Predictors of Weight Status among School-age Children

Lawan Singhasai, Rutja Phuphaibul, Pisamai Orathai, Noppawan Piaseu, Cynthia S. Darling-Fisher*

Abstract: Being overweight is contributing to health problems in children. This study aimed to validate a causal model, the Weight Status Model among Thai School Age Children, depicting the pattern of relationship among children with unhealthy dietary pattern, physical activity and parent and family factors in predicting weight status among Thai school-age children. The participants were 603 dyads of children who were studying in nine primary schools and their parents in Bangkok. The questionnaires used were the Unhealthy Dietary Pattern Questionnaire, the Child Physical Activity Questionnaire, the Parent Physical Activity Questionnaire, the Food Parenting Practice Questionnaire, the Unhealthy Food Available in the Home Scale, the Parent Encouragement of Child Activity Scale, and the Parent Monitoring of Child Television Viewing Scale. Data were analyzed through use of descriptive statistics and path analysis.

The results indicated that parental weight status had a significant positive direct effect on child weight status. Unhealthy food available in the home, parents' unhealthy dietary patterns, and permissive and authoritarian food parenting practices had an indirect effect on weight status through child unhealthy dietary pattern. The Model suggests that nursing interventions to control weight status in children should be focused on shaping them to have a healthy dietary pattern which relates to family factors. However, the Model accounted for only 15.4% of the variance in child weight status. Thus, additional relevant predicting variables such as monitoring of a child's computer game use and parental concern about their child's weight should be included in future studies, and the Model tested further with different populations of children and their parents.

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Introduction

Overweight/obesity is increasing rapidly around the world both in the developed and developing countries. In the United States, data from the National Health and Nutrition Examination Survey (NHANES) indicated that among children aged 6 to 11 years, obesity increased from 11.3% in 1988-1994 to 19.6% in 2007-2008, and to 17.4% in 2013-2014.[1] In Asia, the prevalence of overweight/obesity among Chinese children and adolescents aged 7 to 18 years was 8.1%.[2] It was more likely found in children aged

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10-12 years and children who lived in urban areas. Similarly in South East Asia, childhood overweight/obesity is also a growing problem in Thailand. A survey in 16,596 children and adolescents aged 3 to 18 years found the prevalence of overweight and obesity were 7.6% and 9.0%, respectively.[3] The Institute for Population and Social Research, at Mahidol University stated in the Thai Health Report 2014 that the percentage of overweight and obesity among school-age children was 9.7%.[4] Similarly, a study in Vietnam[5] revealed the percentage of overweight/obesity in 2002 (5.9%) increased to 11.7% in 2004 and the percentages of overweight and obesity among children continuously increasing to 17.8% and 3.2%, respectively in 2010.

Exceeding weight status correlates with adverse health consequences. Empirical evidence has shown that being overweight or obese raises the risk of chronic diseases such as hypertension and metabolic syndrome.[6-7] In addition, previous research revealed an association between overweight in childhood and adulthood.[8]

It is necessary to understand the family context, as parents influence children's dietary patterns and physical activity. To develop an effective and tailored intervention program with family involvement, research needs to examine the factors influencing child weight status within a complex set of factors at the child, parent and family level. Previous descriptive studies in Thailand have reviewed variables related to child weight status[9,10]; however, few studies have sought to describe parent and family characteristics and their influence on child's risk behaviors including unhealthy dietary patterns and physical activity that affects child weight status.[11,12] Furthermore, no studies have explored the effect of the factors influencing child weight status simultaneously. The findings of this study provide a helpful explanation and prediction of weight status of Thai children.

Conceptual Framework and Review of Literature

The conceptual framework of this study was guided by the ecological model of predictors of childhood overweight of Davison and Birch.[13] In this model, child behavior such as dietary pattern and physical activity refers to children's risk factors for developing overweight weight status. These factors are shaped by parent and family factors. In the next level, the parent and family factors are influenced by community, demographic and societal characteristics. There are multiple factors influencing weight status in children; however, the variables in the current study were selected from Davison and Birch's model and based on a literature review. The study framework focuses on child risk factors (including child unhealthy dietary pattern and physical activity), parent and family factors (including food parenting practice, parental encouragement of child activity, parental monitoring of child television viewing, unhealthy food available in the home, parental unhealthy dietary pattern, parental physical activity and weight status) that affect weight status in Thai school children.

