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Athlete Sleep Behavior Questionnaire - Turkish Version: Study of Validity and Reliability

Sporcu Uyku Davranış Anketi - Türkçe Versiyonu: Güvenilirlik ve Geçerlilik Çalışması

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Abstract

Objective: Athlete sleep behavior questionnaire (ASBQ) is a new, valid and reliable questionnaire for evaluating the sleep behaviors of elite athletes. The main objective of the current study was to provide evidence for the validity and reliability of the Turkish version of the ASBQ (ASBQ-TR).

Materials and Methods: Ninety-seven athletes and eighty-three non-athletes were included in the current study and asked to complete the 18-item ASBQ-TR. A sub-group of athletes (n=50) completed the ASBQ-TR twice, 7 days apart. The ASBQ was translated into English twice and then back-translated to Turkish after the permission of the author was received. Test-retest reliability and internal consistency were performed via intraclass correlation coefficient (ICC) and Cronbach's alpha, respectively.

Results: There was a significant difference between the athlete and non-athlete groups in ASBQ-TR total score (38.4 and 36.2 respectively, $p<0.05$). Test-retest reliability of the questionnaire was acceptable (ICC=0.85). The factor loadings of ASBQ-TR were between 0.41 and 0.82. One of the 18-items of the questionnaire was removed due to the factor loading (below 0.40).

Conclusion: The ASBQ-TR is a 17-item valid and reliable tool that can be used to identify sleep challenges that athletes face. The ASBQ-TR can be used as a practical tool for researchers and coaches evaluating the sleep behaviors of elite athletes. This tool may also be used to examine the sleep behavior differences among sports with different recovery needs and training loads.

Keywords: Reliability, validity, Turkish version, athlete, sleep behavior

Öz

Amaç: Sporcu uyku davranış anketi (SUDA) elit sporcuların uyku davranışlarının değerlendirilmesinde kullanılan yeni, güvenilir ve geçerli bir ankettir. Bu çalışmanın temel amacı sporcu uyku davranış anketinin Türkçe (SUDA-TR) versiyonunun güvenilirlik ve geçerliliğine delil sağlamaktır.

Gereç ve Yöntem: Doksan yedi sporcu ve seksen üç sporcu olmayan birey çalışmaya dahil edilmiş ve 18 maddelik SUDA-TR'yi doldurmuştur. Sporculardan oluşan bir alt grup (n=50) SUDA-TR'yi 7 gün arayla iki kere doldurmuştur. SUDA, yazarın izni alındıktan sonra iki kere ingilizceye ardından tekrar türkçeye çevrilmiştir. Test tekrar test güvenilirliği ve iç tutarlılık sırasıyla sınıf içi korelasyon katsayısı (SKK) ve Cronbach's alpha ile yapılmıştır.

Bulgular: SUDA-TR toplam skorunda, sporcu ve sporcu olmayan grupları arasında anlamlı fark görülmüştür (sırasıyla 38,4 ve 36,2, $p<0,05$). Anketin test tekrar test güvenilirliği kabul edilir seviyedeydi (SKK=0,85). SUDA-TR'nin faktör yükleri 0,41 ve 0,82 arasındaydı. Anketin 18 maddesi arasından 1 madde faktör yükünden dolayı (0,40 altında) kaldırıldı.

Sonuç: SUDA-TR, sporcuların karşılaştıkları uyku zorluklarını belirlemek için kullanılabilen 17 maddelik güvenilir ve geçerli bir araçtır. SUDA-TR elit sporcu uyku davranışlarını değerlendiren antrenör ve araştırmacılar için pratik bir araç olarak yararlanılabilir. Bu araç ayrıca toparlanma ihtiyacı ve antrenman yükü bakımından farklı olan spor türleri arasında uyku davranış farklılıklarının incelenmesinde kullanılabilir.

Anahtar Kelimeler: Güvenilirlik, geçerlilik, Türkçe versiyon, sporcu, uyku davranışı

Introduction

Decades of research indicates that sleep is an important factor for human performance (1,2). Sleep is pointed out as a significant element contributing to the optimal athletic performance (3) and recognized as an inevitable component of recovery from athletic training and reported as the single most effective recovery strategy (4). Despite the fact that sleep has a significant role in optimizing recovery and athletic performance (4), as a recovery strategy, it is not addressed sufficiently and/or is overlooked by athletes (5,6). As the previous review notified, athletes have unique physical and psychological requirements, have to deal with strict competition and training schedules and have to comply with difficult travels (7). Hence there is

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an obvious need for developing valid, reliable tools in order to track and monitor athlete sleep behaviors. Furthermore, to ensure wider utilization of these tools translation and adaptation to other languages are required to be the next necessary steps. There are three key factors that affect the whole curative outcome of the sleep state; a) length of sleep (total required sleep), b) quality of sleep, c) phase of sleep (circadian timing of sleep stage) (8). These factors also have an effect on an athlete's training, maximizing training response, performance and recovery abilities (9). Additionally, the previous reviews reports an equation between exercise-related sleep disturbance and sleep loss by exposing the impact of disordered sleep during athletic performance through sleep deprivation motives (10,11). However, these models may only provide limited insights into sleep quality-performance relationships (12).

