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Validation of Health Promoting Lifestyle Profile-II: A Confirmatory Study with a Malaysian Undergraduate Students Sample

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ABSTRACT

Objective: To determine the factor structure of the Health Promoting Behaviours (HPB) component of Health Promoting Lifestyle Profile-II among undergraduate students in Universiti Sains Malaysia (USM) by confirmatory factor analysis (CFA). **Methods**: A cross sectional study was conducted among undergraduate students. The data was collected in the USM campus using a proportionate cluster sampling method. The HPB questionnaire was handed to students in the lecture hall and collected immediately when the lecture finished. CFA was conducted using robust maximum likelihood estimation due to violation of multivariate normality assumption. A three-factor model was tested for measurement model validity and construct validity. **Results**: A total of 788 students participated in the study. CFA of a 21-item, three-factor model yielded an adequate goodness-of-fit values. The measurement model also showed a good convergent and discriminant validity after model re-specification. **Conclusion**: The health promoting behaviours scale was proven to have a valid measurement model and reliable constructs. It was deemed suitable for use to measure the health promoting behaviours components of a healthy lifestyle among Malaysian undergraduate students. It was recommended to further conduct cross-validation studies in other Malaysian public universities to provide additional empirical evidence to support its use.

Keywords: *Composite reliability, Confirmatory factor analysis, Construct validity, Health promoting behaviours, Undergraduate students*

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Introduction

Health promotion is defined as the process of enabling people to increase control over, and to improve individual's health (1). Generally, the ultimate goal of health promotion is to prevent illness, enhances well-being, and creates a healthy lifestyle at all stages of life (2). In Malaysia, health promotion had become the national agenda in combating non-communicable diseases. Health promotion programme delivered benefits for the community in promoting the wellbeing, reducing preventable illness and lowering overall health care expenditure (3). With a recent upward trajectory of healthcare costs in Malaysia (4), it requires a greater attention of the nation to provide a better healthcare at sustainable costs through early health promotion.

Lifestyle behaviours (e.g. nutrition, physical activity, smoking, stress, and substance used and abused) are the contributing factors of non-communicable diseases such as cardiovascular disease, diabetes, and osteoporosis (5). Research showed that unhealthy lifestyles are widespread among young adults (6, 7) and they suffered from poor dietary habits (8–10). A systematic review examined the associations of physical activity (PA) and sedentary behaviour to childhood overweight and obesity from the last 10 years showed that sedentary behaviours were positively associated with weight status (11).

Within the health context, healthy lifestyle involved the engagement of all the behaviours over which the individual has control, including risky behaviours (12). There are some valid generic health behaviours measurement tools available that specifically measure physical activity behaviours alone such as Physical Activity Scale (PAS) and International Physical Activity Questionnaire (IPAQ) (13) and nutritional behaviours such as Diet History Questionnaire, Short Dietary Assessment Instruments (14) and meats, eggs, dairy, fried foods, fat in baked goods, convenience foods, fats added at the table and Snack (MEDFICTS) dietary assessment questionnaire (15). However, they are not specific to the overall healthy lifestyles component.

The Health Promoting Lifestyle Profile-II (HPLP-II) (16) was developed to measure the multicomponent of healthy lifestyles. It was a revision of the HPLP scale (12) based on Nola Pender's health promotion model. The model identifies background factors (e.g. individual characteristics and experiences and behaviour specific cognitions) that influence health behaviour. Health promoting behaviour – the desired behavioural end point or outcome of health decision-making and preparation for action (17). Up to date, the HPLP-II had been widely used to measure health promoting lifestyles among healthy college student (10, 18, 19) and including people with clinical diseases such as fibromyalgia syndrome (20) and metabolic syndrome (21). In short, this fact signifies the important roles of health promotion that is to improve health and quality of life not only to those who had diseases, but to include healthy young adults as well. Young adults often represents unique challenges in healthcare as the transition process of parent-manage healthcare to personal responsibility healthcare just begin among these populations (22). Therefore, a feasible questionnaire is essential to measure the health promotion needs among healthy young adults.