Unhealthy dietary patterns are central to the development of childhood overweight.[13] Inappropriate eating behaviors have been positively associated with high weight status.[14] According to Rodriguez-Ramirez,[15] high intake of sweets has been associated with a higher risk of exceed weight status among school-age children. Frequent fast-food consumption is associated with this.[16] In a literature review Nepper and Chai[17] found that the associations of the home food environment with children's eating behaviors and weight status in the normal weight status child were more likely to have healthier foods availability. In addition, Raynor and colleagues[18] found positive relationships between child and parent eating, and parental diet significantly increased the proportion of the variance explained for child eating fruits, vegetables, low-fat dairy, and

snack foods. Furthermore, children of parents who used more authoritative food parenting tended to consume a more healthy diet.

Previous research[19] indicates that physical activity is associated with weight status in school-age children. Children who engage in low levels of physical activity are more likely to be classified as exceeding weight status compared with those engaging in high physical activity.[19] However, parent and family factors influence a child's physical activity. Several studies[20, 21, 22] suggested the role of parent as a factor influencing child physical activity and contributing to child weight status. Parents with more monitoring can decrease a child's screen-time.[20] Moreover, Trost[21] reviewed 71 studies investigated parental supporting and child activity relationship. Higher parental support is associated with higher physical activity among children.[21] Fuemmeler[22] also demonstrated that moderate-to-vigorous activity measured by accelerometers in fathers and mothers was significantly associated with a child's activity.

Genetics is another influencing factor on weight status. A cross-sectional study by Thibault[23] indicated that having at least one overweight parent was positively associated with exceeding weight status.

The current study proposed to validate a causal model displaying relationships among parent and family factors (unhealthy food available in the home; parental unhealthy dietary pattern; permissive, authoritarian, and authoritative food parenting practice; parental monitoring of child television viewing; parental encouragement of child activity; parent physical activity; and parent weight status), child risk factors (child unhealthy dietary pattern and child physical activity) and weight status among school-age children. The hypothesized model is shown in Figure 1. It was hypothesized that the proposed model fitted with the empirical data.

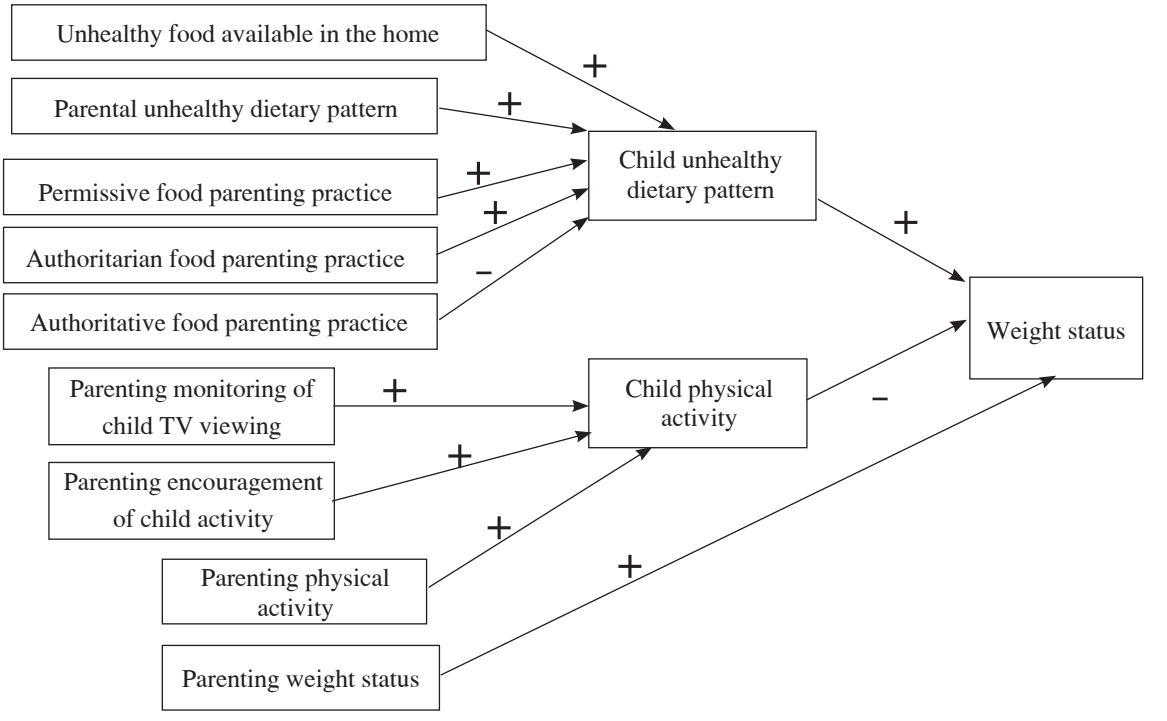

Figure 1 The hypothesized model of factors influencing weight status among school-age children

Methods

Design: A correlational design.

