Predicting Factors among Healthy Lifestyle Beliefs, Behaviors and Mental Health Indicators in Taiwanese Adolescents

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Original Research Article

ABSTRACT

Aims: The prevalence of overweight adolescents in Taiwan has dramatically increased in recent years. A survey shows that 66.6% of adolescents do not get the recommended amount of vegetables and fruit (i.e., two portions of fruit and three portions of vegetables per day each week). The purpose of this study was to explore relationships between individual understanding of activity and nutrition, healthy lifestyle beliefs, perceived difficulty of efficacy in reaching health goals, mental health variables, and healthy lifestyle behavior on BMI in Taiwanese adolescents.
Study Design: This is a theoretically-based and cross-sectional research study.
Place and Duration of Study: Data were conducted from two middle schools in Taiwan between Sep 2011 to November 2011.
Methodology: We used a convenience sampling to recruit 453 adolescents with a mean age of 13.42 years. The instruments used were demographics, Beck Youth Inventory II (Depression,

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Anxiety, Self-concept), Healthy Lifestyle Belief Scale, Healthy Lifestyle Behavior Scale, Perceived Difficulty Scale, Nutrition and Activity Knowledge Scales. We conducted path analysis to test our theoretical model by using Mplus 5.21.

Results: Fit indices included $\chi 2$ (23, 453) =33.75, *P*= .05, *CFI*=.98, and *RMSEA*=.03, indicating that the model fit the model well. Healthy lifestyle beliefs had a significant positive effect on healthy lifestyle behaviors (β= .41, *P*= .01). Moreover, there was a significant negative relationship between perceived difficulty and healthy lifestyle behaviors (β= -.54, *P*= .01).

Conclusion: Our findings suggest that promoting positive beliefs about healthy lifestyle among adolescents may facilitate healthy lifestyle changes and help them perceive less difficulty in maintaining a healthy lifestyle. School nurses and health professionals in Taiwan need to coordinate essential resources and implement theoretical-based educational program that address issues on increasing adolescents' healthy lifestyle beliefs.

1. INTRODUCTION

In recent years, the high prevalence of overweight and obese adolescents in Taiwan has become a public health concern. A survey from 2018 reveals that 30.5 % of boys and 22.2 % of girls aged 12 to 15 years of age were overweight or obese [1]. Moreover, a recent report found that 24.3% of Taiwanese adolescents (n=436) aged 13 to 15 years were overweight or obese [1].

Adolescence is a crucial period for physical development and development of healthy exercise and eating patterns. Lack of physical activity and excessive sugary drink consumption are risk factors for becoming overweight or obese [2]. Most adolescents understand that healthy lifestyles include eating fruit and vegetables and getting regular exercise [3]. However, the prevalence of adolescents with unhealthy lifestyles seems to increase (i.e., they eat less fruit and become more sedentary) as they get older [4,5]. According to a survey from the National Health and Nutrition Examination in Taiwan, 51% of Taiwanese adolescents aged 13-15 years drank at least one high-calorie drink per day [1]. Furthermore, the most recent national data collected in 2018 (n=5,703) revealed that 74.6% of Taiwanese adolescents who have sedentary home lifestyles (i.e., they play games or watch television more than two hours per day) and 54.4% of adolescents also use computers for recreation during the school day [1]. An interesting but unsurprising finding is that sedentary lifestyles (e.g., heavy TV watching) may encourage adolescents to eat unhealthy foods (i.e., high fat food or "junk food") and increase their BMI [6,7].

A review article found that obesity in adolescents has become common in recent years, and obesity has been identified as a risk factor for type 2 Diabetes Mellius (DM) and Cardiovascular Disease (CVD) [8]. Conversely, the study indicated that health-conscious adolescents with healthy lifestyles (i.e., a healthier diet, higher levels of physical activity) and better nutritional knowledge have a lower risk of obesity [9]. The relationship between healthy lifestyle (i.e., belief), cognitive (i.e., knowledge) and mental health variables (i.e., depression) has been well explored in correlational and interventional studies among western adolescents, but these variables have not been properly investigated in Taiwanese adolescents [10,11]. Thus, this study aims to examine the interplay between cognitive and mental health variables (e.g., healthy lifestyle beliefs), healthy lifestyle behavior and their influence on Taiwanese adolescents' BMI.

2. METHODOLOGY

2.1 Design

This is a theoretically-based, cross-sectional research study that assessed factors of healthy lifestyle beliefs/behaviors, physical activity, perceived difficulty, gender, and mental health factors including depression, anxiety, and self-concept on Body Mass Index (BMI) in Taiwanese adolescents.

