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Perceived Benefits, Perceived Barriers and Self-Efficacy Towards Weight Reduction Among Overweight and Obese Children in Kedah, Malaysia

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ABSTRACT

The objective of this study was to identify the psychological factors (perceived barriers to, perceived benefits of, and perceived self-efficacy toward weight reduction) associated with body mass index (BMI) among overweight (OW) and obese children. A cross-sectional survey was carried out among primary school children in Kedah, Malaysia. A multistage randomised cluster sampling technique was used in this study. The socio-demographic data were collected from the parents, and the researchers took anthropometric measurements of the children. A set of validated instruments were used to assess perceived benefits of weight reduction, perceived barriers to weight reduction, perceived self-efficacy in dietary practice and perceived self-efficacy in exercise among the participants. Data were analysed by using SPSS software for Windows Version 25.0. A total of 398 OW and obese children aged 10 and 11 years old (221 boys and 177 girls) were recruited. Based on the socio-demographic data, the father's educational level was found to be significantly associated with the child's body mass index (BMI) ($\chi 2$ = 7.873, p = 0.049). There were no significant differences in mean scores for perceived benefits, perceived barriers, and perceived self-efficacy in dietary practice and exercise between the OW and obese groups (p>0.05). However, perceived self-efficacy in exercise was significantly associated with BMI

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among OW and obese children ($p<0.05$). Health perceptions and beliefs variables are important and should be included in any future weight management programme among OW and obese children.

Keywords: Body mass index, body weight status, obesity, overweight, perceived barriers, perceived benefits, perceived self-efficacy

INTRODUCTION

Obesity is a multifactorial syndrome with genetic, sociocultural, environmental and psychological factors contributing to its aetiology. Currently, obesity-combating initiatives, especially through prevention programmes, are widely practised. Different subclasses of obesity are crucial for tailoring appropriate and efficient care (Buscemi et al., 2013). However, positive change must come from the person themself and support within all parts of society, including governments, schools, businesses, non-profit organisations, neighbourhoods, communities and families, to make true progress. Hence, a detailed assessment of psychological and emotional risks and current eating and exercise habits are also important to help overweight (OW) or obese people maintain a healthier weight.

Children's obesity is one of the most important public health challenges of the 21st century. The number of OW and obese children and adolescents aged 5 to 19 has increased drastically worldwide, from 4% in 1975 to over 18% in 2016 (WHO, 2019). Findings from the National Health and Morbidity Survey Malaysia (NHMS) showed that the prevalence of OW and obese children and adolescents (10 to 17 years old) in the state of Kedah was 30.9% (IPH, 2017) and in Malaysia has increased from 30.4 to 32.5% (IPH, 2019). Socio-demographic characteristics such as children's locality have been suggested as important determinants of childhood obesity. Thus, from this study, the association between socio-demographic characteristics and childhood obesity can determine Kedah's nature and obesity situation.

Previous studies have shown that psychosocial factors, such as self-belief and self-efficacy, play major roles in the development of obesity (Lazzeretti, 2015; Faghri et al., 2016). Lazzeretti (2015) also added that a psychological asset could be strictly related to unhealthy behaviours, fickle compliance, and poor weight loss programme results. As they can lead to unhealthy lifestyles, they are known to be prominent factors in developing obesity. Thus, there has been increasing interest in understanding the beliefs or psychological functioning of obese children and the effect of psychological influences on the outcome of treatment. Psychological features or behavioural interventions play a key role in treating obesity. They have also been examined to minimise the lack of compliance and increase the effectiveness of dietary treatment. It indicates that higher success rates in treating obesity may correlate with good psychological functioning, and weight loss may be associated with beneficial effects on several care areas (Tseng et al., 2002).

There are several theories and models related to health and behaviour. The Health Belief Model (HBM) is commonly used in health promotion. Champion and Skinner (2008) stated that HBM is a psychological model that describes and predicts the health behaviour used to understand how a disease could be identified and avoided. The pillars of the HBM, namely perceived threat (perceived susceptibility and perceived seriousness or severity) and response effectiveness or modifying variables (perceived benefits, perceived barriers, and self-efficacy), were the basis of the HBM.

Studies on children's beliefs about or perceptions of weight reduction have been conducted in several countries, including South Korea (Park, 2011), Mexico (Rodríguez-Ventura et al., 2014), and seven Middle Eastern countries (Musaiger et al., 2013). Park (2011) reported that, regarding the effect of the health belief model in controlling obesity among elementary school children, health belief was a significant predictive variable affecting the weight-management activity and the desire to control obesity. In this study, only modifying variables were applied due to time constraints regarding the children's school. International studies have shown that childhood obesity can lead to depression in adulthood (Sánchez- Villegas et al., 2010), and obese children are far more likely to become obese adolescents and adults unless they adopt healthy exercise and eating habits. Thus, it is important to promote a better understanding and effective early intervention in younger children (Simmonds et al., 2016).

In Malaysia, studies on psychological or belief factors (barriers, benefits, self-efficacy) among OW and obese children are still lacking. To our knowledge, no similar study has reported the psychological factors for this particular group (OW and obese children) related to primary school children under 12 years old in Malaysia. Therefore, this study aimed to identify the psychological factors (perceived barriers, benefits, self-efficacy towards weight reduction) associated with body mass index (BMI) among OW and obese children.