Sample and Sampling: The estimated sample size was calculated using estimated parameters. The ratio of 10-20 respondents per each estimated parameter was recommended for calculation of a structural equation modeling.[24] In this study, there were 23 estimated parameters in the hypothesized model. The sample size was 230 participants when using the ratio of 10 participants per each parameter. However, the sample size was increased by 30% to compensate for violating multivariate non-normality of the study variables. So a sample of at least 299 students and their parents was needed.

A multi-stage sampling technique was used to recruit participants. Primary schools in Bangkok were divided by school sizes into three groups: large, middle, and small size. The large size schools were selected. Three schools under the Bangkok Metropolitan Administration, three schools under the Office of the Basic Education Commission and three schools under the office of the Private Education Commission were randomly selected, making a total of nine targeted schools drawn. Thus, the sample group in this study composed of students in government and private primary schools which held varying economic status and family characteristics. From each of nine primary schools, students in grades 4, 5, and 6 were targeted. One class room in each grade was randomly selected to be included in the study sample. Twenty-seven classrooms were chosen. In each selected classroom, students who willing to participate in this study were recruited in the data collection to reduce the possibility of bias. Participants of this study were 738 dyads of children and their parents, data from 603 dyads (82%) completed and were used for data analysis process.

Ethical consideration: Research proposal was approved by the Institutional Review Board for the protection of human subjects Faculty of Medicine, Ramathibodi Hospital, Mahidol University (No.MURA 2012/313) before the data collection. Children and parents were informed about the purpose and process of the study. Participants were assured that their information would be kept confidential and their identity would not be revealed. Participants were also informed that they could refuse any question or withdraw from this study at any time. If the children agreed to participate, written assent was obtained from them in the classroom setting. Then the parents willing to participate were asked to sign informed consent and their child's consent prior to data collection.

Instruments: Research instruments in this study comprised three self-administering questionnaires for children and seven questionnaires for their parents including the demographic, unhealthy food available in the home, unhealthy dietary pattern, food parenting practices, parent monitoring of child television viewing, parent encouragement of child activity, physical activity questionnaires and the child weight status assessment.

The Child Demographic Questionnaire consisted of gender, age, grade, birth order, number of siblings, daily monetary allowance for school, and health problems.

The Parent and Family Demographic Questionnaire consisted of parents' gender, age, marital status, religion, occupation, type of relationship with the child, number of family members in the home, and who was responsible for cooking food for the child.

The Unhealthy Food Available in the Home Scale was developed by the Principal Investigator (PI) and consisted of 12 items. Unhealthy food available in the home consisted of two dimensions: high-energy foods and sweet foods. Parents were asked to select a response using a 5-point scale on the frequency of the unhealthy food items which were available in their home. Response options range from 0 (never) to 4 (everyday). The total score ranged from 0-48. A higher score indicates more availability of unhealthy foods in home. An item example is: "How many days

per week did you have soft drinks in your home?" Cronbach's alpha coefficients of this questionnaire in the pilot study with 37 parents and the main study were .70 and .72 respectively.

The Unhealthy Dietary Pattern Questionnaire was modified from Part I of the Eating Habits and Physical Activities Questionnaire of Chokprajakchad.[25] The original questionnaire comprised 20 items, and 13 of these that asked about unhealthy behaviors of both children and parent were selected. Examples of food were provided in some items for a better understanding. Furthermore, the rating scale of the original questionnaire which was rated on a scale of 0 (never) to 3 (always) was modified to a 5-point Likert-type scale ranging from 0= never done to 4= did every day. An item example was: "How often do you eat fast-food such as pizza, sandwich, and hamburger?" The interpretation was based on the total scores ranging from 0-52. A higher score indicated higher unhealthy dietary pattern. The reliability of this questionnaire was .76 in the school children group[25]. Cronbach's alpha coefficients of this questionnaire in the pilot study with 37 children and in the main study were .79 and .76, respectively. In the parent group, the reliability of this instrument in the pilot study with 37 parents and in the main study were .75 and .78, respectively.

The Food Parenting Practices (FPP) of Vereeken and colleagues[26] was used to measure authoritative, authoritarian, and permissive food parenting practices. The FPP previously translated into Thai by Thongbai[27] was used. Permission for using this version was obtained prior to use. There are 43 items with a 5-point rating scale ranging from never (1) to always (5). Item examples are: "My child is allowed to take sweets whenever he/she wants." (Permissive), "My child has to finish his/her plate." (Authoritarian) and "If my child does not like something we agree that he/she only has to eat a small amount" (Authoritative). In items addressing the frequency of type of food practices, for the question beginning: "How often do you tell your child…", parents are asked to select a response option from the range of less than once a week (1) to several times a day (5). The total score of permissive, authoritarian, and authoritative food parenting practice ranges from 4-20, 8-40, and 31-155, respectively. Higher scores indicated higher food parenting practice. In the study of Thongbai,[27] reliabilities of this questionnaire ranged from .82 - .92. Cronbach's alpha coefficients of this questionnaire in the pilot study with 37 parents and in the main study were .74 and .76 respectively.

