*	*Female Mean ± SD*	*Total Mean ± SD*
(A) Physical activity-related dimensions						
Physical components						
(i) Physical activity equipment availability	293	0.0 – 22.0	1.0 – 20.0	8.1 ± 2.7	8.1 ± 2.9	8.1 ± 2.8
(ii) Physical activity equipment accessibility	293	0.0 – 4.0	1.0 – 4.0	2.8 ± 0.7	2.7 ± 0.7	2.7 ± 0.7
Social components						
(iii) Parental role modelling of physical activity	280	0.0 – 4.0	0.7 – 4.0	2.4 ± 0.6	2.4 ± 0.6	2.4 ± 0.6
(iv) Parental policies around physical activity	280	0.0 – 4.0	0.0 – 4.0	2.5 ± 0.8	2.5 ± 0.8	2.5 ± 0.8
(B) Diet-related dimensions						
Physical components						
(v) Fruit/vegetable availability	293	0.0 – 4.0	0.8 – 3.7	1.9 ± 0.4	2.0± 0.5	2.0 ± 0.5
(vi) Fruit/vegetable accessibility	293	0.0 – 4.0	0.0 – 4.0	3.1 ± 0..9	3.1 ± 1.0	3.2 ± 0.9
(vii) Fat/sweet availability	293	0.0 – 4.0	0.5 – 4.0	2.2 ± 0.5	2.3 ± 0.5	2.3 ± 0.5
(viii) Fat/sweet accessibility	293	0.0 – 4.0	0.0 – 4.0	1.9 ± 0.7	1.8 ± 0.7	1.8 ± 0.7
Social components						
(ix) Parental role modelling of healthy eating	289	0.0 – 4.0	1.6 – 4.0	2.8 ± 0.6	2.8 ± 0.4	2.8 ± 0.5
(x) Parental policies around eating	293	0.0 – 4.0	0.8 – 3.6	2.3 ± 0.5	2.4 ± 0.5	2.4 ± 0.5

Note. For the physical activity-related dimension, higher mean score on each dimension indicates higher availability and accessibility of physical activity equipment at home and greater positive influence of parents to support physical activity. For diet-related dimension, higher score on each dimension indicates higher availability and accessibility of food at home and greater positive influence of parents in supporting healthy eating.

Table 4. Association between diet-related dimensions of HES and dietary intake of students

Diet-related dimensions of HES	*r-value*				
	Vegetable intake	*Fruit intake*	*Fat intake*	*Sugar intake*	*Energy intake*
Physical components					
(i) Fruit/vegetable availability	0.128*	0.001	- 0.115*	0.042	- 0.031
(ii) Fruit/vegetable accessibility	0.028	0.025	- 0.015	0.077	- 0.010
(iii) Fat/sweet availability	0.044	0.125*	0.013	- 0.017	- 0.010
(iv) Fat/sweet accessibility	- 0.012	0.065	- 0.055	0.073	0.094
Social components					
(v) Parental role modelling of healthy eating	0.086	0.117*	- 0.108	0.017	- 0.028
(vi) Parental policies around eating	0.017	- 0.046	0.011	0.060	- 0.029

Note. * $p < 0.05$

Table 5. Association between physical activity-related dimensions of HES with energy expenditure and physical activity of students

Physical activity-related dimensions of HES	*r-value*	
	Energy expenditure	*PAL value*
Physical components		
(i) Physical activity equipment availability	0.123*	0.100
(ii) Physical activity equipment accessibility	0.057	0.043
Social components		
(iii) Parental role modelling of physical activity	0.123*	0.123*
(iv) Parental policies around physical activity	0.058	0.060

Note. * $p<0.05$

Association between physical activity-related dimension of home environment, energy expenditure, and physical activity of students

Table 5 shows the association between physical activity-related dimensions of HES, energy expenditure, and physical activity of students. For the physical components, physical activity equipment availability was significantly associated with energy expenditure of the students (r=0.123, $p<0.05$). As for the social components, parental role modelling of physical activity was significantly associated with energy expenditure (r=0.123, $p<0.05$) and physical activity of the students (r=0.123, $p<0.05$). No association was found between the remaining dimensions with energy expenditure and physical activity of the students.

DISCUSSION

This study found that a majority (75.0%) of the children had total energy intake below the recommended level and about two in five (39.0%) under-reported their energy intake. This finding is consistent with the findings of Elias *et al.* (2007) who reported that the majority (85.3%) of the Malay primary school children in their study in Kuala Lumpur (8.12±0.89 years) had inadequate energy intake. In the present study, no association was found between the diet-related dimensions of the home environment and energy intake of the children. A possible explanation for this may be due to under-reporting of daily energy intake among the children. Recall bias or incorrect estimation of food portion sizes may contribute to under-reporting or over-reporting of daily energy intake among the children (Zalilah *et al.*, 2006).