The HPLP-II scale had been translated and validated to various language including Turkish (23), Portuguese (24), Spanish (25), Chinese with both a 51-item version (26) and a 30-item shorter version (2), and Iranian version which include four-factors of HPLP-II (27). Both (10) and (16) agreed that Health responsibility (HR), PA, Nutrition (N) components belonged to the constructs that investigate observable behaviours known as health promoting behaviours (HPB), whereas the Spiritual Growth (SG), Interpersonal Relations (IR), and Stress Management (SM) were the cognitive and emotional well-being components termed as psychosocial well-being.

Past research on the healthy lifestyle among university students in Malaysia was looking at the association factors of healthy lifestyle practices by Al-Naggar et al. (28) but not on the instrument validity of reliability. It is hoped that the validation of the HPB components of HPLP-II may serve as the psychometrically sound tool of the health behaviours among young adults. A validation study of the Spanish version of HPLP-II had showed a high and stable level of internal consistency (25) among university students, however, the English version of the HPLP-II was not yet properly validated among Malaysian undergraduate students. From that notion, this study aimed to determine the measurement model validity of the HPB component of HPLP-II among undergraduate students in USM by confirmatory factor analysis (CFA).

Methods

Study Design, Setting and Population

This study incorporated a cross sectional design to answer our research objective, which aimed to generalise the study findings to Malaysian undergraduate university students, while the source population available to us was Malaysian undergraduate university students studying in Universiti Sains Malaysia (USM). The sampling frame was the first, second, and third year of the Malaysian undergraduate students enrolled in the year of 2014. The self-administered survey was conducted in the three campuses (Main, Health, and Engineering) of USM.

Measurement Tool

Originally, the HPLP-II questionnaire consisted of a 52-item, with a 4-point Likert scale from 1 (never) to 4 (routinely) that measures the respondent behaviours in six theoretical dimensions of health promoting lifestyle: HR, PA, N, SG, IR, and SM. Each dimension includes eight to nine items. The internal consistency (Cronbach alpha) of the subscales was ranged 0.79 to 0.87 among adults in the United States of America and a 3-week test-retest stability coefficient, r = 0.89 (16). Although no validity report had been found for the English version of the HPLP-II instrument but it was reported to have sufficient validity and reliability among for used among university students in Spanish version (25) and among Taiwanese women in Chinese version (26).

In the present study, the 26-question related to HPB with three subscales includes N (9 items), PA (8 items), and HR (9 items) behaviours was used to determine its factor structure. Questionnaire was adopted from (16) with permission (see Appendix 1). The present study included N, PA, and HR scales as an end point of behavioural outcome of CVD prevention.

Procedures

All data were collected for a period of three months from November 2014 to January 2015. Surveys were distributed to the students before their lecture. Participants were briefed on the purpose of the study, the procedures, and the confidentiality of their responses. Participants were also informed it was not compulsory for them to participate in the study and if they agreed to participate they would complete and returned the questionnaire to the researcher. The students were also instructed to give their honest responses in the forms. The completed forms were immediately collected before the students leaved the lecture hall. The time to complete the questionnaire was approximately 10 to 15 minutes.

A cluster sampling technique with probability proportional to cluster size was applied. The campuses of USM were divided into three main clusters (Health, Main, and Engineering). Eight schools were selected at random from the total of 24 schools in the three campuses. Due to the restricted information from the Registrar Office of USM and the availability of students in class are dynamic, not all students were selected from each cluster. The weightage was given to each school based on the population of students enrolled in the year 2014. Then, undergraduate students were purposively selected from the selected eight schools at the final clusters of schools/programmes.