METHODS

Participants and Recruitment

A cross-sectional study was carried out to investigate the associations of the independent variable (perceived barriers, benefits, and self-efficacy regarding weight reduction) with BMI among OW and obese children in Kedah. The sample size was estimated using the proportions formula created by Lemeshow et al. (1990) and data from the previous study in Kedah (IPH, 2017). The minimum sample size required for this study was 70 participants. In consideration of non-responses and missing data, the minimum sample size was increased by 30%, leading to a total of 91 participants. Participation in this study was selected based on the following eligibility criteria: boys and girls who were OW, > + 1 standard deviation (SD) - ≤ + 2SD, or obese > 2SD (WHO, 2020). Only participations who could provide

written consent and had parents who could read and understand the Malay language were included in this study. Those with physical or mental disabilities were excluded.

A multistage randomised cluster sampling technique was used in this study. A list of primary schools was obtained from the Jabatan Pendidikan Negeri Kedah to achieve the needed sampling size (2019). Participants were selected from rural and urban areas to include representative participants from the state of Kedah. All eleven districts in Kedah were involved in this study. One school was randomly selected from each district from March 2019 to September 2019 by visiting the selected schools. The respective school teachers provided the list of OW and obese children from grades 4 and 5, that is, ages 10 and 11, after being extracted from the National Physical Fitness Standard (SEGAK) test data. Overweight and obese school children aged 10–11 years from the selected schools were chosen based on the assumption that older children (aged 10 and above) were more likely than younger children to express their perceptions correctly, and six primary school children were excluded due to examination at a certification level before entering secondary school.

The written informed consent form was given to the parents of the participants (461), and 415 parents agreed to participate in this study. Of the 415 participants, 398 provided complete data (221 boys and 177 girls). The response rate of the study was 84.3%. Data were collected in three stages: in the first stage, a consent form and socio-demographic data were collected from the parents. The second stage covered anthropometric measurements of the children, while the third stage involved answering HBM questionnaires by children. The perceived benefits, perceived barriers, perceived self-efficacy in dietary practice, and perceived self-efficacy in exercise were among the constructs explored in this study. Respondents must complete the questionnaire (guided group interview) to obtain research information. The researcher explained the question and guided them question by question.

A second screening (using anthropometry measurements) was performed to ensure that only OW or obese children were involved in this study. Body weight was measured in kilograms using a Seca 803 digital scale, with a precision of 0.01 kg. Height was measured centimetres to the nearest 0.1 cm using a Seca 213 portable free-standing height measurement. Measurements were taken twice to obtain the averaged results to minimise measurement bias. This study was approved by the Research and Ethics Committee, Ministry of Health (NMRR-19-577-45778(IIR)). Written informed consent was obtained from all the participants and their parents.

Survey Instruments

The questionnaire included questions regarding demographic characteristics, such as family income, parents' education, and occupation, and questions related to the HBM (48 questions), which comprised four sections and were utilised for data collection. Parents were asked to answer the socio-demographic survey separately and were allowed to bring

it home with them. The instruments related to the health belief model (HBM) were adapted from Park (2011), who used a scale for HBM constructs in their study. The Cronbach's α of the instruments was (α = 0.859) for the perceived benefits of weight reduction, (α = 0.805) for perceived barriers to weight reduction, (α = 0.843) for perceived self-efficacy in dietary practice, and (α = 0.831) perceived self-efficacy in exercise. The response categories used a 4-point Likert scale (1—completely disagree, 2—disagree, 3 – agree, 4—completely agree). For each item listed, a high score was associated with a more positive weight reduction perception. A total score was calculated by summing the marks obtained for perceived benefits, perceived barriers, and perceived self-efficacy. The total score was calculated for the perceived benefits of weight reduction by summing the marks obtained from items 1 to 8. The possible score for this section ranged from a minimum of 8 to 32. The total score was classified into three categories: the low score category ranged from 8 to 16, the moderate category ranged from 17 to 24, and the high category ranged from 25 to 32. Perceived barriers to weight reduction were categorised as low (score 12 to 24), moderate (25 to 36), or high (37 to 48). Perceived self-efficacy in dietary practice was categorised as low (16 to 32), moderate (33 to 48), or high (49 to 64). Perceived self-efficacy in exercise was also categorised as low (9 to 18), moderate (19 to 27), or high (28 to 36).

A guided group interview was used to obtain the information. The researcher explained the questions to every child and guided them question by question. The questionnaire was first translated into Bahasa Malaysia using the forward translation method (English to Bahasa Malaysia). It then was translated again using the backward translation method (Bahasa Malaysia to English) to ensure that the questionnaire's language, meaning, and content were correct and clear, according to two qualified English school teachers. The final version of the instrument was presented to the expert panel of this research group for approval before the data collection began.

Statistical Analysis

Data were analysed using the Statistical Package for Social Sciences (SPSS) software for Windows version 25.0 (SPSS Inc., 2010, Chicago, Illinois). Descriptive statistics were used to describe variables, such as BMI, perceived benefits, perceived barriers, and perceived self-efficacy. The chi-square test was used to determine associations between the variables. An independent sample t-test was used to compare the difference between the means of the OW and obese groups. Multiple logistic regression analysis was used to determine the relationship between HBM variables and children's BMI. The statistical significance was assigned for all statistical analyses at $p < 0.05$.