The Parent Monitoring of Child Television Viewing Scale was developed by the PI. This consists of four dimensions: time, amount, content, and access. There are 14 items and responses are chosen on a 5-point scale of the frequency of activities. Response options range from "never" to "always". Scores are reversed for negative behaviors. The score range is 0-56. Higher scores indicate that parents engage in more monitoring of their child's television viewing. An item example is: "After school, your child has to finish homework before watching television." Cronbach's alpha coefficients of this questionnaire in the pilot study with 37 parents and the main study were .71 and .77, respectively.

The Parent Encouragement of Child Activity Scale was developed by the PI and consists of five dimensions: informational support, emotional support, appraisal support, instrumental support, and direct modeling of physical activity. There are 13 items. A 5-point rating scale was used for the frequency of activities. Scores are assigned in each item from never (0) to always (4). Scores range from 0 to 52. Higher scores reflect greater parental encouragement of their child to be active. An item example is: "You praise your child when he/she exercises." Cronbach's alpha coefficients of this questionnaire in the pilot study with 37 parents and in the main study were .87 and .88 respectively.

The Thai Parents' Physical Activity Questionnaire of Siriprachote[10] was used in this study for assessing

the parent physical activity. This questionnaire consists of 20 items asking about the frequency and duration of activities. Example of an activity is: "Ride a bicycle." The total score of physical activities are calculated by using the equation, "Total score = Frequency x Time x METs for each item". Higher scores reflect a higher level of parental physical activity. When this instrument was tested with fathers and mothers of primary school students, the reliability was .88 and .85, respectively[10]. Cronbach's alpha coefficients of this questionnaire in the pilot study with 37 parents and in the main study were .70 and .72 respectively.

Parent weight status in this study refers to parent's body mass index (BMI) and is calculated as parent's weight in kilograms divided by their height in meters squared (kg/m^2). A higher BMI indicates higher parental weight.

The Child Physical Activity Questionnaire was modified from the Physical Activity Questionnaire (PAQ) of Cutchawaree.[28] There are 23 items asking about the duration of each activity. The original questionnaire was modified by adding some items, modifying pictures and duration of activities. Rating is done on a scale of 0 (none), 1 (less than 15 minutes), and 10 (more than 15 minutes). The duration of activities are divided into "never done", "less than 30 minutes", "30 minutes to 1 hour" and "more than 1 hour". An activity example is: "Play a ball such as football, volleyball, chair ball." The total scores of physical activities are calculated by using the equation, "Total score = Duration of activity x Metabolic Equivalents (METs) for each activity. Scores range from 0 to 225. A higher score indicates a higher level of child physical activity. The PAQ was tested for validity with an accelerometer by the criterion method, and was found to be valid ($r = .48$, $p < .01$)[28]. The reliability between test and retest of the PAQ had a high correlation ($r = .85$, $p < .01$)[28]. Cronbach's alpha coefficients of this questionnaire in the pilot and main study were .78 and .79 respectively.

All the developed and modified questionnaires were validated by five experts who were a pediatric nurse instructor with expertise in childhood obesity, two pediatric nurse instructors with expertise in children and adolescents, a public health nurse instructor with expertise in family nursing, and a pediatric doctor with expertise in child nutrition. The content validity index (CVI) of the Unhealthy Dietary Pattern Questionnaire, the Child Physical Activity Questionnaire, the Unhealthy Food Available in the Home Scale, the Parent Encouragement of Child Activity Scale, and the Parent Monitoring of Child Television Viewing Scale were 1.00, 1.00, 1.00, .95, and .96, respectively.

The Institute of Nutrition, Mahidol University (INMU)-NutriStat program was used for determining child weight status. This program was developed by this Institute for assessing the nutritional status in the Thai population from birth to 19 years of age. Child weight status is shown in terms of weight for height % Standard. The higher % Standard weight for height reflects children who have higher weight status.

Procedure: The director of each primary school was contacted to determine an appropriate time for data collection. The children's questionnaires were completed by all students in each classroom. The PI read all questions and the children answered each question by question on the forms. Unclear questions were explained by the PI every time when the children asked. The PI measured the weight and height each child and recorded this on their questionnaire, then PI passed the questionnaires to the parents. The questionnaires were completed by parents at home and then returned to the PI and the completeness of all questionnaires was then checked.