Data Management and Statistical Analysis

All data analyses were conducted using IBM SPSS Statistics Version 22 and Mplus Version 7.3 (29). On preliminary data screening, cases or variables with 50% missing values were treated as non-respondents and were excluded in further analysis (30). Multivariate normality assessment of the item responses was done on univariate and multivariate levels. Univariate normality was checked visually, on each item by inspection of histogram with normality curve and box-and-whisker plot. Multivariate normality assessment was done statistically based on the two-sided skewness test of fit and two-sided kurtosis test of fit with a P-value of > 0.05 is suggestive of multivariate normality. When the assumption of multivariate normality was not met, the alternative estimator to Maximum Likelihood (ML) would be replaced by Robust Maximum Likehood (MLR) estimator in the subsequent CFA analyses (31).

In CFA analyses, a number of fit indices were recommended: Insignificant MLR scaled chi-square difference test, Comparative fit index (CFI) ≥ 0.92; Tucker-Lewis index (TLI) ≥ 0.92; the standardised root mean square residual (SRMR) ≤ 0.08; the root mean square error of approximation (RMSEA) < 0.05 or at most 0.08 (30, 32–34).

The assessment of construct validity involves convergent validity and discriminant validity. The Composite Reliability (CR) was used to assess the reliability of a measure (35). If there was covariance between errors, the CR was calculated based on the formula by Raykov and Marcoulides (36). The minimum acceptable range of CR was > 0.60 (37, 38) for good convergent validity. For discriminant validity of the constructs, if the correlations among constructs were ≤ 0.85, the discriminant validity could be established (32, 39).

Ethical Considerations

Ethical approval and permission of access to schools was obtained from the Human Research Ethics Committee, USM (USM/JEPeM/14070253). Participants were informed and implied consent was obtained before being included into the study. Anonymity and confidentiality were guaranteed for participating in the study.

Results

Data Screening, Assumptions Checking, and Sample Characteristics

A total of 788 students responded to this study making a response rate of 70.9% which was considered as good rate. On data screening, no missing data was found.

Item from health promoting behaviours scale (Q2, Q3, Q7, Q8, Q10, Q11, Q14, Q16, Q17, Q20, Q21, Q23–Q25) were not normally distributed on univariate normality check. On multivariate normality, the scale showed significant P-values for two-sided multivariate skew test of fit and two-sided multivariate kurtosis test of fit. Thus, it was concluded that the items were not multivariate normal.

Table 1 gives the demographic characteristics of the respondents. The majority of the students were female, Malay, from the field of science, and stayed in hostel. About half of the students were in their first year of study and from the field of science.

Table 1: Sociodemographic characteristics of the study samples

Demographic variables	Frequency (n)	Percentage (%)	Mean (SD)
Gender			
Female	557	70.7	
Male	231	29.3	
Ethnicity			
Malay	375	47.6	
Chinese	338	42.9	
Indian	48	6.1	
Others	27	3.4	
Living arrangement			
On campus	707	89.7	
Off campus	81	10.3	
Fields of study			
Arts	165	20.9	
Sciences	401	50.9	
Technical	222	28.2	
Year of study			
First	421	53.4	
Second	234	29.7	
Third	133	16.9	
Age (years)[a]			20.2 (1.02)

[a]normally distributed.

Confirmatory Factor Analysis

Estimation method used was MLR because the items did not fulfil multivariate normality assumption. The initial measurement model showed poor model fit to sample data. From the initial model, only two items (Q18 and Q25) were below loading of 0.40 (40, 41). After iteratively removing the item below 0.40 loading, re-specification of the model was conducted for error covariances with Modification Indices (MI) > 10. Four error covariances were noted for item Q21–Q24, Q9–Q15, Q1–Q4, and Q20–Q23 within their respective factors. The model fit indices for the initial three-factor model and revised models were presented in Table 2.

MI also suggested that there was high correlation between item Q5 (indicator of health responsibility) and other item Q4 from other constructs (nutrition); item Q6 (indicator of physical activity) with latent construct (health responsibility); and item Q17 (indicator of health responsibility) with item Q16 (nutrition), thus, we decided to remove these items (Q5, Q6, and Q17) respectively because there was no theoretical connection between these component. After removal of the aforementioned items, the final model fit yielded a 21-item three-factor structure and the goodness-of-fit values shown to be adequate fit (Table 2).