2.1.1 Theoretical framework

This study is based on the principles of cognitive behavioral theory (CBT). Cognitive behavioral theory postulates that peoples' feelings, emotions, and behaviors are influenced by conscious thought [12,13]. According to Wright et al. (2006), Cognitive Theory (CT), focuses on three levels of

cognitive phenomena: (a) automatic thoughts; (b) cognitive distortions, and (c) schema. Automatic thoughts are specifically private or unspoken and are generated spontaneously as an individual evaluates the significance of events in their daily lives [14]. We also experience cognitive distortions, which are systematic errors in reasoning [14]. Schema are based on individual experiences stemming from interactions with others and with the environment [15]. The theory predicts that adolescents who lack confidence in their ability to live a healthy lifestyle and who perceive maintaining a healthy lifestyle to be difficult should have increased BMI; concordantly, their levels of depression, anxiety, and poor self-esteem should be elevated as well. Automatic thoughts, cognitive distortions and schema were explored as moderators of the relationship between healthy lifestyle behavior and BMI in Taiwanese adolescents.

2.1.2 Procedures

The study was approved by the Human Subjects Institutional Review Board of Arizona State University (ASU) (IRB Protocol No. 1109006862) and Taiwan schools. Written parental consent and student assent were collected from all parents and participants prior to data collection. Oral and written information including the purpose of the study, the possibility to withdraw at any point without affecting any school rights, contact information such as phone number and e-mail, and participants' name would be presented only on consent forms and remain anonymous.

2.1.3 Participants

Inclusion criteria for this study were: (1) was between 13 to 15 years of age, (2) read and wrote Chinese, and (3) returned both the adolescent assent and the parental consent forms. Students who did not meet all of the inclusion criteria were excluded. Adolescents were recruited from two middle schools, Taiwan. Data were conducted from Sep 2011 to November 2011.

2.2 Measures

2.2.1 Demographics

Demographic information was collected on a questionnaire which was developed for this study and included age, gender, date of birth,

physical activity, and Body Mass Index (BMI). Height and weight were measured by school nurses to calculate BMI, which was calculated as body weight (kg) divided by the square of height (meter). Weights and heights were obtained from the school nurse's records. Physical activity was a self-reported question and assessed time spent in physical activity. This measure was tested in adolescents (N=148) by Prochaska et al. (2001) and had an intraclass correlation of .77 [16].

2.2.2 Beck youth inventory ii (depression, anxiety, self-concept)

The self-concept, depression, and anxiety questionnaires were self-report scales that have been validated for youth aged from 7 to 18 years. Self-concept scale consisted of 17 questions and both depression and anxiety scales consisted of 20 questions each. Original scores were converted to T scores regarding age and gender based on population norms [17]. The Cronbach'α for the self-concept, depression, and anxiety scales with this sample were .93, .95, and .94, respectively.

2.2.3 Healthy lifestyle beliefs scale

The healthy lifestyle beliefs scale evaluates adolescents' belief/confidence about their ability to live a healthy lifestyle (e.g., "I believe that I can be more active.") on a 5-point Likert scale that ranged from 1(*strongly disagree*) to 5 (*strongly agree*) [18]. This scale has 16 items and total scores ranged from 16 to 80 with higher scores indicating stronger beliefs/confidence about ability to engage in health lifestyle behaviors. The Cronbach's α with this sample was .94.

2.2.4 Perceived difficulty scale

The perceived difficulty scale measures one's perceived difficulty in living a healthy lifestyle (e.g., eat healthy, exercise regularly) and adolescent answer to 11 questions on a 5-point Likert scale that ranges from 1 (*very hard to do*) to 5 (*very easy to do*) [19]. Items are reverse scored for analysis and the total scores ranged from 11 to 55. Higher scores indicate that an adolescent perceives it is difficult living in a healthy lifestyle. The Cronbach's α with this sample was .91.

2.2.5 Healthy lifestyle behaviors scale

The healthy lifestyle behaviors scale measures an individual's current healthy lifestyle

behavioral activities and adolescent answers to 16 questions (e.g., "I exercise on a regular basis") on a 5-point Likert scale that ranged from 1(*strongly disagree*) to 5 (*strongly agree*) [20]. The Cronbach's α with this sample was .90.

2.2.6 Nutrition and activity knowledge scales

Adolescents' knowledge about healthy eating (e.g., "It is a good idea to have fruit juice at every meal") and physical activity (e.g., "Exercise helps reduce stress") was evaluated via 12- and 8-question scales [21,22]. The 12-question scale asked about knowledge regarding foods nutritional information, eating habits, and health and the 8-question scale measures knowledge regarding physical activity. Adolescents answer questions with "yes," "no," or "don't know"; choosing incorrect answers or "don't know" answers are obtained 0-point and correct answers obtain 1-point. The Cronbach'α for the nutrition and activity knowledge scales with this sample was .86 and .70, respectively.