Data Analysis: Descriptive statistics was analyzed by using the SPSS version 18.0 to describe child risk behaviors, parent and family characteristics and child weight status. Data was analyzed in term of frequency, percentages, means, range and standard deviations. Path analysis was analyzed using the LISREL program version 9.10 (Student Edition) to

answer the research questions and test the hypothesized model. Assumptions related to path analysis including normal distributions, linearity, homoscedasticity and multicollinearity[24] were assessed prior to path analysis.

Results

Characteristics of the children: The majority of children were female with a mean age of 10.72 years. Nearly half were the youngest child in the family and had one to six siblings. Their weight ranged between 33.1 and 93.0 kilograms (mean = 41.62) and height ranged between 128 and 169 centimeters (mean = 144.05). Most children had no health problems. Characteristics of children in detail were shown in **Table 1**.

Characteristics of the parents: Most parents were female with the mean age of 41 years. Most of them were the mother. About one-third had secondary school education. Nearly half of parents were employed. The person who most often cooked for the child was the mother. Characteristics of parents are in **Table 2**.

Table 1 Characteristics of children (N = 603)

Variables	Number	%
Gender		
Male	281	46.6
Female	322	53.4
Age (Mean = 10.72, Median = 11, *SD* = 0.92, Range = 9 - 12) years		
9	53	8.8
10	202	33.5
11	210	34.8
12	138	22.9
Grade		
4	187	31.0
5	197	32.7
6	219	36.3
Birth order		
The only child	180	29.9
The first child	119	19.7
The middle child	63	10.4
The youngest child	241	40.0
Number of sibling (Median = 2, Range = 1 - 6) person		
Child's weight (Mean = 41.62, *SD* = 13.10, Range = 33.1 - 93.0) kg.		
Child's height (Mean = 144.05, *SD* = 8.97, Range = 128 - 169) cm.		
School allowance per day (Mean = 49.47, *SD* = 21.95, Range = 20 - 150) baht		
Health problem		
No	527	87.4
Yes	76	12.6

Table 2 Characteristics of parents (N = 603)

Variables	Number	%
Gender		
Male	166	27.5
Female	437	72.5
Age (Mean = 41.23, Median = 39, *SD* = 8.01, Range = 27 – 69) years		
Relation with child participating in study		
Mother	376	62.4
Father	150	24.9
Grandparent	77	12.7
Parent's weight (Mean = 62.45, *SD* = 13.13, Range = 33.1 – 93.0) kg.		
Parent's height (Mean = 147.06, *SD* = 8.51, Range = 128 – 169) cm.		
Marital status		
Single	29	4.8
Married	449	74.5
Divorce	35	5.8
Widow	31	5.1
Separated	59	9.8
Religion		
Buddhism	592	98.1
Christian	4	0.7
Islam	6	1.0
Other	1	0.2
Educational level		
Primary school	168	27.9
Secondary school	185	30.7
Diploma	131	21.7
Bachelor degree	107	17.7
Master degree	12	2.0
Working status		
Unemployment	11	1.8
Housewifery	86	14.3
Agriculturalist	3	0.5
Employee	266	44.1
Self-employed business	89	14.8
Government officer	58	9.6
Other	90	14.9
Family monthly income (Mean = 23,846.97, *SD* = 21,431.01, Range = 5,000 – 100,000) baht		
Number of family member (Median = 4, Range = 2 – 12) person		
Number of children in the family (Median = 2, Range = 1-6) children		
Person who cooks for the child		

Table 2 Characteristics of parents (N = 603) (cont.)

Variables	Number	%
Mother	364	60.4
Father	62	10.3
Grandparent	121	20.1
Other	56	9.3

Descriptive statistics of the study variables: Parents reported their unhealthy food available in the home, unhealthy dietary pattern, authoritarian food parenting practices, monitoring of child television viewing and encouragement of child activity with a mean of each variable approximately half of the possible range. The mean score of permissive and authoritative food parenting practice were slightly higher than half of the possible range. Parent physical activity was low. The mean score of parent weight status was 24.30 kg/m^2 which was having a normal BMI. For the children, they reported their unhealthy dietary pattern approximately half of the possible range. The child physical activity was low. The majority of children (60.2%) had normal weight. Almost one-third of children were overweight and obese (31%), while a few participants (8.8%) were underweight. The results of descriptive statistics of study variables are given in **Table 3.**

Table 3 Descriptive statistics of the study variables (n = 603)