RESULTS

Respondent's Characteristics

A total of 398 children from 11 primary schools in Kedah were involved in this study; boys made up 55.5% of the sample, while girls comprised 44.5% (Table 1). The study sample was multi-ethnic in composition, while Malay children comprised the largest population, 97.7%. All respondents were between 10 and 11 years old, and most (61.6%) were from urban areas. The mean BMI of the children (25.77 ± 4.27 kg/m²) was higher among the boys than the girls (25.50 ± 3.73 kg/m²). However, no significant difference was found between BMI and sex.

Table 1

Characteristics of study respondents

Characteristics	Boys n (%)	Girls n (%)	Total n (%)	*p*-value
Sex	221 (55.5)	177 (44.5)	398 (100.0)	
Ethnic				
Malay	215 (97.3)	174 (43.7)	389 (97.7)	
Indian	1 (0.5)	0 (0.0)	1 (0.3)	
Others	5 (2.3)	3 (0.8)	8 (2.0)	
Standard (Age)				
4 (10 y/o)	102 (46.2)	71 (40.1)	173 (43.5)	
5 (11 y/o)	119 (53.8)	106 (59.9)	225 (56.5)	
School location				
Urban	147 (66.5)	98 (55.4)	245 (61.6)	
Rural	74 (33.5)	79 (44.6)	153 (38.4)	
Body weight status				
OW	40 (18.1)	56 (31.6)	96 (24.1)	
Obese	181 (81.9)	121 (68.4)	302 (75.9)	
BMI (kg/m²)	25.77 ± 4.27	25.50 ± 3.73	25.65 ± 4.04	0.513

Independent t-test. *$p < 0.05$

About 70% of their parents had attained a minimum secondary school education, and the father's educational level was found to be significantly associated with the child's BMI ($x^2 = 7.873$, $p = 0.049$); however, the mother's educational level was not associated with the child's BMI (Table 2). Most fathers for both categories (OW and obese children) were in elementary jobs, and most mothers were not in the labour force (99.4% homemakers). About 60% of the respondents were classified in the B40 monthly household income, with

a mean of RM1746 ± 861. The children were mostly from low- and bottom-income families based on Malaysia's B40, M40 and T20 household income distribution. In addition, 11.3% (B40 category) came from poor-income families (monthly income of less than RM950). The parents' occupational level and monthly household income were not significantly associated with the child's BMI.

Table 2

Difference in proportion of parental characteristics based on children BMI

Parental Characteristics	Father		Mother	
	OW n (%)	Obese n (%)	OW n (%)	Obese n (%)
Educational level[a]				
Not formal	1 (1.0)	0 (0)	3 (3.1)	1 (0.3)
Primary education	6 (6.3)	6 (2.0)	3 (3.1)	6 (2.0)
Secondary education	66 (68.8)	225 (74.5)	67 (69.8)	215 (71.2)
Tertiary education	23 (23.9)	71 (23.5)	23 (24.0)	80 (26.5)
Total	96 (100)	302 (100)	96 (100)	302 (100)
	$\chi2 = 7.873$, $p = 0.049$*		$\chi2 = 6.276$, $p = 0.099$	
Occupational level[b] (MASCO, 2020)				
Managers	1 (1.0)	5 (1.7)	1 (1.0)	1 (0.3)
Professionals	13 (13.5)	35 (11.6)	13 (13.5)	45 (14.9)
Technicians and associate professionals	7 (7.3)	26 (8.6)	5 (5.2)	16 (5.3)
Clerical support workers	6 (6.3)	16 (5.3)	12 (12.5)	34 (11.3)
Service and sales workers	2 (2.1)	8 (2.6)	2 (2.1)	4 (1.3)
Skilled agricultural, forestry and fishery workers	10 (10.4)	34 (11.3)	3 (3.1)	8 (2.6)
Craft and related trade workers	3 (3.1)	21 (7.0)	1 (1.0)	11 (3.6)
Plant and machine operators/ assemblers	12 (12.5)	28 (9.3)	2 (2.1)	10 (3.3)
Elementary occupations	31 (32.3)	77 (25.5)	11 (11.5)	45 (14.9)
Armed forces occupations	7 (7.3)	25 (8.3)	0 (0)	2 (0.7)
Outside labour force (housewife/ pensioner)	4 (4.2)	27 (8.9)	46 (47.9)	126 (41.7)
Total	96 (100)	302 (100)	96 (100)	302 (100)
	$\chi2 = 6.944$, $p = 0.804$		$\chi2 = 5.548$, $p = 0.902$	

Table 2 *(Continue)*

Parental Characteristics	Father		Mother	
	OW n (%)	Obese n (%)	OW n (%)	Obese n (%)
Monthly Household Income [c] (RM)	Father & Mother			
	OW		Obese	Mean ± SD
B40 (< RM3860)	61 (63.5)		196 (64.9)	RM1746 ± 861
M40 (RM3860 – RM8,319)	26 (27.1)		85 (28.1)	RM5660 ± 1296
T20 (> RM8319)	9 (9.4)		21 (7.0)	RM10820±2276
Total	96 (100)		302 (100)	RM3521±2944
	$\chi 2$ =0.617, p =0.735			