2.3 Data Analysis

Data were examined for invalid responses, normality, outliers, multicollinearity, and homoscedasticity to make sure that statistical assumptions were met. Descriptive statistics were used to describe sample characteristics (e.g., age, gender, and body mass index).The theoretical path model was tested using path analysis, with M*plus* 5.21 [23]. Model fit was assessed using chi-square、root mean square error of approximation (*RMSEA*), and comparative fit index (*CFI*).A non-significant in the chi-square indicates that a model perfectly fits the data [24].The RMSEA value was .05 or lower indicates close fit of the model to the data, .05 and .08 indicate fair fit, .08 and .10 indicate mediocre fit, and values greater than .10 suggests poor fit [25-28]. The CFI value was greater than .95, indicating acceptable fit (Hu & Benler,1999).Full information maximum likelihood (FIML) was used for dealing with missing data [29].The Sobel test was used to examine the influence of mediators (e.g., healthy lifestyle behaviors and physical activity) on an outcome and interaction terms (e.g., depression, anxiety, and self-concept) were computed by taking the cross-product of two predictors.

3. RESULTS

3.1 Demographics

The sample was comprised of 453 participants (52.5% females) with a mean age of 13.42 years who met the inclusion criteria and mean of BMI was 20.78 (*SD*= 4.30). Sample demographic and BMI were listed in Table 1. The significant correlations ranged between .12 and .84 and the correlation matrix between variables was displayed in Table 2.

3.2 Test of the Theoretical Path Model

The path model was created based on the CBT model (Fig. 1). Fit indices included χ^2 (23, 453) =33.75, *P* > .05, *CFI*=.98, and *RMSEA*=.03, indicating that the model fit the model well. Study showed that healthy lifestyle beliefs had a significant positive effect on healthy lifestyle behaviors (β= .41, *P* = .01) and had a significant negative effect on physical activity (β= -.15, *P* = .05), indicating that adolescents who had a higher level of healthy lifestyle beliefs engaged in more healthy lifestyle behaviors, but had less physical activity. Furthermore, there was a significant negative relationship between perceived difficulty and healthy lifestyle behaviors (β= -.54, *P* = .01) and between perceived difficulty and physical activity (β= -.41, *P* = .01), which indicated that adolescents who perceived more difficulty in leading a healthy lifestyle reported less healthy behaviors and less physical activity. Two non-significant paths were found between activity knowledge and healthy lifestyle behaviors and between activity knowledge and physical activity. In addition, the path between nutrition knowledge and healthy lifestyle behaviors was not significant. The relationship between healthy lifestyle behaviors and BMI and between physical activity and BMI were not significant.

Results of this study indicated that both healthy lifestyle behaviors and physical activity did not mediate the relationship predictors (i.e., activity knowledge, nutrition knowledge, healthy lifestyle beliefs, and perceived difficulty) and BMI. Depression moderated the relationship between physical activity and BMI (β= -.22, *P* = .05). However, anxiety and self-concept did not moderate the relationship between physical activity and BMI. Furthermore, depression, anxiety, and self-concept did not moderate the relationship between healthy lifestyle behaviors and BMI.

Table 1. Descriptive Statistics for Sample Demographics (N=453)

Age Group	N (%)	Range	Min	Max	M(SD)
	453	13-15	13	15	13.42 (.64)
13 (%)	299 (66.0)				
14 (%)	116 (25.6)				
15 (%)	38 (8.4)				
BMI	453		12.8	40.4	20.78 (4.30)
Gender	**n**			**%**	
Female	238			52.5	
Male	215			47.5	

*BMI=body mass index; M=mean; SD=standard deviation

Table 2. Correlation matrix between variables in the conceptual path model

	Variables	1	2	3	4	5	6	7	8	9	10	11
1	Gender	1										
2	BMI	-.23**	1									
3	Depression	.02	.08	1								
4	Physical Activity	-.14**	.01	-.01	1							
5	Self-Concept	-.07	.01	-.40**	.17**	1						
6	Healthy Lifestyle Beliefs	.02	.02	-.52**	.17**	.68**	1					
7	Healthy Lifestyle Behaviors	.17**	.05	-.44**	.24**	.56**	.81**	1				
8	Perceived Difficulty	-.12*	.08	.39**	-.32**	-.48**	-.73**	-.84**	1			
9	Nutrition Knowledge	.19**	.05	.02	.02	.16**	.19**	.12*	-.09	1		
10	Activity Knowledge	-.07	.03	-.13**	.14**	.27**	.37**	.29**	-.25**	.39**	1	
11	Anxiety	.04	.07	.84**	.00	-.29**	-.37**	-.36**	.30**	.07	-.08	1