Variable	Possible Range	Actual Range	Mean	SD
Unhealthy food available in the home	0-48	4-41	27.49	5.81
Parent unhealthy dietary pattern	0-52	6-43	28.43	6.92
Permissive food parenting practice	4-20	4-20	12.92	3.33
Authoritarian food parenting practice	8-40	8-36	17.35	3.76
Authoritative food parenting practice	31-155	31-144	89.72	13.72
Parent monitoring of child TV viewing	0-56	2-53	28.98	8.53
Parent encouragement of child activity	0-52	4-49	29.12	9.17
Parent physical activity	0-1,080	7.10-551	130.22	80.69
Parent weight status	-	15.57-47.86	24.30	4.58
Child unhealthy dietary pattern	0-52	3-42	23.99	7.24
Child physical activity	0-225	26.50-199.40	94.77	28.78
Weight status	-	72.75-217.72	113.92	26.12

Model Testing: The model fitted the empirical data. The results revealed $c^2 = 52.30$, $df = 52$, $c^2/df = 1.01$, $p = 0.462$, RMSEA = 0.00, SRMR = 0.03, GFI = 0.98, AGFI = 0.97, and CFI = 0.99 (Figure 2). The model accounted for 15.4% of the variance in child weight status. The causal effects of the variables on weight status are displayed in **Table 4**. Statistical analysis revealed that parental weight status had a significant positive direct effect on child weight status ($\gamma = 0.38$, $p < 0.05$). In addition, the findings revealed unhealthy child dietary pattern had a significant positive direct effect on weight status ($\beta = 0.08$, $p < 0.05$). The results indicated that unhealthy food available in the home, parental unhealthy dietary pattern, permissive and authoritarian food parenting practice had an indirect effect on weight status through child unhealthy dietary pattern. The findings demonstrated that parental monitoring of child TV viewing, parental encouragement of child activity and parental physical activity did not have a significant indirect effect on weight status through child physical activity.

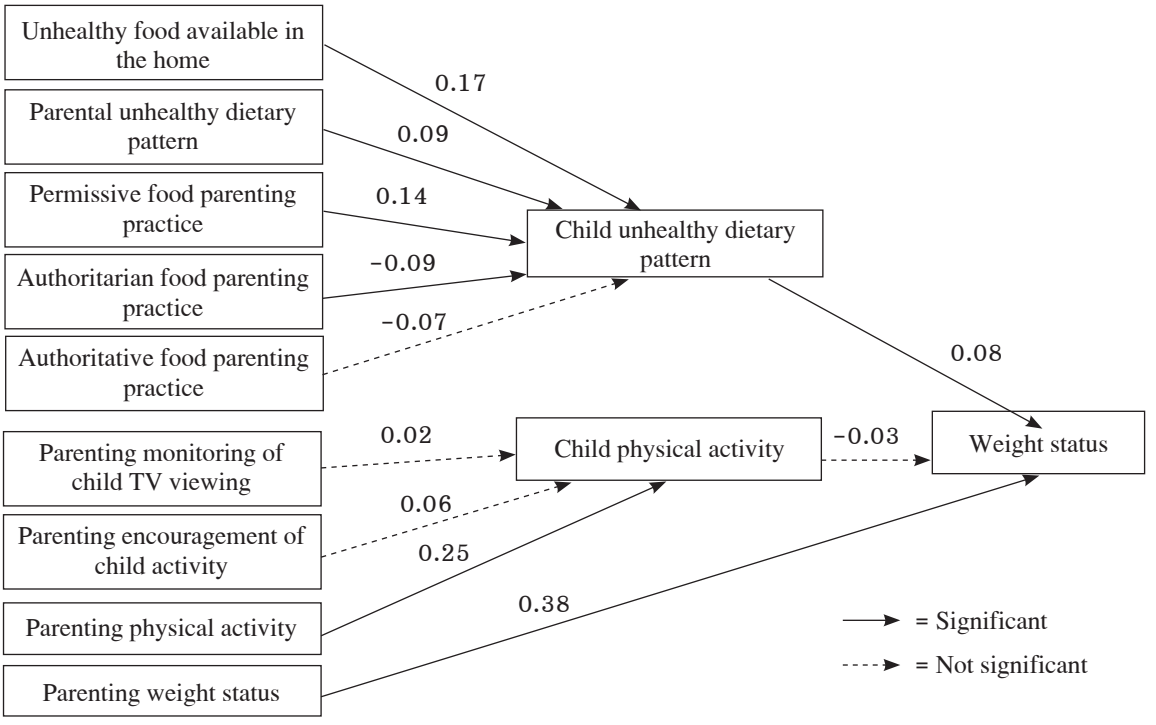

Figure 2: The Weight Status Model among Thai School Age Children (WSTSAC)

Table 4. Path coefficients, standard errors, T-values of parameter estimates of the hypothesized model (N = 603)