After validation of the factor structure of the scale (Table 2), the focus was to confirm the model's construct validity. All items showed a factor loading above 0.40. The convergent validity was indicated by CR estimateΔs, which ranged from 0.664 to 0.844. Therefore, adequate convergent validity was noted for HPB scale (Table 3). Discriminant validity was proven as the results of the correlation between factors were significant and r ≤ 0.85. All factors have positive and statistically significant correlations as follows: PA–HR, r = 0.750; N–HR, r = 0.632; and N–PA, r = 0.714. The final measurement model of HPB was illustrated in Figure 1.

Table 2: Summary of goodness-of-fit indices: Health promoting behaviours (HPB) measurement models

Model	Chi-squarea			CFI[b]	TLI[c]	SRMR[d]	RMSEA (90%CI)[e]	Clfit *P*-value[f]
	Δx^2MLR	df	*p*-value					
initial	280.78	11	< 0.001	0.825	0.808	0.064	0.060 (0.056, 0.064)	< 0.001
final	61.63	15	< 0.001	0.921	0.904	0.055	0.045 (0.040, 0.050	0.935

[a]MLR scaled chi-square difference test, [b]CFI = Comparative fit index, [c]TLI = Tucker-Lewis fit index, [d]SRMR = Standardisation of root mean square residual, [e]RMSEA = Root mean square error of approximation, [f]Clfit = Close fit for RMSEA.

Table 3: Standardised factor loadings (λ) and composite reliability for the initial and finalised measurement models of health promoting behaviours (HPB) scale

Construct and items	Initial model	Final model	
	Standardised factor loading, (λ)	Standardised factor loading, (λ)	CR (95% CI)[a]
HR[*]			0.844 (0.825, 0.864)
Q2	0.532	0.541	
Q5	0.426	–	
Q8	0.704	0.708	
Q11	0.721	0.725	
Q14	0.773	0.787	
Q17	0.561	–	
Q20	0.755	0.738	
Q23	0.583	0.547	
Q26	0.639	0.644	
Nutrition*			0.698 (0.661, 0.734)
Q1	0.565	0.517	
Q4	0.490	0.428	
Q7	0.414	0.428	
Q10	0.527	0.544	
Q13	0.542	0.544	
Q16	0.508	0.535	

(*continued on next page*)

Table 3: (*continued*)

Construct and items	Initial model	Final model	
	Standardised factor loading, (λ)	Standardised factor loading, (λ)	CR (95% CI)a
Q19	0.437	0.423	
Q22	0.490	0.470	
Q25	0.308	–	
PA**			0.664 (0.621, 0.707)
Q3	0.595	0.612	
Q6	0.581	–	
Q9	0.546	0.496	
Q12	0.563	0.570	
Q15	0.654	0.659	
Q18	0.289	–	
Q21	0.481	0.452	
Q24	0.545	0.530	

Q = Question number, CR = Composite Reliability, HR = Health responsibility, PA = Physical activity, aCR was calculated using the formula by Raykov and Marcoulides (2015),*One error covariance for the finalised model, **Two error covariances for the finalised model.

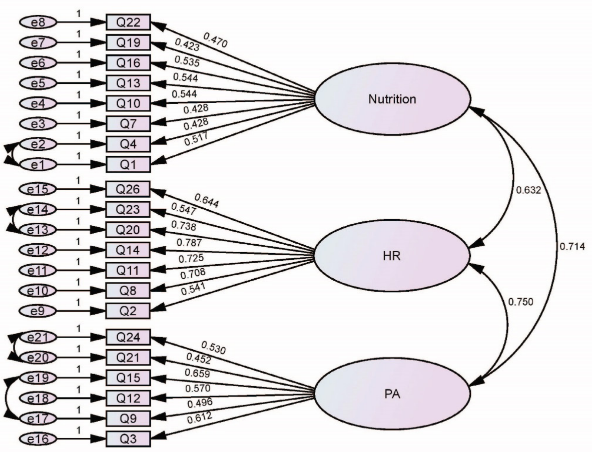

Figure 1: The final measurement model of health promoting behaviours (HPB) scale.