[a] Educational level category based on the Department of Statistics Malaysia (2020)
[b] Occupation classification-based Malaysia Standard Classification of Occupations (MASCO, 2020)
[c] Monthly income categories referred to the Department of Statistic Malaysia (2017) distribution of households by income class in Malaysia. 1USD=RM4.2
Chi-square test - p indicates the level of significance in the difference in proportion ($p < 0.05$*)

Perceived Benefits of Weight Reduction

Children's perceived benefits of weight reduction are presented in Table 3. The mean score of the total perceived benefits item for both groups was 3.18 ± 0.78. Item 11, regarding the perception of "exercise better with friends", had the highest mean (3.52 ± 0.61) and Item 6, regarding the perception of "getting friends", received the lowest mean (2.99 ± 0.82). For all perceived benefits items, the perception of "attractiveness towards others" (Item 8) showed a significant difference ($p = 0.046$), whereby children in the obese group had a higher mean (3.13 ± 0.83) compared to the OW group (2.94 ± 0.84).

Table 3
Mean ± SD of perceived benefits of weight reduction

Perceived benefits	BMI status			
	OW	Obese	All	p-value
1. Health will be improved	3.08 ± 0.84	3.13 ± 0.82	3.12 ± 0.82	0.611
2. Chronic diseases will be prevented	3.27 ± 0.75	3.25 ± 0.79	3.26 ± 0.78	0.862
3. It is easy to act in daily life	3.35 ± 0.74	3.33 ± 0.71	3.34 ± 0.72	0.785
4. Confidence will be increased in everything	3.06 ± 0.78	3.15 ± 0.77	3.13 ± 0.77	0.322
5. Appearance will be better	3.32 ± 0.80	3.35 ± 0.65	3.34 ± 0.69	0.759

Table 3 *(Continue)*

Perceived benefits	BMI status			
	OW	Obese	All	*p*-value
6. I can get a boyfriend	2.92 ± 0.80	3.05 ± 0.84	2.99 ± 0.82	0.173
7. I will have a wide range of selection for clothes	3.20 ± 0.76	3.26 ± 0.83	3.25 ± 0.81	0.481
8. I will be attractive to others	2.94 ± 0.84	3.13 ± 0.83	3.09 ± 0.84	0.046*
9. People react favourably to me	2.89 ± 0.87	3.01 ± 0.84	2.98 ± 0.85	0.222
10. I will save money on food	3.07 ± 0.79	3.10 ± 0.76	3.09 ± 0.76	0.768
11. I will exercise and play the game better with friends	3.52 ± 0.63	3.52 ± 0.59	3.52 ± 0.61	0.989
TOTAL	3.15 ± 0.78	3.21 ± 0.77	3.18 ± 0.78	0.547

Response categories used a 4-point Likert scale (completely disagree = 1, disagree = 2, agree = 3, completely agree = 4). A score was given to each response from 1 to 4 to indicate higher scores strong feeling of benefits.

Perceived Barriers to Weight Reduction

As seen in Table 4, the mean of the total perceived barriers to weight reduction for all children was 2.51 ± 0.87 (range 1 - 4). For Item 8, "it is difficult to stand when delicious food is in front of me", children in both groups had the highest mean (2.95 ± 0.85 for OW) and (2.90 ± 0.80 for obese). The lowest mean for the OW group was for "family often dines out: (Item 7), and for the obese group was for "family often eats food delivered" (Item 6). However, there was no significant difference ($p > 0.05$) between the OW and obese groups.

Table 4

Mean ± SD of perceived barriers to weight reduction

Perceived barriers	BMI status			
	OW	Obese	All	*p*-value
1. I don't know the right diet therapy for weight control.	2.72 ± 0.78	2.62 ± 0.85	2.64 ± 0.83	0.293
2. I don't know desirable snacks for weight control.	2.65 ± 0.83	2.51 ± 0.90	2.55 ± 0.89	0.203
3. I don't understand processed food's food and nutrition labels.	2.41 ± 0.89	2.57 ± 0.91	2.53 ± 0.91	0.132
4. I cannot make simple good snacks for weight control.	2.66 ± 0.74	2.55 ± 0.85	2.57 ± 0.82	0.254
5. I cannot refuse to eat some food when family and friends ask me to try it.	2.72 ± 0.90	2.68 ± 0.89	2.69 ± 0.89	0.725

Table 4 *(Continue)*

Perceived barriers	BMI status			
	OW	Obese	All	*p*-value
6. My family often eats food delivered.	2.16 ± 0.89	2.11 ± 0.87	2.12 ± 0.87	0.623
7. My family often dines out	2.10 ± 0.78	2.15 ± 0.85	2.14 ± 0.83	0.622
8. It is difficult to stand when delicious food is in front of me.	2.95 ± 0.85	2.90 ± 0.80	2.91± 0.81	0.596
9. I don't have time for dieting or exercise.	2.17 ± 0.93	2.30 ± 0.90	2.27 ± 0.90	0.204
10. I don't know the proper way to exercise for weight control.	2.45 ± 0.94	2.48 ± 0.91	2.47 ± 0.92	0.788
11. My family and friends seldom exercise.	2.51 ± 0.90	2.51 ± 0.86	2.51 ± 0.86	0.970
12. It is difficult to practice even though I make a plan.	2.63 ± 0.93	2.57 ± 0.89	2.59 ± 0.89	0.621
TOTAL	2.51 ± 0.86	2.50 ± 0.87	2.51 ± 0.70	0.503

Response categories used a 4-point Likert scale (completely disagree = 1, disagree = 2, agree = 3, completely agree = 4). A score was given to each response from 1 to 4 to indicate higher scores and fewer feelings of barriers. T-test (CI 95%), *$p < 0.05$

Perceived Self-Efficacy in Dietary Practice

As seen in Table 5, the total mean of perceived self-efficacy in dietary practice for weight reduction for all children was 2.77 ± 0.93 (range 1–4). The highest mean was Item 3 regarding eating fresh food instead of processed food: (3.11 ± 0.89), and the lowest mean Item 13 regarding their: "refusal to eat even though offered by family members" (2.40 ± 0.88). There were no significant differences between the groups.