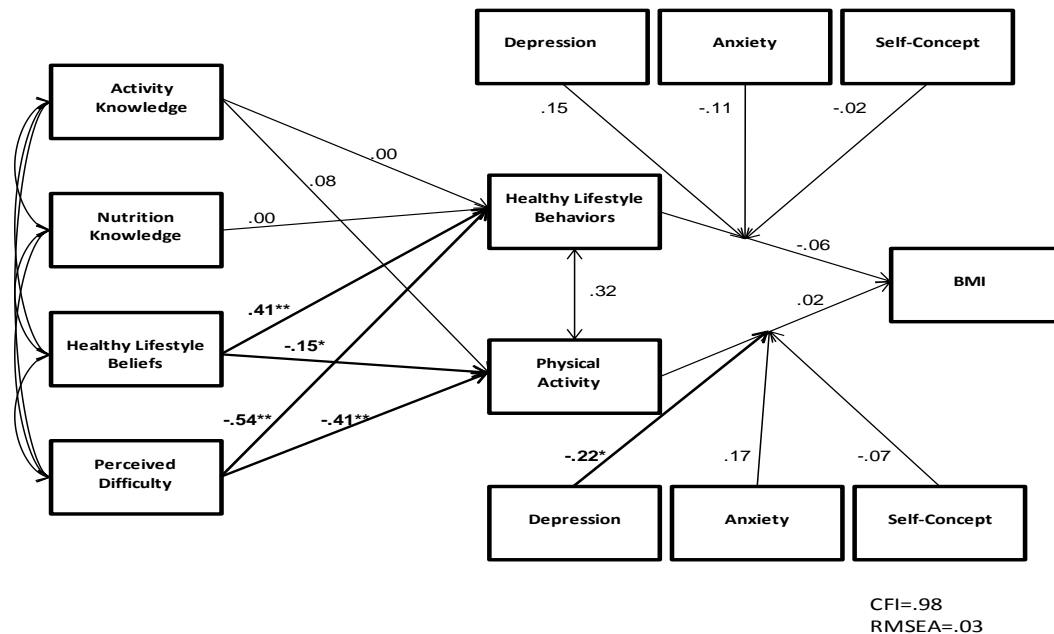**Male is the reference group; ** P= .01.* P= .05*

Fig. 1. Standardized parameters estimate of alternative path model demonstrates relations among activity/nutrition knowledge, healthy lifestyle beliefs/behaviors, physical activity, depression, anxiety, self-concept, and BMI. (-) Signifies an inverse relation between the variables. ** *P*= .01.* *P*= .05

4. DISCUSSION

Cognitive-behavioral therapy builds skills such as problem-solving, behavior changes and cognitive re-structuring. With guidance from a psychology professional in a clinical setting, individuals achieve therapeutic goals by reflecting on the relationship between their thoughts, feelings and behaviors [30].

Findings from this study indicate that Taiwanese adolescents who had more positive lifestyle beliefs were more likely to engage in healthy lifestyle behavior. This is consistent with findings from studies of adolescent subjects in the U.S. [10-11,31]. McGovern et al. (2018) [38] which indicated that more positive-thinking adolescents tend to have healthier lifestyle habits. Furthermore, this finding concurs with another finding from an intervention study conducted by Jacobson and Melnyk (2012) which revealed that an increase in adolescents' healthy lifestyle beliefs is associated with greater incidences of healthy lifestyle behavior.

Our study found that Taiwanese adolescents who have a higher level of healthy lifestyle beliefs report less physical activity, which was inconsistent with the findings from Melnyk and her colleagues (2013) [32]. Another recent intervention study was based on cognitive-behavioral skills training. One portion of the training course covers a concept called the healthy lifestyles thinking, feeling and behavior triangle. Western adolescents who attended the Creating Opportunities for Personal Empowerment (COPE) program significantly increased their frequency of physical activity, which was inconsistent with our study finding [32]. Although our subjects had positive impressions about physical exercise, they were discouraged from being more physically active due to post-exercise effects, i.e., fatigue and somatic pain. [33-34]. Moreover, other obstacles such as laziness and lack of time or fitness skills further encouraged them to remain sedentary [35-36]. These findings suggest that a low but adequate level of physical activity (30 minutes or less) combined with an interesting aerobic program might encourage adolescents to be more active.

In addition, Chen and Ho (2012) revealed that parental involvement mediated Taiwanese adolescents' beliefs, and consequently influenced their child's academic performance as defined by GPA [37]. Parents in Asia typically set high academic standards for their children; this focus on higher grades and preparation for entrance examinations often comes at the cost of adequate physical activity [33, 39-40]. Culturally-Chinese adolescents spend extra time in "intensive classes" to enhance academic performance, therefore they are more sedentary [41]. Furthermore, Children in Asia are deeply influenced by Confucian culture [42]. Parents in Asia have higher expectations for their children in places such as Japan, Hong Kong, and Singapore [43-45]. Studies have indicated that Chinese students with parents that place high expectations of school performance upon them will have an increased probability of being less active [46]. A study showed an association between blood pressure and academic performance, indicating that higher blood pressure is related to better academic performance in adolescents [47]. Elevated blood pressure in adolescents might be due to learning stress. A study reported a positive relationship between physical activity and academic performance, so teachers should encourage adolescents to be more active [48].

