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ORIGINAL RESEARCH

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Cross-cultural validation of the Korean male version of athletes sleep behavior questionnaire

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Abstract

In male athletes, sleep plays an important role in recovery and the improvement of physical abilities through high-intensity training. Unfortunately, no appropriate questionnaire is currently available to assess sleep problems in male Korean athletes. Therefore, this study translated and cross-culturally validated the Athlete Sleep Behavior Questionnaire (ASBQ) for male Korean athletes. This study employed a conceptual review, comprising translation preparation, review, and preliminary investigation, and a statistical review, comprising the test-retest method, test-retest reliability, and internal consistency analysis. Content equivalence between the original ASBQ text and the Korean version was secured, and test-retest reliability and internal consistency were acceptable. Acceptable levels of comprehension were observed for the translated questions. The dependent *t*-test analysis showed no significant differences between any of the questions. A verification of the stability of the Korean male version of the ASBQ using the test-retest method at 2-week intervals showed an acceptable level of reliability (intraclass correlation coefficient = 0.78, $r = 0.77$, typical measurement error = 2.5, coefficient of variation = 7.6%). Lastly, the internal consistency reliability test revealed a Cronbach's α of 0.87 at the 95% confidence level. The Korean male version of the ASBQ showed content equivalence and reliability with the original version. It can be used as a tool to analyze the sleeping behavior of Korean male athletes and provide customized training schedules.

Keywords

Male athletes; Sleep behavior; Cross-culture; Athletic training

1. Introduction

In athletes, sleep plays an important role in recovery and enables them to demonstrate their physical ability through high-intensity training [1]. Particularly, competitive situations, such as sporting events, may cause sleep disturbances and disruptions in sleep patterns in athletes [2, 3]. In addition, the nervous state of athletes negatively affects their performance, which requires high levels of cognitive function [4]. Sleep and life patterns of athletes are significantly different from those of nonathletes due to their unique physical and psychological characteristics [4–6]. Athletes are required to adapt to irregular living patterns due to high psychological stress from high-intensity training and long-distance competitions. Therefore, it is difficult for most athletes to maintain stable sleep patterns. Hence, the diagnosis and evaluation of sleep problems in all athletes is crucial to promote their sleep hygiene.

Sleep evaluation methods, such as polysomnography and actigraphy, can be used to objectively evaluate sleep; however, they require laboratory environments and equipment. Thus, owing to low economic feasibility, these methods are not useful for primary sleep evaluation [7, 8]. In contrast, as the sleep evaluation questionnaire has high utility and economic feasibility as an initial diagnostic tool [9], the development and clinical verification of the sleep evaluation questionnaire according to various target characteristics and sleep variables is in progress. Although the sleep assessment questionnaire is somewhat less accurate in measuring quantitative sleep variables compared with polysomnography, which is the standard tool for sleep assessment, a questionnaire with a quickly administrable early and subjective self-report format is highly recommended for the easy and convenient identification of sleep problems [10].

The Athlete Sleep Behavior Questionnaire (ASBQ) is a subjective self-report questionnaire developed to measure and manage sleep behaviors in athletes [11]. Compared with the Pittsburgh Sleep Quality Index, Epworth Sleepiness Scale, and Sleep Hygiene Index, which are representative sleep evaluation questionnaires for the general public, the ASBQ allows the identification of unique sleep problems in elite athletes [11]. Moreover, it can be utilized in sports fields, facilitating the provision of information to individual athletes for improving their sleep behaviors by sports coaches and professional trainers [10].

In Korea, sleep assessment tools are used only for non-

athletes. Therefore, sleep in Korean athletes is not investigated [12]. Unlike those in Korea, several studies from various countries have examined the relationship between sleep and the intrinsic variables of athletes, such as psychological characteristics before, during and after competitions. In Korea, studies on athletes have mainly focused on physiological indicators, such as hormones and muscle function.

