Psychometric properties of sleep hygiene index in Indonesian adolescents

Anggi Setyowati,1,2 Min-Huey Chung,2,3 Ah. Yusuf,4 Setya Haksama5

1Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia; 2School of Nursing, College of Nursing, Taipei Medical University, Taipei, Taiwan; 3Department of Nursing, Taipei Medical University-Shuang Ho Hospital, New Taipei City, Taiwan; 4Department of Community and Mental Health Nursing, Faculty of Nursing, Universitas Airlangga, Surabaya, Indonesia; 5Department of Health Administration and Policy, Public Health Faculty, Universitas Airlangga, Surabaya, Indonesia

Abstract

Background: Sleep is associated with some behavioral factors such as maladaptive, which tend to disrupt its normal mechanism, therefore, a tool is needed to measure maladaptive sleep hygiene. This study aims to assess the psychometric properties of sleep hygiene index (SHI), translation, factor structure, validity, and reliability.

Design and Methods: Data were collected from 101 Indonesia adolescents in junior high school, with SHI-Indonesia translated based on WHO guideline. The obtained data were analyzed using varimax rotation, while the convergent validity was evaluated by calculating the correlation between the item and total score. In addition, the Cronbach’s alpha was computed to investigate internal consistency, and two-week interval test-retest was conducted to assess reliability.

Results: SHI is a unidimensional factor structure with an excellent test-retest reliability of P<0.001 at 0.618, and a positive convergent validity correlation between each item and the total score.

Conclusions: The SHI Bahasa translation is a reliable and valid tool to assess maladaptive sleep hygiene among Indonesia Adolescents.

Introduction

Poor sleep hygiene is associated with maladaptive behavior and practices. The strongest factor to predict sleep quality is behavioral factors, such as sleep hygiene. Sleep hygiene is needed to acquire good sleep quality, adequate duration, full daytime alertness and the ability to maintain sleep-wake pattern in consecutive days.

Generally, sleep hygiene is associated with behavioral practices and environmental factors. The key to achieving the required amount of sleep is resting regularly every day. Other practices include taking late-afternoon naps, avoiding alcohol, coffee, and tobacco consumption before bedtime, sleeping in a comfortable, and quiet environment, sleeping during weekends and avoiding emotional, physiological, or cognitively stimulating activities before bedtime. Generally, adolescents tend to experience an inadequate amount of sleep. Sleep hygiene practice is needed to maintain the quantity and quality of sleep, therefore, rapid screening tools need to be utilized for adolescents to have an idea of their problem. Sleep Hygiene Index (SHI) shows higher internal consistency compared to Sleep Hygiene Awareness and Practice Scale (SHAPS) and Sleep Hygiene Self-test (SHST), with moderate internal consistency and good test-retest. Moreover, SHI was positively correlated (P<0.01) with all features of inadequate sleep hygiene. However, SHI has not been translated into Bahasa, and there are no studies on its psychometric version. This study, therefore, aims to assess the psychometric properties of sleep hygiene index (SHI), including translation, validity, and reliability among Indonesia adolescents.