Consistent with previous studies on Western adolescents, our findings indicated that adolescents who perceive more difficulty in leading a healthy lifestyle report less healthy behavior and less physical activity [10,31,49]. Our present study found there is not a direct relationship between perceived significance of activity and actual physical activity, indicating increased awareness does not result in increased levels of physical activity. However, this increased awareness resulted in less sedentary behavior (i.e., time spent watching television) and helped improve adolescents' attitude toward regular exercise, resulting in better academic performance overall [50]. Peer pressure was another contributing factor; group exercise and having an exercise partner helped increase individual levels of physical activity [51]. Adolescents who perceived more difficulty in leading healthy lifestyles reported less healthy behavior and less physical activity, which is consistent with previous studies [31,49]. Glazier et al. (2014) reporting that individuals living in less-walkable neighborhoods tend to be overweight and/or obese. Most of Taiwan is heavily urbanized, which limits the amount of safe space available for walking, jogging, or cycling [52]. The population density of Taiwan is approximately 647 persons/km2 [53]. Furthermore, there are local civil and environmental factors which discourage exercise,

including heavy traffic, cluttered streets, poor air quality, and a hot, humid, semi-tropical climate.

In contrast to a previous study conducted by Jacobson and Melnyk (2012) and Gupta et al. (2013), increased appreciation of the importance of activity and good nutrition did not increase healthy lifestyle behavior in Taiwanese adolescents [40.,54]. Hyun et al. (2017) found that Korean adolescents had higher scores in nutritional knowledge, but most of them did not use this knowledge in their daily lives. Instead, they preferred to adopt severe personal weight control measures [55]. An intervention study indicated that adolescents who participated in educational programs had more positive attitudes regarding healthy eating and were more likely to read nutritional information on food labels when shopping for food [45]. Based on the findings above, public information campaigns to sway general public attitudes toward healthy eating seem to be better than trying to teach nutrition to adolescent students. In addition, an interesting study finding showed that adolescents tended to choose food based on individual preference rather than general nutritional knowledge [56].

Findings from this study indicate that it was Taiwanese adolescents suffering from depression who increased their physical activity and decreased their BMIs the most. However, a study revealed that increased symptoms of depression negatively affected female adolescents' physical activity, so depression as a moderator between physical activity and BMI in Taiwanese adolescents is a subject for further study [5]. According to the DSM-IV, depression can be associated with either increased or decreased physical activity and increased or decreased appetite [58]. Findings from Wit et al. (2009), note a positive U-shaped trend in the relationship between depression and BMI. This provides indirect support for future research on quadratic trends within BMI categories [59]. Results indicated that depression, anxiety, and self-conceptualization did not moderate the relationship between healthy lifestyle behaviors and BMI, which was inconsistent with the theoretical model. Anxiety and self-conceptualization did not moderate the relationship between physical activity and BMI, which was also inconsistent with the theory. These non-significant findings could possibly be attributed to invariance of moderators (e.g., depression, anxiety, and self-conceptualization),

rather than a failure of the theoretical model. This required several modifications in order to strengthen the model. Our findings showed that there were non-significant relationships between healthy lifestyle and BMI, and also between physical activity and BMI. Chinese adolescents tend to be underweight (21.7%) when compared to Western adolescents (6.4%), and this may be the cause [60]. Thus, aspiration toward achieving a healthier lifestyle should increase the actual prevalence of healthier lifestyles among adolescents. Furthermore, a decreased level of difficulty achieving a healthy lifestyle should have the opposite effect.

5. CONCLUSION

Cognitive behavioral theory-based techniques can be applied in clinical practice. Health professionals can help adolescents understand how their thoughts influence their behavior [61]. Our results suggest that promoting positive beliefs about healthy lifestyles may inspire adolescents to make healthier lifestyle choices, and in turn, help them perceive less difficulty in maintaining a healthy lifestyle. Understanding the benefits of proper nutrition and physical activity does not effectively persuade Taiwanese adolescents to be more active or to eat better. This may be due to parental demands for high academic performance. When compared to their Western counterparts, Taiwanese adolescents spend inordinate amounts of time in tutoring sessions or intensive classes as a response to these demands. On the whole, Taiwanese adolescents have a good background knowledge about the importance of physical activity. Unfortunately, there are strict limits on available time for them to be active [62]. Finally, we suggest that school nurses in Taiwan could provide informational programs about the benefits of proper diet and exercise. These programs could help Taiwanese adolescents perceive less difficulty in adopting and maintaining healthier lifestyles.