Table 5

Perceived self-efficacy in dietary practice

Perceived self-efficacy in dietary practice	BMI status			
	OW	Obese	All	*p*-value
1. I can eat three meals regularly.	2.81 ± 0.84	2.77 ± 0.90	2.78 ± 0.88	0.669
2. I can eat meals in moderate amounts.	2.80 ± 0.80	2.93 ± 0.76	2.90 ± 0.76	0.152
3. I can eat fresh food rather than processed one.	3.17 ± 0.84	3.05 ± 0.93	3.11 ± 0.89	0.287
4. I can refrain from eating sweets like candy and cookies.	2.75 ± 0.92	2.84 ± 0.84	2.82 ± 0.86	0.385
5. I can refrain from eating fatty food like fried food and fork belly.	2.58 ± 0.82	2.46 ± 0.80	2.49 ± 0.80	0.181
6. I can refrain from drinking carbonated drinks like cola and cider.	3.06 ± 0.99	3.06 ± 0.91	3.06 ± 0.93	0.997

Table 5 *(Continue)*

Perceived self-efficacy in dietary practice	BMI status			
	OW	Obese	All	*p*-value
7. I can eat various foods to avoid unbalance in my diet.	2.63 ± 1.01	2.70 ± 0.90	2.68 ± 0.93	0.478
8. I can refrain from eating just before going to bed.	2.80 ± 0.90	2.77 ± 0.91	2.78 ± 0.90	0.797
9. I can eat slowly, even when hungry	2.89 ± 0.96	2.85 ± 0.94	2.86 ± 0.94	0.756
10. I can stop to eat before filling my stomach, even if the food is delicious.	2.75 ± 0.62	2.60 ± 0.95	2.64 ± 0.95	0.176
11. I can get up early to eat breakfast.	2.77 ± 0.96	2.85 ± 0.97	2.83 ± 0.97	0.499
12. I can refrain from watching TV or reading a book when I eat.	2.50 ± 0.97	2.45 ± 1.01	2.46 ± 0.99	0.692
13. I can refuse to eat when my family or friends offer me food.	2.43 ± 0.88	2.37 ± 0.88	2.40 ± 0.88	0.607
14. I can refrain from eating when I am bored.	2.65 ± 0.90	2.63 ± 0.93	2.63 ± 0.92	0.853
15. I can refrain from eating when I am angry.	2.83 ± 0.98	2.85 ± 0.95	2.84 ± 0.96	0.898
16. I can refrain from eating when I am depressed.	2.82 ± 0.87	2.96 ± 1.96	2.93 ± 1.76	0.719
TOTAL	2.77 ± 0.89	2.76 ± 0.97	2.77 ± 0.93	0.572

Response categories used a 4-point Likert scale (completely disagree = 1, disagree = 2, agree = 3, completely agree = 4). A score was given to each response from 1 to 4 to indicate higher scores and less feeling of self-efficacy in dietary practice. T-test (CI 95%), *$p < 0.05$

Perceived Self-Efficacy in Exercise

Perceived self-efficacy in exercise is presented in Table 6. The mean perceived self-efficacy in exercise for all children was 2.55 ± 0.91 (range 1–4). Item 1, "I can do light exercise every free moment," had the highest mean (2.99 ± 0.82), and Item 5, "I can exercise in cold weather," had the lowest mean. There were no significant differences between the two groups. Only Item 8, "I can exercise instead of watching TV in leisure time", and Item 9, "I can go up and down for five floors," showed significant differences ($p = 0.006$ and $p = 0.05$, respectively), with children in the OW group having a higher mean score than the obese group.

Table 6
Perceived self-efficacy in exercise

Perceived self-efficacy in exercise	BMI status			
	OW	Obese	All	*p*-value
1. I can do light exercise every free moment.	3.03 ± 0.85	2.96 ± 0.78	2.99 ± 0.82	0.448
2. I can exercise until getting short of breath.	2.98 ± 0.92	2.81 ± 0.94	2.85 ± 0.93	0.125
3. I can walk for a distance as far as 15 minutes walk.	2.95 ± 0.76	2.81 ± 0.87	2.84 ± 0.85	0.159
4. I can exercise for 30 minutes three times a week.	2.56 ± 1.05	2.36 ± 0.98	2.41 ± 0.99	0.085
5. I can exercise in cold weather.	1.86 ± 0.89	1.93 ± 0.85	1.91 ± 0.86	0.534
6. I can exercise in hot weather.	2.06 ± 0.97	2.04 ± 0.91	2.05 ± 0.92	0.833
7. I can exercise with friends after school.	2.70 ± 0.93	2.63 ± 0.86	2.65 ± 0.88	0.524
8. I can exercise instead of watching TV in my leisure time.	2.74 ± 1.03	2.43 ± 0.92	2.51 ± 0.95	0.006*
9. I can go up and down stairs to the fifth floor.	2.63 ± 0.94	2.41 ± 0.93	2.46 ± 0.94	0.050*
TOTAL	2.61 ± 0.93	2.49 ± 0.89	2.55 ± 0.91	0.307