Significance for public health

Poor sleep is a public health issue with broad implications for mental health, physical health, and academic performance. Generally, adolescents tend to experience poor sleep. Sleep hygiene practice is needed to maintain the quantity and quality of sleep, therefore, rapid screening tools need to be utilized, for adolescents to have an idea of their problem. This study, therefore, aims to assess the psychometric properties of sleep hygiene index (SHI), including translation, validity, and reliability among Indonesian adolescents. The data used were collected in 2014 and translated using SHI in accordance with the World Health Organization guideline. In conclusion, the SHI version is a reliable and valid tool to assess maladaptive sleep hygiene among Indonesian adolescents.
Quality Index ($r(269)=0.481$, $P<0.01$). Research permission was obtained from the Universitas Airlangga, Indonesia, while the original authors granted the request to use the questionnaire. The data used were collected in 2014 and translated using SHI in accordance with the World Health Organization guidelines. In the initial step, a nurse familiar with the terminologies was used to translate the questionnaire in the Bahasa language. This was preceded by the identification of the concepts of translation using the services of an expert panel. Finally, the questionnaire was translated back in English, with the result compared to the original SHI by recruiting 10 adolescents. The aim of the pilot study is to determine the ability of adolescents to understand the Indonesian questionnaire. All analyses used the SPSS version 20.0 for Windows, while descriptive statistics such as means and standard deviation were used as variables. Reliability analysis was used to calculate Cronbach’s Alpha for each item of the SHI and was considered acceptable at $>0.5$. The varimax-rotated principal components analysis was used to explore the construct validity of the SHI-Indonesia (SHI-i), with Kaiser-Meyer-Olkin used to measure its adequacy (KMO) 0.60 and Bartlett’s test with $P<0.05$ and loading variables $≥0.32$. Furthermore, a confirmatory factor analysis (CFA) was conducted to confirm the factors structure. The fitness of these factors was measured using the Root Mean Square Error of Approximation (RMSEA) $<0.08$. Good model fit for the Goodness-of-Fit statistic (GFI) $>0.90$ and the Incremental Fit Indices (IFI) $>0.90$. Convergent validity was considered to determine the significant and positive correlation between global score SHI-I and 13 items of score SHI-i. A correlation of $>0.2$ between each domain was considered satisfactory.

**Results**

Table 1 showed the characteristic of the sample, with the respondents predominantly males (67.3%) and 14 years old (62.4%). The majority slept in their rooms (78.2%) and conducted regular exercise 2-4 times a week (95%). Mean SHI-i score was 31.84±5.861 with a range of 20-48.

**Reliability estimate: Internal consistency**

The Cronbach’s alpha for SHI-i was 0.618 and ranged 0.576-0.616 when an item is deleted. Table 2 shows the item-total correlation coefficient of SHI-I, between 0.202 – 0.567. In addition, a test-retest was conducted, and the result showed that SHI-i had good reliability at $P<0.001$.

**Validity: Factor structure of SHI-i**

An exploratory analysis was conducted to test the construct validity of the SHI-i. Kaiser-Meyer-Olkin and Bartlett’s chi-square showed values of 0.604 and 187.255, respectively at $P<0.001$, thereby, supporting the adequacy of data for the analyses. Most items had factor loading greater than 0.40. The first factor consists of 6 items, which refers to sleep-distribution, with an explained variance of 19.90% and the second factor consists of five items referred to as irregular sleep-wake schedule at 11.88%.

**Construct Validity**

CFA was conducted to validate the structure of SHI-i extracted through EFA. The model with second order performed, using, the Goodness-Of-Fit indices ($\chi^2=475.826$ df = 101, $P=0.00$, GFI = 0.95, Incremental Fit Indices (IFI) = 0.959, Root-Mean-Square Error of Approximation (RMSEA) = 0.03) as shown in Figure 1.

| Table 1. SHI Instrument Analysis. |
|-----------------------------------|
| Mean          | SD     | Cronbach's Alpha | Item total r |
| SHI1           | 2.66   | 0.952            | 0.616         | 0.309 |
| SHI2           | 3.34   | 1.032            | 0.597         | 0.430 |
| SHI3           | 2.66   | 1.134            | 0.576         | 0.535 |
| SHI4           | 1.65   | 0.905            | 0.605         | 0.357 |
| SHI5           | 2.41   | 1.079            | 0.614         | 0.353 |
| SHI6           | 1.22   | 0.559            | 0.612         | 0.270 |
| SHI7           | 2.56   | 1.153            | 0.590         | 0.477 |
| SHI8           | 2.07   | 0.951            | 0.577         | 0.524 |
| SHI9           | 2.90   | 1.196            | 0.593         | 0.473 |
| SHI10          | 1.98   | 1.166            | 0.596         | 0.452 |
| SHI11          | 2.26   | 1.189            | 0.569         | 0.567 |
| SHI12          | 3.46   | 1.229            | 0.653         | 0.202 |
| SHI13          | 2.67   | 1.193            | 0.578         | 0.532 |
| Global score   | 31.84  | 5.861            |              |      |