Discussion

In CFA, ML was the most widely used as fitting function for structural equation models. It assumed that the variables in th model were multivariate normal (i.e., the joint distribution of the variables was a multivariate normal distribution) (33). In this study, MLR estimation method was used as the items violated the assumption of multivariate normality. MLR produces the same parameter estimate, but the chi-square for the model test and standard errors for the parameters were calculated differently (42). MLR was assumed to be robust against moderate violations of assumption including un-modelled heterogeneity (42) and can accommodate non-normality data (29).

The proposed three-factor model of HPB fit well after re-specification and resulted in a final model consisted of 21-item three-factor model with four error covariances. In the re-specification process, five items out of 26 items (19%) were dropped. This re-specification in the present study was inconsistent to the four-factor model of HPLP-II among Iranian female adolescence (27) in which large number of items (34 out of 34 items or 100%) were retained which was attributed to carrying over high loading items to CFA stage of validation. In Mohamadian et al. (27)'s study, the nature of the data (e.g. normality of the items) and estimator method were not published.

The items retained in the present study are different from previous validation studies of the translated version of HPLP-II using all the six subscales (24–26). This finding signifies the use of different set of translated questions for different population may have different understanding of the items measured. The items that are relevant to other translated version such as Chinese, Spanish, and Portuguese might not be applicable to Malaysian undergraduate students and vice versa. However, there is a similarity between the Spanish version (25) and Taiwanese-Chinese version (26) of HPLP-II with the present study in terms of the problematic item "*Eat breakfast*" in both studies. The current study's item Q25 "*Eat breakfast*" was found to be problematic item that affect the fitness of the model and dropped from the scale. However, all items were retained and produced an adequate fit after re-specification of model with six error covariances in Sousa's et al. (24)'s validation study.

Given that the validation in term of CFA was not reported in the original English version HPLP-II instrument (16), the present study had confirmed the validation for the three-factor structure measurement model based on CFI, SRMR, and RMSEA except for and TLI. Our study provided a foundation for further, larger-scale investigation of this instrument as a culturally appropriate tool to assess the healthy lifestyles among Malaysian undergraduate students. Furthermore, a university-based programme aimed at promoting healthy lifestyles could help prevent cardio-metabolic risks (18).

Overall, the final measurement model demonstrated discriminant validity among Malaysian university students. The strong positive correlations between subscales of health promoting behaviours found in the present study were an evidence of discriminant validity. Each subscales was distinct from each other in measuring its latent variables but they belong to the component of HPB in HPLP-II. The findings were similar to Sousa et al. (24)'s study which also found significant positive correlations between the construct.

The CR estimates in the present study was adequate proof of good construct reliability. Thus, convergent validity was established. However, the findings were not comparable to previous validation studies. This was due to the usage of different reliability coefficient. Previous validation-reliability studies (23, 24, 26, 27) used internal consistency (Cronbach alpha) to determine the reliability of the constructs and found that the subscales of HPLP-II were reliable, Cronbach alpha more than 0.70. However, in the present study, we utilised the CR based on Raykov and Marcoulides (36)'s formula which accounted for error covariance. This estimate takes into the account of the individual contribution of each item and its error towards its latent factor; they were based on proportions of variance, and can be used in situations where hierarchical structure exists in the data. Furthermore, they provided a much less biased estimate of reliability than Cronbach alpha (43). The estimates of true reliability (via the confidence interval) produced by composite reliability had the ability to empirically assess and overcome some of the limiting assumption of coefficient alpha (36, 44) in CFA study. The coefficient alpha and CR values might be used interchangeably when correcting validity coefficients or effect sizes in meta-analyses with few practical consequences (45). Although coefficient alpha values may generally be lower bounds on true reliability, their used in practice should not be deleterious to knowledge development.