6. LIMITATIONS

Several limitations include the following: first, our sample is limited to Taiwanese adolescents, so it is difficult to generalize findings to the wider population. Second, height and weight were obtained from school records, which might decrease their reliability. Third, this sample was a convenience sample, which limits external validity.

CONSENT

Written parental consent and student assent were collected from all parents and participants.

ETHICAL APPROVAL

The study was approved by the Human Subjects Institutional Review Board of Arizona State University (ASU) (IRB Protocol No. 1109006862) and Taiwan schools. All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki".

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Ministry of Health and Welfare (Taiwan). National Annual Population Statistics. Accessed 29 October. Available:https://www.hpa.gov.tw/Pages/Detail.aspx?nodeid=257&pid=11582
2. Kohut T, Robbins J, Panganiban J. Update on childhood/ adolescent obesity and its sequela. Curr Opin Pediatr. 2019;31(5): 645-53. DOI: 10.1097/MOP.0000000000000786
3. Subramanian B. Perception of adolescence on healthy lifestyle and factors contributing to health and its barrier: grounded theory approach Balasubramanian N. Asian J. Nursing Edu. and Research. 2017;7:26-30. DOI:10.5958/2349-2996.2017.00007.6.
4. Marques A, Loureiro N, Avelar-Rosa B, Naia A, Matos MG. Adolescents' healthy lifestyle. J Pediatr (Rio J). 2020;96(2):217-24. DOI:10.1016/j.jped.2018.09.002
5. Neumark-Sztainer D, Wall MM, Chen C, Larson NI, Christoph MJ, Sherwood NE. Eating, activity, and weight-related problems from adolescence to adulthood. Am J Prev Med. 2018;55(2):133-41. DOI:10.1016/j.amepre.2018.04.032
6. Jodhun BM, Pem D, Jeewon R. A systematic review of factors affecting energy intake of adolescent girls. Afr Health Sci. 2016;16(4):910-22. DOI:10.4314/ahs.v16i4.5
7. Sun S, He J, Fan X. Mapping and predicting patterns of Chinese adolescents' food preferences. Nutrients. 2019;11(9): 2124. DOI:10.3390/nu11092124
8. Ruiz LD, Zuelch ML, Dimitratos SM, Scherr RE. Adolescent obesity: diet quality, psychosocial health, and cardiometabolic risk factors. Nutrients. 2019;12(1):43. DOI:10.3390/nu12010043
9. Wadolowska L, Hamulka J, Kowalkowska J, Kostecka M, Wadolowska K, Biezanowska-Kopec R et al. Prudent-active and fast-food-sedentary dietary-lifestyle patterns: the association with adiposity, nutrition knowledge and sociodemographic factors in Polish teenagers-the ABC of healthy eating project. Nutrients. 2018;10(12):1988. DOI:10.3390/nu10121988
10. Melnyk BM, Small L, Morrison-Beedy D, Strasser A, Kreipe R, Van Blankenstein S. Mental health correlates of healthy lifestyle attitudes, beliefs, choices, and behaviors in overweight adolescents. J Pediatr Health Care. 2006; 20(6):401-406. DOI:10.1016/j.pedhc.2006.03.004
11. Jacobson D, Melnyk BM. Psychosocial correlates of healthy beliefs, choices, and behaviors in overweight and obese school-age children: a primary care healthy choices intervention pilot study. J Pediatr Nurs. 2011;26(5):456-464. DOI:10.1016/j.pedn.2011.07.001
12. Beck AT. Cognitive therapy and the emotional disorders. New York: International Universities; 1976.
13. Dobson KS. Cognitive therapy for depression. Adapting cognitive therapy for depression. New York, NY: Guilford; 2008.
14. Wright JH, Basco MR, Thase ME. Basic principles of cognitive-behavior therapy. Washington, DC: American Psychiatric Publishing; 2006.
15. Freeman SM, Roy SC. Cognitive behavior therapy and the Roy adaptation model: integrating CBT into nursing practice. New York: Springer; 2005.
16. Prochaska JJ, Sallis JF, Long B. A physical activity screening measure for use with adolescents in primary care. Arch Pediatr Adolesc Med. 2001;155(5):554-59. DOI:10.1001/archpedi.155.5.554
17. Beck JS, Beck AT, Jolly JB, Steer RA. Beck youth inventories for children and adolescents: Manual. 2ed. San Antonio: Harcourt Assessment; 2005.

18. Melnyk B, Small L. Healthy Lifestyles Belief Scale. Edson College of Nursing and Health Innovation, Arizona State University. 2003b: (Unpublished Manuscript).

19. Melnyk B, Small L. Healthy Lifestyles Belief Scale. Edson College of Nursing and Health Innovation, Arizona State University. 2003c: (Unpublished Manuscript).