Response categories used a 4-point Likert scale (completely disagree = 1, disagree = 2, agree = 3, completely agree = 4). A score was given to each response from 1 to 4 to indicate higher scores and less feeling of self-efficacy in exercise. T-test (CI 95%), *$p < 0.05$

Table 7 shows the unadjusted and adjusted multiple logistic regression analysis of the psychological factors influencing obesity among children in Kedah. The odds of obesity were 2.43 times higher for the high score group of perceived self-efficacy in exercise compared to the low and moderate groups. Factors such as perceived benefits, perceived barriers and self-efficacy in dietary practice did not reveal any significant association with children obesity despite their significant relationship in univariate analysis.

Table 7
Psychological factors associated with obesity of OW and obese children in Kedah

	Multiple logistic regression analysis			
Psychological factors score	Crude OR (95% CI)	*p*-value	Adjusted OR (95% CI)	*p*-value
Perceived benefits				
Low & moderate	Reference	-	Reference	-
High	1.27 (0.14,11.55)	0.829	1.03 (0.11,9.62)	0.978

Table 7 *(Continue)*

Psychological factors Score	Multiple logistic regression analysis			
	Crude OR (95% CI)	*p*-value	Adjusted OR (95% CI)	*p*-value
Perceived barriers				
Low & moderate	Reference	-	Reference	-
High	1.29 (0.68,2.44)	0.430	1.31 (0.68,2.53)	0.416
Perceived self-efficacy in dietary practice				
Low & moderate	Reference	-	Reference	-
High	1.19 (0.71,2.00)	0.519	0.78 (0.43, 1.44)	0.430
Perceived self-efficacy in exercise				
Low & moderate	Reference	-	Reference	-
High	2.18 (1.27,3.76)	0.005*	2.43 (1.34,4.42)	0.004*

DISCUSSION

The distribution of the respondents by sex was almost equal, with 55.5% boys and 44.5% girls. Most children were Malays (97.7%), and the rest included one Indian and five others (Siamese). This proportion is because 85.3% of primary school children in Kedah are Malays, 9.8% are Chinese, and 4.9% are Indians and other races (Jabatan Pendidikan Negeri Kedah, 2019). To preserve the uniformity of the school environment, the targeted respondents were mostly children from national primary schools at the expense of the Chinese and Indian children who were mostly enrolled in the vernacular schools. Our study reports that urban children are heavier than rural children. This finding was in line with the National Health and Morbidity Survey (IPH, 2019), which found that urban children were more likely to be OW and obese than their rural counterparts. However, these findings were inconsistent with the IPH (2017) report for Kedah, showing that rural children had higher BMIs than urban children. The number of sampling locations may explain this difference. Two districts were involved in the study mentioned above, whereas eleven were involved in our study. This study also found that older children were more OW and obese than younger children, even though there was no significant difference in the mean between the two groups. In agreement with our findings, past studies have found that older children are more likely to be obese than younger children, but that body shape and weight concerns are increased (Mukherjee et al., 2016; da Cunha Feio Costa et al., 2016).

Gender differences were found to not be significant in mean BMI. It is in line with a local study which stated that there was no significant difference in the mean BMI between boys and girls (Ahmad et al., 2018). However, it contrasts with Anuar et al. (2005), who stated a significant difference in BMI, which was found to be higher among girls than boys.

This difference might be due to the study respondents' puberty age, when girls' bodies start to release hormones that cause physical changes, such as breasts and buttocks. Girls tend to have higher BMI because of rapid growth and physical changes associated with early puberty and sexual maturation (Ahmad et al., 2018).

About 70% of the parents in the current study had attained secondary education, and almost 25% had received tertiary education. A significant association was found between children's BMI and the father's educational level, but no association was found with the mother's educational level. It was consistent with a previous study that reported that the mother's education is associated with her children's physical development, though not as strong as the father's (Anuar et al., 2005). However, inconsistent with these results regarding the association between parents' educational level and obesity. Fitzgerald and Spaccarotella (2009) found no association between the level of education and obesity. Meanwhile, another finding stated that women with low education and socioeconomic status reported the cost of diet as a barrier, significantly more so with higher educated women (Sharifi et al., 2013).

For parents' occupational levels, this study found that three-quarters of fathers were in elementary jobs, while almost half of the mothers were homemakers. No association was found between the father's and mother's educational levels and children's BMI. Gnavi et al. (2016) mentioned that the prevalence of children's OW and obesity was inversely related to both the mother's and father's educational and occupational levels, with a higher prevalence observed in children born to parents with very low educational or occupational levels. Regarding household income, the present study shows that the mean household income for B40 (RM1,746) and T20 (RM10,820) is lower than the national finding for B40 (RM2,089) and T20 (RM11,469), but for the M40 category, this study found a higher amount (RM5,660) than the national finding (RM4,608) (Department of Statistics Malaysia, 2017). The majority (64.6%) of the respondents in this study came from B40 household families, with 27.9% from M40 and 7.5% from T20. Regarding the association of body weight status and socio-demographic factors among preschool children, Norimah et al. (2014) found no significant association between BMI and food intake, even though parents' educational level and household income were significantly associated with food intake.