The three subscales of HPLP-II in this study were tested among undergraduate students in USM. We are optimistic that the questionnaire might also be valid to other undergraduate students in other universities in Malaysia keeping in view that the environment and their school structure are closely similar. However, we are unsure about its generalisation among Malaysian undergraduate students in general until further cross-validation studies are conducted among these populations. Although the data from the 21-item HPLP-II of the three subscales revealed sufficient validity and reliability to study the HPB, participants might have given their socially desired responses.

Conclusion

Despite the limitations, we provided the evidence of the measurement model validity for HPB components in the HPLP-II among Malaysian undergraduate students. In conclusion, the scale showed good psychometric properties and can be used to assess HPB among undergraduate students. Further research is warranted through cross-cultural validation whereby the model should be tested in other universities in Malaysia to provide further empirical evidence of its measurement model validity. Future studies should also include the findings of the relationship between HPB scores and actual student's performance to provide predictive validity of the inventory.

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Appendix 1: Detail descriptions on the health promoting behaviours (HPB) scale

No.	Statement
Q1.	Choose a diet low in fat, and cholesterol.
Q2.	Report any unusual signs or symptoms to a physician or other health professional.
Q3.	Follow a planned exercise program.
Q4.	Limit use of sugars and foods containing sugar (sweets).
Q5.	Read or watch TV programs about improving health.
Q6.	Exercise vigorously for 20 or more minutes at least three times a week (such as brisk walking, bicycling, aerobic dancing, stair climber).
Q7.	Eat 6–11 servings of bread, cereal rice and pasta each day.
Q8.	Question health professionals in order to understand their instructions.
Q9.	Take part in light to moderate physical activity (such as sustained walking 30–40 minutes 5 or more times in a week).
Q10.	Eat 2–4 servings of fruits each day.
Q11.	Get a second opinion when I question my healthcare provider's advice.
Q12.	Take part in leisure-time (recreational) physical activities (such as swimming, dancing, bicycling).
Q13.	Eat 3–5 servings of vegetables each day.
Q14.	Discuss my health concerns with health professionals.
Q15.	Do stretching exercises at least 3 times a week.
Q16.	Eat 2–3 servings of milk, yogurt, or cheese each day.
Q17.	Inspect my body at least monthly for physical changes/danger signs.
Q18.	Get exercise during usual daily activities (such as walking during lunch, using stairs instead of elevators, parking car away from destination and walking).
Q19.	Eat only 2–3 servings from meat, poultry, fish, dried beans, eggs, and nuts group each day.
Q20.	Ask for more information from health professionals about how to take care of myself.
Q21.	Check my pulse rate when exercising.
Q22.	Read labels to identify nutrients, fats, and sodium content in packaged food.
Q23.	Attending educational programs on personal healthcare.
Q24.	Reach my target heart rate when exercising.
Q25.	Eat breakfast.
Q26.	Seek guidance or counselling when necessary.