20. Melnyk B, Small L. Healthy Lifestyles Belief Scale. Edson College of Nursing and Health Innovation, Arizona State University. 2003a: (Unpublished Manuscript).

21. Melnyk B, Small L. Healthy Lifestyles Belief Scale. Edson College of Nursing and Health Innovation, Arizona State University. 2003d: (Unpublished Manuscript).

22. Melnyk B, Small L. Healthy Lifestyles Belief Scale. Edson College of Nursing and Health Innovation, Arizona State University. 2003e: (Unpublished Manuscript).

23. Muthén LK, Muthén BO. Mplus User's Guide. 7th ed. CA: Muthén & Muthén; 1998 -2009.

24. Kline RB. Principles and practice of structural equation modeling. Guilford Press: New York; 2011.

25. Browne MW, Cudeck R. Alternative ways of assessing model fit. In: Bollen KA, Long JS, edtors. Testing structural equation models. CA: Sage; 1993.

26. Browne MW, Mels G. RAMONA user's guide. Department of Psychology, Ohio State University. 1990: (Unpublished report).

27. MacCallum RC, Browne MW, Sugawara HM. Power analysis and determination of sample size for covariance structure modeling. Psychological Methods. 1996; 1(2):130–49.
DOI:10.1037/1082-989X.1.2.130

28. Steiger JH. Causal modeling: a supplementary module for SYSTAT and SYGRAPH. IL: SYSTAT; 1989.

29. Schlomer GL, Bauman S, Card NA. Best practices for missing data management in counseling psychology. J Couns Psychol. 2010;57(1):1-10.
DOI:10.1037/a0018082

30. Melnyk B, Moldenhauer Z. The KYSS guide to child and adolescent metal health screening, early intervention and health promotion. Cherry Hill, NJ: NAPNAP; 2006.

31. O'Haver J, Jacobson D, Kelly S, Melnyk BM. Relationships among factors related to body mass index, healthy lifestyle beliefs and behaviors, and mental health indicators for youth in a title 1 school. J Pediatr Health Care. 2014;28(3):234-40.
DOI:10.1016/j.pedhc.2013.02.005

32. Melnyk BM, Jacobson D, Kelly S, Belyea M, Shaibi G, Small L et al. Promoting healthy lifestyles in high school adolescents: a randomized controlled trial. Am J Prev Med. 2013;45(4):407-15.
DOI:10.1016/j.amepre.2013.05.013

33. Lee PH, Lai HR, Chou YH, Chang LI, Chang WY. Perceptions of exercise in obese school-aged children. J Nurs Res. 2009;17(3):170-178.
DOI:10.1097/JNR.0b013e3181b2554b

34. Pawlowski CS, Andersen HB, Tjørnhøj-Thomsen T, Troelsen J, Schipperijn J. Space, body, time and relationship experiences of recess physical activity: a qualitative case study among the least physical active schoolchildren. BMC Public Health. 2016;16:16.
DOI:10.1186/s12889-015-2687-0

35. Al-Sheyab NA, Alomari MA, Hayajneh AA, Shah S. Attitudes and perceived barriers toward healthy lifestyle behaviors in Jordanian adolescents: a developing country perspective. Adolesc Health Med Ther. 2019;10:39-47.
DOI:10.2147/AHMT.S181001

36. Chinekesh A, Hoseini SA, Shahbolaghi FM, et al. A Comprehensive Health Plan: The Lifestyle Affecting Factors in Iranian Youth. Int J Prev Med. 2018;9:1.
DOI:10.4103/ijpvm.IJPVM_309_17

37. Chen WW, Ho HZ. The relation between perceived parental involvement and academic achievement: the roles of Taiwanese students' academic beliefs and filial piety. Int J Psychol. 2012;47(4):315-24.
DOI:10.1080/00207594.2011.630004

38. McGovern CM, Militello LK, Arcoleo KJ, Melnyk BM. Factors Associated With Healthy Lifestyle Behaviors Among Adolescents. J Pediatr Health Care. 2018;32(5): 473-80.
DOI:10.1016/j.pedhc.2018.04.002

39. Chen Y, Zheng Z, Yi J, Yao S. Associations between physical inactivity and sedentary behaviors among

adolescents in 10 cities in China. BMC Public Health. 2014;14:744. DOI:10.1186/1471-2458-14-744

40. Gupta N, Shah P, Nayyar S, Misra A. Childhood obesity and the metabolic syndrome in developing countries. Indian J Pediatr. 2013;80. DOI:10.1007/s12098-012-0923-5

41. Morita N, Nakajima T, Okita K, Ishihara T, Sagawa M, Yamatsu K. Relationships among fitness, obesity, screen time and academic achievement in Japanese adolescents. Physiol Behav. 2016;163: 161-66. DOI:10.1016/j.physbeh.2016.04.055

42. Ho D. Chinese patterns of socialization: a critical review. In: Bond MH, editor. The Psychology of the Chinese People. Hong Kong: Oxford University Press; 1986.