**Figure 1.** The Factor structure of SHI. Model fit index: $\chi^2=475.826$ (df = 101, $P=0.00$); Goodness-Of-Fit index (GFI) = 0.922, Comparative Fit Index (CFI) = 0.954, Incremental Fit Indices (IFI) = 0.959, Root-Mean-Square Error of Approximation (RMSEA) = 0.03.
Table 3. Factor loadings for explanatory factor analysis

| Item | Factor Loadings |
|------|-----------------|
| Item 1 | 0.552 |
| Item 2 | 0.474 |
| Item 3 | 0.657 |
| Item 5 | 0.569 |
| Item 7 | 0.529 |

Convergent Validity

Convergent validity was demonstrated through a significant and positive statistical correlation between global score SHI-i and 13 items of score SHI-i. Table 3 showed the correlation range between each domain was \( r = 0.202 - 0.567, P< 0.05 \).

Discussions

These findings supported the psychometric of Sleep Hygiene Index-Indonesian (SHI-i) consisting of translation, validity, and reliability among Indonesia adolescents. It is an extension of the previous study and supports the SHI-i by constructing valid and convergent methods. SHI-i had good validity and reliability used to screen sleep hygiene among adolescents.

The SHI-i was supported by construct validity and convergent validity, with the exploratory factor analysis used to extract the questionnaire. The results showed some changes in the factor structure, compared with the previous psychometric of the SHI, with only 11 items of SHI-i greater than 0.4. This was considered statistically significant, with the interpretation of two items and also different characteristics of the population. The CFA was also conducted to assess the construct validity of SHI-i, as shown in Figure 1. Convergent validity of SHI-i version showed a positive correlation between each item and total score.

This study also examined the internal and test-retest reliability for SHI-i with a Cronbach's alpha value of 0.618, similar to previous research using a stable test-retest reliability for two-weeks for the non-clinical population. However, further study is needed to test SHI-i into the clinical sample.

Adequate sleep is associated with good sleep hygiene. This study did not examine the correlation between sleep quality and sleep hygiene, therefore, further research is needed. In addition, the research is limited to the sample size for EFA, which has not been established based on the rule of thumb with a minimum value of 100.

Conclusions

In conclusion, this study supports the psychometric of SHI-Indonesia version, including reliability, construct validity, and convergent validity. This tool can be used to assess sleep hygiene practices among healthy adolescents.

Correspondence: Ah. Yusuf, Department of Community and Mental Health Nursing, Faculty of Nursing, Universitas Airlangga, Surabaya, 60115 Indonesia.
Tel.: +62315913257, Fax: +62315913752.
E-mail address: ah-yusuf@fpk.unair.ac.id

Key words: Sleep hygiene; psychometric; validity; reliability.

Acknowledgements: The authors are grateful to the lecturers of the University for their friendly support.

Contributions: The authors contributed equally. Conception and design: MHC and AS. Analysis and interpretation of the Data: AS. Drafting of the article: AS, NY, SH. Critical revision of the article for important intellectual content: NY and SH. Final approval of the article: NY. Provision of the study materials: MHC, Obtaining of funding: NY, SH, and MHC. Collection and assembly of data: AS.

Conflict of interest: The authors declare no potential conflict of interest.

Funding: A TMU grant and Universitas Airlangga supported this research.

Clinical trials: The study is not involved in any clinical trial.

Conference presentation: Part of this paper was presented at the 4th International Symposium of Public Health, held from October 30th - November 1st, 2019, at Griffith University, Australia. Received for publication: 6 March 2020. Accepted for publication: 13 June 2020.
References

1. Tsai YL, Chen CW, Cheng HC, et al. Cognitive and behavioral factors in insomnia comorbid with depression and anxiety. Sleep Biol Rhythms 2013;11:237-44.

2. Chung MH, Liu WI, Lee HL, et al. Selected neurophysiological, psychological, and behavioral influences on subjective sleep quality in nurses: a structure equation model. PloS One 2013;8:e79529.