This study found no significant difference between the means scores of the OW and obese groups for all the perceived benefits items except the item "I will be attractive to others" (Table 3). The respondents thought the greatest perceived benefit of weight reduction was that they would "exercise and play games better with friends", followed by "easy to act in daily life". A similar finding previously reported that being healthy and physically attractive is a prominent benefit of normal BMI among high school boys and that it can help them improve their physical appearance and attract girls (Tergerson & King, 2002). A previous finding by Park (2011) reported that the highest mean score of the perceived benefits was the item "health will be improved", followed by the item "easy to

act in daily life". Several studies have revealed that the obese group, rather than the OW group, perceived obesity to be a serious threat to their health and perceived that a threat or perceived benefit of a health condition could help predict changes in an individual's health behaviours (Moore et al., 2010; Okop et al., 2016). The result of this study also revealed that the children also knew that the items "preventing chronic diseases" and "better appearance" were benefits that they could get from reducing their weight, with mean scores of 3.26 ± 0.78 and 3.34 ± 0.69, respectively.

The findings show no significant difference in the mean score for perceived barriers to weight reduction in children between the two groups (Table 4). The items "it is difficult to stand when delicious food is in front of me" in diet adherence and the "it is difficult to practise even though I make a plan" for exercise had the highest scores among the children. The lowest mean score for barriers to weight reduction in the OW group (2.10 ± 0.78) was "my family often dines out", and for the obese group (2.11 ± 0.87) was "my family often eats food delivered." In contrast, a previous study (Park, 2011) reported that the highest mean score of perceived barriers to weight reduction was the item "my family often eats food delivered", followed by the item "my family often dines out". This difference might be due to the respondents' family lifestyle and situational factors.

To reduce weight or achieve a normal BMI, acquiring support from family members and friends is very important to overcome perceived barriers, especially situational barriers. "Situational barriers" were the most important factor that kept people from sticking with their recommended diet and planned physical activity. Park (2011) explained the influences of family, peers, and mass media on weight control behaviours, which is related to this study. In relation to this, Serour et al. (2007) highlighted that situational barriers could affect dietary adherence among different groups within the population. He added that adhering to the diet was difficult when the everyday routine was interrupted, such as during weekends, when in a group, while travelling, and dining out. Other barriers to weight loss among OW and obese children were intrapersonal, interpersonal, community, institutional and public policy factors (Fitzgerald & Spaccarotella, 2009). Food is given as a reward, such as fast food as treats, parties, or good achievements. It is involuntary parental encouragement in raising emotional eaters, and the children learn to use food to help them cope with various emotions and feelings. Many children who become OW or obese might have fallen into these entrenched feeding patterns.

This study found that plan adherence scored the highest for physical activity or exercise barriers. Similarly, lack of time as a barrier to physical activity was one of the barriers in many previous studies (Andajani-Sutjahjo et al., 2004; Sit et al., 2008). Lack of interest and motivation to exercise for the item "my family and friends seldom exercise" ranked second highest for exercise barriers. It was consistent with the results stating that tiredness in exercising because of body weight was one of the internal barriers reported

by obese participants (Allison et al., 1999). Moreover, children and adolescents who were OW or obese were less likely to engage in physical activity or exercise because barriers, such as fear of strangers while playing outside, bad weather and too much homework, had a substantial effect on primary school children's levels of exercise (Miri et al., 2017). According to the present study, there was no significant difference between the mean score for perceived self-efficacy in the diet in both groups (Table 5), and this result is consistent with a previous study (Park, 2011). The highest average mean score was dedicated to the item "can eat fresh food rather than processed food," followed by the item "can refrain from drinking carbonated drinks like cola and cider." It is contrary to previous findings (Park, 2011) that the highest mean score of the perceived self-efficacy in the diet was the item "can stop to eat before filling stomach even if the food is delicious" and the item "can get up early to eat breakfast". This difference might be due to the individual respondent's family lifestyles and situational factors.

The lowest score or the most difficult to practise in perceived self-efficacy in dietary practice for both groups was "I can refuse to eat when my family members or friends offer food." It is inconsistent with Park (2011), who found that the lowest mean score in perceived self-efficacy in the diet was for "I can get up early to eat breakfast". According to Shin et al. (2011), individuals with greater overall self-efficacy to avoid eating when food is available may lose weight. That means these groups of children are not ready to reduce weight or control their appetite at this particular time. In relation to this, Kim et al. (2011) found that when obesity incidence was high, self-efficacy was low, and that increased self-efficacy was associated with greater weight reduction. The perceived self-efficacy item "I can refuse to eat when my family members or friends offer foods" portrays an individual's belief in their capabilities to exercise control over challenging demands and over their functioning. These include ambitious self-beliefs of the expectations that people set for themselves, what course of action they want to follow, how much time they spend on the given assignments and how long they persevere in the face of obstacles and setbacks. However, the study by Park (2011) found that the item "can refrain from eating when I am angry" was the most perceived self-efficacy in dietary practice.