Path Diagram	b/Beta	SE of b	*t*-values
BETA			
CDIET - WS	.30/ .08	.14	2.04*
CPA - WS	-.03/ -.03	.03	-.86
GAMMA			
UHFOOD - CDIET	.20/ .17	.06	3.57*
PDIET - CDIET	.09/ .09	.04	2.07*
PMM - CDIET	.03/ .14	.10	3.05*
ATR - CDIET	-.17/ -.09	.07	-2.43*
ATT - CDIET	-.04/ -.07	.02	-1.78
TV - CPA	.06/ .02	.14	.42
ENPA - CPA	.18/ .06	.14	1.33
PPA - CPA	.09/ .25	.02	5.34*
PBMI - WS	2.21/ .38	.22	9.99*

Note: b = Unstandardized Path Coefficient, Beta = Standardized Path Coefficient, SE = Standard Error,
* $p < .05$, UHFOOD= unhealthy food available in the home, PDIET= parent unhealthy dietary pattern, PMM= permissive food parenting practice, ATR= authoritarian food parenting practice, ATT= authoritative food parenting practice, TV= parent monitoring of child TV viewing, ENPA= parent encouragement of child activity, PPA= parent physical activity, PBMI= parent weight status, CDIET= child unhealthy dietary pattern, CPA= child physical activity, WS= weight status

Discussion

These findings support the Weight Status Model among Thai School Age Children (WSTSAC), which hypothesized the relationships between child, parent and family factors that influence weight status in the grade 4 to 6 school-age children. Findings of this study are consistent with previous studies[29,30] which indicated that having parents with overweight weight status increased the risk of high weight status among children. A possible explanation could be because of shared genetic background and environmental factors. In addition, this study found that the child with an unhealthy dietary pattern was at increased risk for high weight status. This finding is congruent with previous research[15] supporting the association between dietary pattern and weight status. The children who participated in this study were school-age children aged 9 to 12. Regarding socio-emotional development, children in middle childhood period are developing skills in many areas. These children gain more independence than in early childhood.[31] When school children spend more time outside home, they have more independence in their food choices.

The result of this study are congruent with previous studies, which found that more availability of unhealthy foods in the home increased children's unhealthy dietary patterns[32] and children with this had a parent who did not have healthy eating.[33] A child's perceptions of their parent's dietary pattern might establish their eating behavior through modeling. A previous study reviewed food selection and found that children would select and eat unfamiliar food when they saw another person eating it.[34]

In addition, results indicated that parents who were more permissive increased the risk of unhealthy dietary pattern in the child. This is congruent with the study of Hennessy et al.[35] which found that a permissive feeding style increased a child's intake of energy-dense foods. This feeding style lead the child to consume unhealthy foods because the parent lacked control of their child's eating and the child was allowed to eat whatever they wanted. Furthermore, this study found that parent who used less authoritarian food parenting practice had a child with unhealthier dietary pattern. This may be related to the ability of parents regarding the regulation of their child's energy intake. If parents control their child's eating of unhealthy foods, they might prefer these foods. Furthermore, the results showed that parents with authoritative feeding style did not effect a child's unhealthy dietary pattern. Although reasoning is more effective with school children because of their ability for logical thinking[31], the amount of time they spend with a parent declines as they get older. A parent may have a greater impact on shaping their child's eating behavior only at home.

One of our findings was not consistent with the previous research[13] which found that school-aged children engaging in low levels of physical activity were more likely to have more weight compared with those engaging in high physical activity. In our study, children tended to have relatively high participation in school activities. Because of the Thai school curriculum which requires physical activities in class (about 2 hours per week), children may decrease their physical activity after school because they already had more activity during school hours.[36]

There was no indirect effect of parent monitoring of child television and parental encouragement of activity on weight status through child physical activity in this study, because of parents' monitoring focusing only on children's television viewing. At present, there are various forms of screen media available. Although parents could limit child television viewing, the child still spent more time using other media and thus decrease their physical activity.[37] In Thailand, a previous study[38] revealed that school-age children spend most of their day-time learning in school and most of their after-school activity taking an extra class or doing their homework. Consequently, these children had a low level of exercise.

Trost[21] found that parental support could increase child physical activity. However, the results of this study revealed that parental encouragement of activities did not increase a child's physical activity which is inconsistent with other studies. Thus, this issue needs further exploration. This study revealed that parents who had more physical activity could promote their child in physical activity. However, there are at least three possible reasons for the absence of an effect of parent physical activity on child weight status. First, it is perhaps because school age children spent the majority of their day time outside home, that direct modeling physical activity from their parents is probably infrequent. Second, it may be related to less amount of time spent in joint parent-child physical activity because difference of types of physical activity. Lastly, older children may need less supervision of their parents. Although the children had more physical activity as their parent did at home, they may have more sitting behavior at school with their friends also.