3. Nam S, Whittemore R, Jung S, et al. Physical neighborhood and social environment, beliefs about sleep, sleep hygiene behaviors, and sleep quality among African Americans. Sleep Health 2018;4(3):258-64.

4. Yazdi Z, Loukzadeh Z, Moghaddam P, et al. Sleep hygiene practices and their relation to sleep quality in medical students of Qazvin University of Medical Sciences. J Car Sci 2016;5:153.

5. O’Donnell S, Driller MW. Sleep-hygiene education improves sleep indices in elite female athletes. Int J Exercise Sci 2017;10:522.

6. Yang CM, Lin SC, Hsu SC, et al. Maladaptive sleep hygiene practices in good sleepers and patients with insomnia. J Health Psychol 2010;15:147-55.

7. Irish LA, Kline CE, Gunn HE, et al. The role of sleep hygiene in promoting public health: A review of empirical evidence. Sleep Med Rev 2015;22:23-36.

8. Leger D, Beck F, Richard JB, et al. Total sleep time severely drops during adolescence. PloS One 2012;7:e45204.

9. Mitchell JA, Rodriguez D, Schmitz KH, et al. Sleep duration and adolescent obesity. Pediatrics 2013;131:e1428-e34.

10. Ramirez SZ, Lukenbill J. Psychometric properties of the Zung Self-Rating Anxiety Scale for adults with intellectual disabilities (SAS-ID). J Develop Physical Disabilities 2008;20(5):573-80.

11. Lacks P, Rotert M. Knowledge and practice of sleep hygiene techniques in insomniacs and good sleepers. Behav Res Ther 1986;24(4):365-8.

12. Blake DD, Gomez MH. A scale for assessing sleep hygiene: Preliminary data. Psychol Rep 1998;83:1175-8.

13. Mastin DF, Bryson J, Corwyn R. Assessment of sleep hygiene using the Sleep Hygiene Index. J Behav Med 2006;29:223-7.

14. Setyowati A, Chung M-H, Yusuf A. Development of self-report assessment tool for anxiety among adolescents: Indonesian version of the Zung self-rating anxiety scale. J Public Health Afr 2019;10.

15. WHO. Process of translation and adaptation of instruments 2014. Available from: http://www.who.int/substance_abuse/research_tools/translation/en/. Accessed on: 7 February 2014.

16. Morera OF, Stokes SM. Coefficient α as a measure of test score reliability: Review of 3 popular misconceptions. Am J Publ Health 2016;106:458-61.

17. Streiner DL. Starting at the beginning: an introduction to coefficient alpha and internal consistency. J Personal Assess 2003;80:99-103.

18. Hair JF, Anderson RE, Tatham RL, et al. Multivariate data analysis. Upper Saddle River, NJ: Prentice Hall; 1998.

19. Tabachnick BG, Fidell LS, Ullman JB. Using multivariate statistics: Pearson Boston, MA; 2007.

20. Comrey A, Lee H. A First Course in Factor Analysis, Erlbaum. Hillsdale, NJ. 1992.

21. Steiger JH. Structural model evaluation and modification: An interval estimation approach. Multiv Behav Res1990;25(1):173-80.

22. Hooper D, Coughlan J, Mullen M. Structural model evaluation and modification: Guidelines for determining model fit. Articles 2008:2.

23. Ozdemir PG, Boysan M, Selvi Y, et al. Psychometric properties of the Turkish version of the Sleep Hygiene Index in clinical and non-clinical samples. Comprehensive Psychiatry 2015;59:135-40.

24. Kline P. A handbook oftest construction: Introduction to psychometric design. New York: Methuen 1986.

25. Cho S, Kim G-S, Lee J-H. Psychometric evaluation of the sleep hygiene index: a sample of patients with chronic pain. Health Qual Life Outcomes 2013;11(1).

26. Youn S, Kim C, Lee J, et al. Development of Dysfunctional Beliefs and Attitude about Sleep Scale for Cancer Patients. Behav Sleep Medicine 2019:1-11.

27. Hair J AR, Tatham RL, Black WC. Multivariate Data Analysis. New Jersey: Prentice-Hall Inc 1995.