Furthermore, there was no significant difference found between OW and obese children in perceived self-efficacy in exercise (Table 6) except for the items "I can exercise instead of watching TV in leisure time" and "I can go up and down stairs for five floors," with the OW group scoring higher than the obese group for both items. However, the greatest mean score for perceived self-efficacy in exercise in both groups was "can do light exercise every free moment," followed by "can exercise until getting short of breath." However, Park (2011) reported that the items "can walk for a distance as far as 15 minutes" and "can go up and down stairs for five floors" were the highest rated items that they could practise. The lowest mean score in both groups was for the item "can exercise in cold weather," while Park (2011) reported that the item "can exercise in hot weather" had the lowest mean score.

In Malaysia, the responses on understanding the weather or season might be different due to the "cold weather," which would refer to rainy days or nights, and it should be noted that there it is not a norm for Malaysians when exercise in that situation, especially in rural areas. In Korea, however, this would refer to the winter season (Lim et al., 2015). For perceived self-efficacy in exercise, the item "I can exercise instead of watching TV in leisure time" shows a significant difference between the two groups, with the OW group having a higher mean score than the obese group. According to research conducted in Greece, the effect of television viewing time on childhood obesity is independent of physical activity levels and can be attributed to decreased overall energy intake while watching television (Manios et al., 2009).

Multiple logistic regression analysis findings showed that the high scoring group for perceived self-efficacy in exercise was associated with obesity. This result was consistent with prior research (Soliman et al., 2018). Other findings suggest that the obese Class I group was more significantly associated with behavioural intentions of weight reduction than the obese Class II and III groups. However, physical activity level remained an independent factor predicting obesity among middle-school students (Park, 2011). This finding is consistent with a Palestinian study which found that perceived barriers were not significant with behavioural intention of weight reduction (Soliman et al., 2018). The differences in findings might be due to other variables affecting children's behaviour regarding weight reduction, such as friends, family, mass media and food taboos. Previous studies (Park, 2011; Saghafi- Asl et al., 2020; Mostafavi et al., 2014) have mentioned that perceived benefits seemed to be the most important factors of weight reduction, followed by perceived barriers.

Studies on psychological factors, health perceptions or beliefs among OW and obese children have been conducted widely in several countries (Buscemi et al., 2013; Faghri et al., 2016; Park, 2011; Gnavi et al., 2016). However, to our knowledge, there are no published studies on this topic in Malaysia. Therefore, this study focused on two categories of BMI that exceeded normal body weight status (OW and obese) in the relationship between HBM variables of weight reduction and obesity. Another advantage of this study is that it is considered a follow-up programme from the SEGAK test run by schools. Therefore, new and recent information on the perceptions or beliefs of OW and obese children in Malaysia, particularly regarding weight reduction, would be most useful for future intervention programme design.

CONCLUSION

In summary, no significant mean differences were found regarding BMI based on perceived benefits, perceived barriers, and perceived self-efficacy in dietary practice, except for some items regarding perceived self-efficacy in exercise. This study found that perceived

self-efficacy in exercise was significantly associated with obesity among OW and obese children in Kedah.

The study's outcomes showed that psychological factors and perceptions are also important for BMI status and, therefore, may be important to consider in weight management programs among children. Incorrect perceptions and beliefs about weight reduction among overweight and obese children should be corrected and prioritised in intervention programs for these groups of individuals. With a correct mindset, the children's body weight management program may become more effective and successful.

LIMITATIONS

There are several limitations of this study that could affect the study findings. First, no comparison can be made to normal children, as this study only involved OW and obese children. Second, despite guided group interviews, the data obtained solely relied on the ability of the children to grasp the actual meaning of each question in the instrument and their concentration on answering the question. Even though the validity of each instrument has been demonstrated, it is possible that it was over- or under-reported. Another limitation was that other potential factors, such as dietary and physical activity, were not measured to seek their association with BMI. Finally, when dealing with children in school, there was limited time available due to concern of interrupting the teaching and learning session. Thus, this study only focuses on selected variables and could not include others, as this age group of the population has some limitations, as mentioned. The data collected may be less accurate and less meaningful if too many questions or instruments are applied during data collection.

RECOMMENDATION FOR FUTURE RESEARCH

Based on the study's limitations, more OW and obese children should be included by choosing more schools, including vernacular schools. In addition, more research on psychological problems in obese children is required, as these issues can worsen over time. Since only a few factors are investigated in the current research, a follow-up study is needed to validate the results in Malaysian children who are OW or obese, as well as to identify a broader range of other HBM variables such as the perceived threat of obesity and cues to action for weight loss.

IMPLICATIONS FOR RESEARCH AND PRACTICE

Based on understanding the three studied psychological perceptions of weight reduction among OW and obese children, a comprehensive and similar intervention programme could be designed for both groups because their perception of weight reduction shows no significant difference. Such programmes should emphasise the benefits of weight reduction

and other alternative activities that should be implemented, such as counselling and behaviour intervention to overcome the obstacles of weight reduction. Subsequently, this may raise awareness among family members or community members to start a healthier lifestyle. The primary school level can be an effective time to teach positive psychological beliefs about a healthy lifestyle and healthy body weight. Therefore, psychological factors should be considered in any future programme to improve children's BMI. The finding may have implications for designing a better health promotion, wellness educational programme, or intervention programme among OW and obese children.

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