Recently, as scientific evidence on the effects of athletes' sleep on physical and mental recovery and performance is increasing, the importance of sleep management through its measurement and evaluation is simultaneously increasing [4, 13, 14]. Undoubtedly, sleep evaluation questionnaires for athletes can provide a more accurate diagnosis and evaluation than those for non-athletes. Unfortunately, there is no appropriate sleep evaluation questionnaire for Korean athletes under a high level of psychological stress and/or burnouts [15, 16]. Considerable time and cost are required to develop and validate new tools for the diagnosis and evaluation sleep problems in Korean male athletes. Therefore, a Korean version of a previously validated questionnaire in English needs to be developed. As the Korean male version of the ASBQ does not require a specific environment or device and can be used easily at any time, it would be highly useful for athletes who travel frequently for repetitive training and national or international competitions while also experiencing high psychological stress [17].

The ASBQ has been translated into other languages and adapted to a few cultural contexts [8, 18, 19], and sleep behavior in male athletes needs to be assessed using a validated and culturally adapted tool in Korea. Moreover, studies in non-English-speaking countries are needed to confirm and test the questionnaire and its relevance to athletes in other countries. Thus, this study aimed to translate and perform a cross-cultural validation of the ASBQ in Korean male athletes. This study will contribute to further research in non-English-speaking countries by addressing the adaptation, refinement, and evaluation of the feasibility of the ASBQ for athletes in other countries.

2. Materials and methods

Conceptual and statistical reviews were conducted to develop the Korean version of the ASBQ (K-ASBQ). The conceptual review process comprised translation preparation, review and preliminary investigations. The statistical review process included the test-retest method, test-retest reliability, and internal consistency analysis using bilingual users.

2.1 Conceptual review

A parallel-blind technique was used to translate the ASBQ. Compared with the translation/back-translation method, the two-person translation comparison method has the advantage of being able to compare and analyze faster [20]. The original ASBQ text was individually translated by two experts with doctorates in physical education from an English-speaking country and experience in Korean-scale translation research. The two translations were compared and reviewed to arrive at a consensus, and the first translation was developed.

A three-person review team of people with experience in Korean-scale translation research was formed, and a review meeting was held on the equivalence between the translation and the original. After comparing and reviewing the original and translated versions, the second translation was completed.

For the preliminary survey of the second translation, a survey was conducted with 30 male college athletes belonging to the Korean Sports and Olympic Committee. The 30 male athletes were sampled using judgment sampling, which is a non-probability sampling [21]. A 5-point Likert scale (1 = very difficult, 2 = difficult, 3 = normal, 4 = easy and 5 = very easy) was used to score the comprehension of the contents of each question, and the time required to fill out the questionnaire for each survey item was collected. Based on the results of the preliminary investigation, a meeting of the translation review team was held, and the final translation was developed through revision and supplementation of the second translation.

2.2 Statistical review

To verify content equivalence between the original text and the translated version, the "test-retest method using bilingual users" [22] was employed. A survey was conducted using the original and final translations in 30 bilinguals (Korean-English) people sampled using judgment sampling [21] (Table 1). They were divided into two groups. One group was tested through a questionnaire translated into Korean; after 4 weeks, the original questionnaire was retested. The other group was tested using the original text and then through a questionnaire translated into Korean in the same manner.

A test-retest was conducted on 30 male college athletes. The interval between the test-retest periods was 2 weeks, and the data of the 27 participants who completed all the tests were used for the analysis (Table 2).

TABLE 1. Participants for content equivalence verification.

	N	Age (M ± SD)
Original-Translated	16	22.44 ± 1.71
Translated-Original	14	22.00 ± 1.11
Total	30	22.23 ± 1.46

M: mean; SD: standard deviation.

TABLE 2. Participants for item comprehension survey.

	N	Age (M ± SD)	Athletic career
College Athletes	27	21.26 ± 1.02	9.33 ± 2.17

M: mean; SD: standard deviation.