While children in this study met the recommended servings for fish, poultry, meat, and legumes, the intakes of rice, bread, cereals, and cereals products, fruits, vegetables, milk and milk products were lower than the number of servings recommended for food groups in the Malaysian Dietary Guidelines (MDG) for children and adolescents. Nutrition transition due to rapid urbanisation may have changed the dietary pattern of the children to a greater consumption of animal products (Popkin, 2006) and less intake of other food groups. The low consumption for the food groups might also be due to children's low preference for these food groups (Sharif Ishak, Shohaimi & Kandiah, 2013), unavailability of these food groups at home (Gattshall *et al.*, 2008) or the lack of modelling by their parents on healthy eating at home (Young, Fors & Hayes, 2004).

Consistent with Spurrier *et al.* (2008), we found that availability of fruits or vegetables at home was positively associated with vegetable intake, but inversely associated with fat intake of the children. However, no

association was found between availability of fruits or vegetables at home and fruit intake of the children. In other words, children consume more vegetables and less fat when vegetables or fruits are available at home. The availability of vegetables at home especially during dinner may significantly influence the vegetable intake of the children as dinner is the most common time to serve vegetables (Wyse *et al.*, 2011), and is the most frequently consumed meal among children and adolescents (Moy, Gan & Siti Zaleha, 2006). The negative association between the availability of fruits or vegetables at home with fat intake of the children in this study was consistent with Bourcier *et al.* (2003). They found that more healthy foods that were available at home predicted lower fat intake of the children. Parents tend to restrict their child's access to high energy-dense snack foods by exerting pressure on their child to consume foods that they perceive to be healthy such as fruits and vegetables (Galloway *et al.*, 2005).

In this study, home availability of fat or sweets and parental role modelling of healthy eating were significantly associated with fruit intake, but not vegetable intake of the children. Restricting children's access to unhealthy snack foods may promote consumption of the restricted foods (Ludwig, Peterson & Gortmaker, 2001). Our finding suggests that the fruit intake of the children increased when parents reduced their restrictive practice by making fat or sweets available at home which is supported by the findings of Gribbles *et al.* (2003). As in the case of the study by Young *et al.* (2004), fruit consumption among the children in our study increased when they observed their parents consuming fruit. A likely explanation is that children usually follow the eating behaviours practised by their parents or caregivers and tend to consume unfamiliar food if their parents or caregivers consume it (Savage, Fisher & Birch, 2007).

Our study showed that almost all the children (96.5%) were physically inactive and none of them were engaged in moderate and vigorous physical activity. No association was found between physical activity equipment availability, physical activity equipment accessibility, and parental policies around physical activity with physical activity of the children. This finding is in line with Gattshall *et al.* (2008) that availability of physical activity equipment at home is not significantly associated with physical activity of the children. However, this is inconsistent with the finding reported by Ostbye *et al.* (2013) that parental policies to support physical activity significantly contribute to longer duration in performing moderate and vigorous physical activity among preschool children. The inconsistent results might be due to the physical activity level performed by the children which did not reach a level where significant associations could be detected as almost all the children in the present study practised a sedentary lifestyle.

Among the physical components, availability of physical activity equipment at home was positively associated with energy expenditure of the children. When physical activity equipment is available at home, children tend to participate in physical activities which may contribute to higher energy expenditure among the children. As for the social components, parental role modelling of physical activity was significantly associated with physical activity and energy expenditure of the children. Brustad (2010) reported that parents strongly influenced their child's physical activity since children spent a large amount of time at home with their parents and receive their first exposure to different types of physical activity through their parents.

There are several limitations that should be taken into consideration in this study. First, this study focused on primary school children in Selangor for which the results may not be generalisable to the population of children in Malaysia. Future studies

should propose a nationwide study, so that the findings can be generalised to the whole population of primary school children in Malaysia. The results of the current study is based on 24-hour diet and physical activity recalls; hence recall bias may occur due to social desirability. It is also recommended that cohort studies be conducted in order to determine the causal-effect of the home environment on the dietary practice and physical activity of the children.

CONCLUSION

This study shows that the majority of the children were physically inactive and had inadequate energy intake. The physical (fruit or vegetable availability and fat or sweet availability) and social components (parental role modelling of healthy eating) of the diet-related dimensions of the home environment play important roles in influencing the dietary practice of the children. In addition, the physical (physical activity equipment availability) and social components (parental role modelling of physical activity) of the physical activity-related dimensions of the home environment contribute significantly to the physical activity of the children. Since there is lack of Malaysian studies that assess the contribution of the home environment towards dietary practice and physical activity among children, this study can serve as baseline data for future studies. It is recommended that parental role in providing healthy food at home and parental modelling of healthy lifestyle should be incorporated in future health intervention programmes to promote healthy dietary practice and regular physical activity among Malaysian children.

ACKNOWLEDGEMENTS

The authors would like to thank the Ministry of Education, Malaysia, Department of Education Selangor, Department of Nutrition and Dietetics, Universiti Putra Malaysia (UPM), Faculty of Medicine and Health Sciences UPM, and all study participants. This study was supported by the Research University Grant Scheme (RUGS) of UPM.

Conflict of Interest

The author(s) declare that they have no conflict of interests.

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