Limitations and Recommendations of the Study

This study used a cross-sectional design, which limits the ability to clarify the causal relationship between influencing factors and child weight status. In addition, the findings revealed that the study variables jointly accounted for only 15.4% of the variance in child weight status. Therefore, further additional significant variables need to be introduced into the model. In relation to child physical activity, this study focused only on parent monitoring of child television viewing. Future research should assess other variables such as a child's computer game use. Moreover, parental concern about a child's weight may be an additional variable that needs consideration, since this may influence parenting practice.

Considering data collection issues, some other methods might be better in capturing the actual activities and dietary pattern than the questionnaires. For example, a food record on weekdays and weekend could be more accurate in measuring dietary intake. Likewise, a 24-hour activity record and a pedometer could eliminate the under- or over- estimation of physical activity.

Conclusions and Implications for Nursing Practice

The results provide a helpful explanation and prediction of child weight status which reflect the overweight/obesity problem in the Thai context. Child unhealthy dietary pattern was a significant factor that affected weight status. Thus, an implication for nursing practice is to promote healthy dietary patterns to reduce child weight. Healthy dietary patterns should be taught to school-age children. Furthermore, parental weight status had a significant positive direct effect on child weight status. Thus, providing advice to both children and their parent is important to preventing overweight/obesity among children.

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ปัจจัยทำนายภาวะน้ำหนักในเด็กวัยเรียน

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บทคัดย่อ: ภาวะน้ำหนักเกิน/อ้วนในเด็กเป็นปัญหาสำคัญทางสาธารณสุข ซึ่งส่งผลกระทบต่อภาวะสุขภาพและค่าใช้จ่าย การศึกษาครั้งนี้มีวัตถุประสงค์เพื่อตรวจสอบรูปแบบจำลองการวิเคราะห์เชิงสาเหตุเกี่ยวกับภาวะน้ำหนักของเด็กไทยวัยเรียน ตัวแปรในการวิจัยนี้ประกอบด้วยพฤติกรรมการรับประทานอาหารที่ไม่ดีของเด็ก การเคลื่อนไหวและออกกำลังกายในเด็ก และปัจจัยด้านผู้ปกครองและครอบครัว กลุ่มตัวอย่างประกอบด้วยเด็กวัยเรียนที่กำลังศึกษาอยู่ในโรงเรียนประถมศึกษาในกรุงเทพมหานคร 9 แห่ง และผู้ปกครอง เครื่องมือวิจัยประกอบด้วยแบบสอบถามพฤติกรรมการรับประทานอาหารที่ไม่ดี แบบสอบถามการเคลื่อนไหวและออกกำลังกายในเด็ก แบบสอบถามการเคลื่อนไหวและออกกำลังกายในผู้ปกครอง แบบสอบถามการดูแลบุตรด้านอาหาร แบบประเมินอาหารที่มีอยู่ในบ้าน แบบประเมินการส่งเสริมให้บุตรมีกิจกรรมการเคลื่อนไหวร่างกาย และแบบประเมินการควบคุมการดูโทรทัศน์ของเด็ก วิเคราะห์ข้อมูลโดยใช้สถิติขั้นพื้นฐานและการวิเคราะห์อิทธิพลเชิงสาเหตุ

ผลการศึกษาพบว่าแบบจำลองมีความสอดคล้องกับข้อมูลเชิงประจักษ์ ผู้ปกครองที่มีน้ำหนักมากมีอิทธิพลทางบวกต่อภาวะน้ำหนักในเด็ก นอกจากนี้อาหารที่ไม่ดีต่อสุขภาพที่มีอยู่ในบ้าน พฤติกรรมการรับประทานอาหารที่ไม่ดีของผู้ปกครอง และการดูแลบุตรด้านอาหารแบบตามใจและแบบเข้มงวดมีอิทธิพลทางอ้อมต่อภาวะน้ำหนักในเด็กผ่านพฤติกรรมการรับประทานอาหารที่ไม่ดีของเด็ก แบบจำลองนี้ชี้ให้เห็นว่าพยาบาลควรจัดโปรแกรมสำหรับเด็กที่มีภาวะน้ำหนักมาก โดยเน้นการส่งเสริมให้เด็กมีพฤติกรรมการรับประทานอาหารที่ดีซึ่งมีปัจจัยด้านครอบครัวเกี่ยวข้อง อย่างไรก็ตาม แบบจำลองนี้สามารถทำนายความผันแปรของภาวะน้ำหนักของเด็กไทยวัยเรียนได้เพียง 15.4% ดังนั้นควรมีการศึกษาวิจัยเพิ่มเติมในอนาคตเพื่อให้สามารถเข้าใจเกี่ยวกับปัจจัยที่ส่งผลต่อภาวะน้ำหนักเกิน/อ้วนในเด็กวัยเรียนมากยิ่งขึ้น

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