Statistical analyses were performed using SPSS V22.2 (IBM Corporation, Chicago, IL, USA). The degree of comprehension of each question and the time required to complete the preliminary survey were analyzed using descriptive statistics. The content equivalence test for the original-translated version used the dependent *t*-test for each item and the Pearson correlation analysis for comparing the total scores, and statistical significance was set at $\alpha < 0.05$. The test-retest reliability

of the ASBQ was analyzed using the intraclass correlation coefficient (ICC), Pearson correlation coefficient (r), typical measurement error (TME), and percent coefficient of variation (CV%) on an Excel spreadsheet [23]. Cronbach's α was used for internal consistency analysis.

A parallel-blind technique was used to translate the sleep behavior questionnaire for athletes. The two-person translation comparison method is practical; however, the two-person translator must be fluent in the language, and a practical comparative analysis of the two translations is required [21]. To translate the original text written in English into Korean, two university professors with sports research experience in English-speaking countries and developing Korean-scale translations were selected. Each translation was compared and analyzed by the review team, and an agreement was reached through discussion. The ASBQ consists of relatively short text questions and is clear in content; however, it is necessary to consider the use of words and verbs that could be misunderstood owing to cultural differences. A high level of translation was possible by experts who understood the sports culture and Korean and English simultaneously, and the translation could be completed through comparison. Through a preliminary investigation, it was possible to confirm a similar level of survey completion time (1.7 min) and a high comprehension of the question. The validity of the translation was confirmed through verification of content equivalence with the original text.

The most important aspect in the translation of the questionnaire is content equivalence. To verify content equivalence, bilingual users were divided into two groups, and cross-measurements were conducted in Korean-English and English-Korean. The bilingual retest technique using bilingual users is an important method for evaluating the accuracy and appropriateness of translations [24]. There was no difference between any of the questions, and the factor and total score correlation coefficients were acceptable, indicating content equivalence.

3. Results

3.1 Conceptual review results of the K-ASBQ

The translation review team reviewed the equivalence of the translation and the original and completed the second translation in consideration of language and cultural differences in the verbs (sleep, wake up, go to bed, *etc.*), tense, meaning, and form of the questionnaire.

As a result of analyzing the understanding of the questions and the time required to fill out the questionnaire, the average time required to complete the second translation of the ASBQ was 102 s (SD: ±33.07, min: 57 s, max: 180 s). Table 3 presents the final translation of the ASBQ and the results of the comprehension survey for each question.

3.2 Statistical review results of the K-ASBQ

A dependent t-test analysis (Table 4) was performed for each item to verify content equivalence between the original and translated versions. None of the questions showed significant differences, which confirmed the content equivalence between the original and translated versions.

As a result of the correlation analysis for the second verification of content equivalence between the original and translated versions, the correlation between the total scores was 0.796, confirming content equivalence between the original and translated versions.

The test-retest reliability of the K-ASBQ at 2-week intervals was acceptable (ICC = 0.78, r = 0.77, TME = 2.5, AU, CV = 7.6%). The average of Tests 1 and 2 showed a difference of 1.30 ± 3.57. As a result of the internal consistency reliability test, Cronbach's α was found to be 0.87 at the 95% confidence level.

4. Discussion

This study aimed to develop a Korean male version of the ASBQ through cross-cultural validation. The developed K-ASBQ for male athletes was confirmed to have content equivalence and reliability at a level that could be used in any sports field. The Cronbach α of the Korean version of the Athletes Sleep Behavior Questionnaire was 0.87, which was higher than those reported in the most recent study on questionnaire development (0.78), the original questionnaire development study (0.63) and the Turkish study on questionnaire development (0.62) [11, 18, 19]. Therefore, the K-ASBQ for male athletes can be easily and conveniently used to analyze the sleep behavior of athletes in all the sports fields.