43. Wong J, Salili F, Ho SY, Mak KH, Lai MK, Lam TH. The perceptions of adolescents, parents and teacher on the same adolescent health issues. Sch Psychol Int. 2005; 26(3):371–384. DOI://dx.doi.org/10.1177/01430343050559 80

44. Ho KC, Yip J. YOUTH.sg: The state of youth in Singapore. Singapore: National Youth Council; 2003.

45. Bossy S. Academic pressure and impact on Japanese students. McGill J Educ. 2000;35(1):71–89.

46. Li M, Xue H, Wang W, Wang Y. Parental Expectations and Child Screen and Academic Sedentary Behaviors in China. Am J Prev Med. 2017;52(5):680-689. DOI:10.1016/j.amepre.2016.12.006

47. Xu S, Yu B, Zepei J, Chang H, Guo J, Li B, Wan Z. School performance affects adolescent blood pressure. Cardiol Young. 2014;24(3):459-63. DOI:10.1017/S1047951113000619

48. Stea TH, Torstveit MK. Association of lifestyle habits and academic achievement in Norwegian adolescents: a cross-sectional study. BMC Public Health. 2014;14:829. DOI:10.1186/1471-2458-14-829

49. Heitzler CD, Lytle LA, Erickson DJ, Barr-Anderson D, Sirard JR, Story M. Evaluating a model of youth physical activity. Am J Health Behav. 2010;34(5): 593-606. DOI:10.5993/ajhb.34.5.9

50. McKinney C, Bishop V, Cabrera K, Medina R, Takawira D, Donate N et al. NuFit: nutrition and fitness CBPR program

evaluation. J Prev Interv Community. 2014; 42(2):112-24. DOI:10.1080/10852352.2014.881180

51. ten Hoor GA, Plasqui G, Schols AM, Kok G. Combating adolescent obesity: an integrated physiological and psychological perspective. Curr Opin Clin Nutr Metab Care. 2014;17(6):521-24. DOI:10.1097/MCO.0000000000000099

52. Glazier RH, Creatore MI, Weyman JT, Fazli G, Matheson F, Gozdyra P et al. Density, destinations or both? A comparison of measures of walkability in relation to transportation behaviors, obesity and diabetes in Toronto, Canada PLoS One. 2014;9(1):e85295. DOI:10.1371/journal.pone.0085295

53. Environmental protection administration executive yuan, Republic of China (Taiwan). National Annual Population Statistics; 2016. Available:http://www.epa.gov.tw/public/Dat a/5817982971.pdf

54. Jacobson D, Melnyk BM. A primary care healthy choices intervention program for overweight and obese school-age children and their parents. J Pediatr Health Care. 2012;26(2):126-38. DOI:10.1016/j.pedhc.2010.07.004

55. Hyun H, Lee H, Ro Y, Gray HL, Song K. Body image, weight management behavior, nutritional knowledge and dietary habits in high school boys in Korea and China. Asia Pac J Clin Nutr. 2017;26(5):923-30. DOI:10.6133/apjcn.122016.05

56. Lin W, Yang HC, Hang CM, Pan WH. Nutrition knowledge, attitude, and behavior of Taiwanese elementary school children. Asia Pac J Clin Nutr. 2007;16::534-46.

57. Neissaar I, Raudsepp L. Changes in physical activity, self-efficacy and depressive symptoms in adolescent girls. Pediatr Exerc Sci. 2011;23(3):331-43. DOI:10.1123/pes.23.3.331

58. American Psychiatric Association. Diagnostic and statistical manual of mental disorder. 4th ed. Washington, DC: American Psychiatric Association; 2004.

59. de Wit LM, van Straten A, van Herten M, Penninx BW, Cuijpers P. Depression and body mass index, a u-shaped association. BMC Public Health. 2009;9:14. DOI:10.1186/1471-2458-9-14

60. Velten J, Bieda A, Scholten S, Wannemüller A, Margraf J. Lifestyle choices and mental health: a longitudinal

survey with German and Chinese students. BMC Public Health. 2018;18(1):632. DOI:10.1186/s12889-018-5526-2

61. Melnyk BM, Jacobson D, Kelly S, O'Haver J, Small L, Mays MZ. Improving the mental health, healthy lifestyle choices, and physical health of Hispanic adolescents: a randomized controlled pilot study. J Sch Health. 2009;79(12):575-584.

DOI:10.1111/j.1746-1561.2009.00451.x

62. Morita N, Nakajima T, Okita K, Ishihara T, Sagawa M, Yamatsu K. Relationships among fitness, obesity, screen time and academic achievement in Japanese adolescents. Physiol Behav. 2016;163: 161-166. DOI:10.1016/j.physbeh.2016.04.055