References

1. World Health Organization [Internet]. Health promotion. 2015 [cited 2015 Aug 21]. Available from: http://www.who.int/topics/health_promotion/en/.
2. Teng H-L, Yen M, Fetzer S. Health promotion lifestyle profile-II: Chinese short version. J Adv Nurs. 2010;66(8):1864–73. doi: 10.1111/j.1365-2648.2010.05353.x.
3. Malaysian Health Promotion Board. Strategic plan 2013–2017. Putrajaya: Malaysian Health Promotion Board; 2013.
4. Kumar, KH. At what cost, healthcare in Malaysia? The Star Online. 2014. [cited 2015 Aug 10]. Available from: http://www.thestar.com.my/lifestyle/health/2014/11/16/at-what-cost-healthcare-in-malaysia.
5. United Nations [Internet]. Non-communicable diseases deemed development challenge of "Epidemic Proportions" in political declaration adopted during landmark general assembly summit. 2011. [cited 2015 Aug 10]. Available from: http://www.un.org/press/en/2011/ga11138.doc.htm.
6. Steptoe A, Wardle J, Cui W, Bellisle F, Zotti A-M, Baranyai R, et al. Trends in smoking, diet, physical exercise, and attitudes toward health in European university students from 13 countries, 1990–2000. Prev Med. 2002;35(2):97–104. doi: 10.1006/pmed.2002.1048.
7. Zick CD, Smith KR, Brown BB, Fan JX, Kowaleski-Jones L. Physical activity during the transition from adolescence to adulthood. J Phys Act Health. 2007;4(2):125.
8. Alizadeh M, Ghabili K. Health related lifestyle among the Iranian medical students. Res J Biol Sci. 2008;3(1):4–9.
9. Gan WY, Mohd Nasir MT, Zalilah MS, Hazizi AS. Differences in eating behaviours, dietary intake and body weight status between male and female Malaysian university students. Malays J Nutr. 2011;12(2):213–28.
10. Lee RLT, Yuen LAJT. Health-promoting behaviors and psychosocial well-being of university students in Hong Kong. Public Health Nurs. 2005;22(3):209–20. doi: 10.1111/j.0737-1209.2005.220304.x.
11. Prentice-Dunn H, Prentice-Dunn S. Physical activity, sedentary behavior, and childhood obesity: a review of cross-sectional studies. Psychol Health Med. 2012;17(3):255–73. doi: 10.1080/13548506.2011.608806.
12. Walker S, Sechrist K, Pender N. The health-promoting lifestyle profile: Development and psychometric characteristic. Nurs Res. 1987;36(2):76–81. doi: 10.1097/00006199-198703000-00002.
13. National Cancer Institute. Physical activity questionnaires (PAQ) validation studies. 2013 [cited 2015 Aug 21]. Available from: http://appliedresearch.cancer.gov/paq/validation.html.
14. The Food and Nutrition Information Center. Dietary assessment instruments for research. 2015 [cited 2015 Aug 21]. Available from: https://fnic.nal.usda.gov/surveys-reports-and-research/research-tools/dietary-assessment-instruments-research.
15. Mochari H, Gao Q, Mosca L. Validation of the MEDFICTS dietary assessment questionnaire in a diverse population. J Am Diet Assoc. 2008;108(5):817–22. doi: 10.1016/j.jada.2008.02.021.
16. Walker SN, Hill-Polerecky DM. Psychometric evaluation of the health promoting lifestyle profile II. Unpublished manuscript. 1996.
17. Pender NJ. The health promotion model manual. 2011 [cited 2015 Aug 18]. Available from: http://nursing.umich.edu/faculty-staff/nola-j-pender.

18. Kim C-J, Park J, Kang S-W. Health-promoting lifestyles and cardio-metabolic risk factors among international students in South Korea. Collegian. 2015;22:215–23. doi: 10.1016/j.colegn.2014.09.008.

19. Jackson ES, Tucker CM, Herman KC. Health value, perceived social support, and health self-efficacy as factors in a health-promoting lifestyle. J Am Coll Health. 2007;56(1):69–74. doi: 10.3200/JACH.56.1.69-74.

20. Beal CC, Stuifberge AK, Brown A. Predictors of a health promoting lifestyle in women with fibromyalgia syndrome. Psychol Health Med. 2009;14(3):343–53. doi: 10.1080/13548500902730093.

21. Chen YC, Wu HP, Hwang SJ, Li IC. Exploring the components of metabolic syndrome with respect to gender difference and its relationship to health-promoting lifestyle beahviour: a study in Taiwanese urban communities. J Clin Nurs. 2010;19:3031–41. doi: 10.1111/j.1365-2702.2010.03280.x.

22. Srof BJ, Velsor-Friedrich B. Health promotion in adolescents: a review of Pender's health promotion model. Nurs Sci Q. 2006;19(4):366–73. doi: 10.1177/0894318406292831.

23. Pinar R, Celik R, Bahcecik N. Reliability and construct validity of the health-promoting lifestyle profile II in an adult Turkish population. Nurs Res. 2009;58(3):184–93. doi: 10.1097/NNR.0b013e31819a8248.

24. Sousa P, Gaspar P, Vaz DC, Gonzaga S, Dixe MA. Measuring health-promoting behaviors: cross-cultural validation of the health-promoting lifestyle profile-II. Int J Nurs Knowl. 2015;26(2):54–61. doi: 10.1111/2047-3095.12065.