The reliability verified through the correlation analysis of the test-retest score was 0.77 at the 95% confidence level, showing an acceptable level of reliability. Although the reliability evaluation was conducted every 7 days for existing studies on questionnaire development in other languages, the reliability-related values were lower than those reported in previous studies due to the 2-week interval in this study. This is attributed to the volatility of athletes' sleep behavior [25], which is a measured variable, rather than the reliability of the test tool, and measuring and monitoring it frequently would help in improving sleep behavior. In addition, considering that

TABLE 3. Test-retest reliability of the Korean version of the ASBQ.

	Test 1 (M ± SD)	Test 2 (M ± SD)	Raw difference (M ± SD)	r (90% CI)	ICC (90% CI)	TME (90% CI)	CV% (90% CI)
K-ASBQ Global Score	38.00 ± 5.30	36.70 ± 5.18	1.30 ± 3.57	0.77 (0.60–0.88)	0.78 (0.62–0.88)	2.5 (2.1–3.2)	7.6 (6.1–9.9)

M: mean; SD: standard deviation; K-ASBQ: Korean version of the Athlete Sleep Behavior Questionnaire; r: Pearson correlation coefficient; ICC: intraclass correlation coefficient; TME: typical measurement error; CV%: percent coefficient of variation; CI: confidence interval.

TABLE 4. Results of comparison between the original and translated questionnaires (*t*-test).

	Original	Translated	*t*	*p*
Q1	2.33 ± 0.99	2.53 ± 1.01	−1.235	0.227
Q2	1.77 ± 1.01	1.63 ± 0.96	0.701	0.489
Q3	2.40 ± 1.04	2.13 ± 1.17	1.610	0.118
Q4	1.77 ± 0.86	1.70 ± 0.84	0.465	0.645
Q5	3.0 ± 0.95	3.03 ± 1.10	−0.328	0.745
Q6	2.27 ± 1.02	2.10 ± 1.09	0.841	0.407
Q7	1.83 ± 0.83	1.63 ± 0.85	1.649	0.110
Q8	3.87 ± 1.25	4.17 ± 0.87	−1.557	0.130
Q9	2.0 ± 0.98	1.73 ± 1.05	1.393	0.174
Q10	2.30 ± 1.24	1.97 ± 1.16	1.439	0.161
Q11	1.40 ± 0.68	1.23 ± 0.50	1.542	0.134
Q12	1.67 ± 0.92	1.67 ± 0.88	0.000	1.000
Q13	1.37 ± 0.56	1.33 ± 0.61	0.328	0.745
Q14	1.27 ± 0.58	1.23 ± 0.57	0.372	0.712
Q15	2.80 ± 1.06	2.63 ± 1.22	0.817	0.420
Q16	1.80 ± 0.76	1.73 ± 1.08	0.421	0.677
Q17	1.5 ± 0.73	1.37 ± 0.72	1.161	0.255
Q18	1.83 ± 0.87	1.97 ± 0.96	−1.000	0.326

the purpose of developing a sleep behavior questionnaire for male athletes was to screen their sleep behaviors, it can be used in almost all sports fields.

The K-ASBQ for male athletes developed in this study secured validity in terms of content equivalence and reliability of each item. As it maintained equivalence in content and form with the original questionnaire, an international comparative study is possible. In addition, owing to its easy and quick application in sports fields, it will be able to contribute to the improvement of sleep behavior of Korean male athletes who undergo special training and have competitive schedules, unlike the general population.

5. Conclusions

The K-ASBQ developed in this study can be used to identify and improve sleep behavior in male Korean athletes. Moreover, athletic organizations can implement this new version of the ASBQ for the scientific management of athletic training and systematic preparation to maintain male athletes in ideal health conditions.

AVAILABILITY OF DATA AND MATERIALS

The data set in this study is available from the first author on reasonable request.

AUTHOR CONTRIBUTIONS

YK—designed the study and performed data collection, analyzed the data, interpreted the data. JY—wrote the first draft of the manuscript. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by the Institutional Review Board of Inha University (IRB 210222-4A), Republic of Korea and was conducted in accordance with the Declaration of Helsinki. Informed consent was obtained from all individuals who agreed to participate in this study.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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