25. Perez-Fortis A, Diez SMU, Padilla J-L. Psychometric properties of the Spanish version of the health-promoting lifestyle profile II. Res Nurs Health. 2012;35:301–13. doi: 10.1002/nur.21470.

26. Lo M, Wong C-N. Validation of the psychometric properties of the health-promoting lifestyle profile in a sample of Taiwanese women. Qual Life Res. 2011;20:523–8. doi: 10.1007/s11136-010-9790-6.

27. Mohamadian H, Ghannaee M, Kortdzanganeh J, Lo M. Reliability and construct validity of the Iranian version of health-promoting lifestyle profile in a female adolescent population. Int J Prev Med. 2012;4(1):42–9.

28. Al-Naggar RA, Bobryshev YV, Mohd Noor NA. Lifestyle Practice among Malaysian university students. Asian Pac J Cancer Prev. 2013;14(3):1895–903. doi: 10.7314/APJCP.2013.14.3.1895.

29. Muthen LK, Muthen BO. Mplus user's guide. 7th ed. Los Angeles, CA: Muthen & Muthen; 1998–2012.

30. Hair JF Jr, Black WC, Babin BJ, Anderson RE. Multivariate data analysis. 7th ed. New Jersey: Pearson Prentice Hall; 2010.

31. Wang J, Wang X. Structural equation modeling applications using Mplus. Chichester, West Sussex, United Kingdom: John Wiley & Sons Ltd.; 2012. doi: 10.1002/9781118356258.

32. Kline RB. Principles and practice of structural equation modeling. 3rd ed. New York: The Guilford Press; 2011.

33. Schermelleh-Engel K, Moosbrugger H, Muller H. Evaluating the fit of structural equation models: tests of significance and descriptive goodness-of-fit measures. Methods of Psychological Research Online. 2003;8(2):23–74.

34. Hu LT, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. Struct Equ Modeling. 1999;6(1):1–55. doi: 10.1080/10705519909540118.

35. Fornell C, Larcker DF. Evaluating structural equation models with unobservable variables and measurement error. J Mark Res. 1981;18(1):39–50. doi: 10.2307/3151312.

36. Raykov T, Marcoulides GA. Scale reliability evaluation under multiple assumption violations. Struct Equ Modeling. 2015:1–12.

37. Bagozzi RP, Yi Y. On the evaluation of structural equation models. J Mark Sci. 1988;16(1):74–94. doi: 10.1007/BF02723327.

38. Tseng W-T, Dornyei Z, Schmitt N. A new approach to assessing strategic learning: the case of self-regulation in vocabulary acquisition. Appl Linguist. 2006;27(1):78–102. doi: 10.1093/applin/ami046.

39. Brown TA. Confirmatory factor analysis for applied research. New York: The Guilford Press; 2006.

40. Bowen NK, Guo S. Structural Equation Modeling. New York: Oxford University Press; 2012.

41. Stevens JP. Applied multivariate statistics for the social sciences. Mahwah, New Jersey: Lawrence Erlbaum Associate; 2009.

42. Hox JJ, Maas CJM, Brinkhuis MJS. The effect of estimation method and sample size in multilevel structural equation modeling. Stat Neerl. 2010;64(2):157–170. doi: 10.1111/j.1467-9574.2009.00445.x.

43. Starkweather J. Step out of the past: Stop using coefficient alpha; there are better ways to calculate reliability. 2012 [cited 2015 Aug 19]. Available from: http://www.unt.edu/rss/class/Jon/Benchmarks/Omega_JDS_Jun2012.pdf.

44. Raykov T. Bias of coefficient α for fixed congeneric measures with correlated errors. Appl Psychol Meas. 2001;25:69–76. doi: 10.1177/01466216010251005.

45. Peterson RA, Kim Y. On the relationship between coefficient alpha and composite reliability. J Appl Psychol. 2013;98(1):194–198. doi: 10.1037/a0030767.