Considering multifactoral demands of elite sport for elite athletes, it is expected to accelerate sleep disruptions in case of high frequency, intensity and volume of training periods (13,14), travels required by national (15) and international (16) competition events, and anxiety that occurred before competition (17,18). Beside these sleep disturbing factors, elite athletes experience distinct conditions such as long naps in the afternoon which interrupts night-time sleep, sleeping various and foreign environments, stimulant use (e.g. caffeine) and over-hydration or dehydration before going to bed (19,20). Notwithstanding the foregoing acknowledgment, present surveys, questionnaires and scales concerning sleep behavior appear not to be specific enough to state given differences in an athlete's sleep structure/patterns and habits. (21).

The athlete sleep behavior questionnaire (ASBQ) is a practical, valid and reliable questionnaire for evaluating the sleep behaviors of elite athletes. The main objective of the tool is to detect the sleep behaviors in elite athletes (21). The ASBQ was originated to differentiate specific sleep problems that elite athletes encountered. The ASBQ was a useful tool to identify areas where sleep behavior improvements could be made, rather than a clinical screening tool like athlete sleep screening questionnaire which was formerly created to identify sleep behaviours of athletes, identify athletes with abnormal sleep and primary sleep problems and elicit the frequency that athletes have trouble with sleep when traveling (7).

However, the ASBQ should be translated into different languages through a verified procedure. Moreover, it must be culturally adapted in order to provide comparison among studies conducted in different countries and groups.

The purpose of the present study was to determine the validity and reliability of the Turkish version of the ASBQ (ASBQ-TR) as an instrument to evaluate the sleep behaviors of elite athletes.

Materials and Methods

Participants

One hundred eighty native Turkish-speaking participants (97 athlete/83 non-athlete, 96 male/84 female, age; 22±4 y) were included in the current study. The participants were aged between 18-35 years with 93% (n=168) of the sample unmarried (Table 1). New parents with kids (<2 years) and the individuals with sleep disorders were excluded from this study.

A subset group of professional, native Turkish-speaking athletes (n=50, age 21±4 years, 60% males; from 12 different sports) were selected. Athletes were recruited from the various areas of Turkey, with following sport branches; basketball (n=2), football (n=11), futsal (n=2), handball (n=3), judo (n=2), kick box (n=1), muaythai (n=1), rugby (n=1), volleyball (n=2), weight lifting (n=4), wrestling (n=2), wushu (n=19).

Table 1. Demographic data of the participants

	Athletes (n=97)	Non-athletes (n=83)
Age (y)	21±4 (mean ± SD)	22±3 (mean ± SD)
Male (n)	57	39
Female (n)	40	44
Team-sport (n)	57	N/A
Individual-sport (n)	40	N/A
Unmarried/married (n)	94/3	74/9

SD: Standard deviation, N/A: Not/applicable

The criteria to be included to the present study as athlete was; as an individual or team player, as either semi-professional or professional player, competing for their country at national or international level for their specific sports branch. Demographic information (such as age, gender, marital status, exercise background) were collected with a questionnaire attached to the ASBQ-TR. The non-athlete group included participants a) with no license or membership in any regional-level sport, b) with no planned exercise routines more than 2, per week. The non-athlete group included participants who can read and speak the Turkish language only. Social media channels were used to reach out to the all sample.

The Athlete Sleep Behavior Questionnaire

The ASBQ is an 18-item questionnaire consisting of 3 subscales: routine/environmental factors (6 items), behavioral factors (7 items) and sport-related factors (5 items). The ASBQ was developed to identify the maladaptive sleep challenges athletes deal with. This instrument offers a sleep behavior evaluation of elite athletes, for coaches, athletes and researchers. The ASBQ is also considered to be a practical tool for identifying the differences in sleep behaviors among different sports with diverse training loads and recovery needs. All of the 18 items were rated using a 5-point scale (1=never, 2=rarely, 3=sometimes, 4=frequently, 5=always). The global score was obtained when the scores of each item were added up. The higher the score, the weaker the sleep behaviors (21).

The ASBQ was translated into Turkish by two academic sports scientist twice and then back-translated to English by a translator who did not know the purpose of the study, after the permission of the author was received. The translated forms were compared in terms of meanings and no difference was found. The cross-cultural adaptation guideline by Beaton et al. (22) was used.

Reliability

The reliability of the questionnaire was assessed via test-retest analysis using intraclass correlation coefficient (ICC). A subset group of the athletes (n=50, age 21±4 years, 60% males;

from 12 different sports) were recruited to run test-retest reliability. Sample size requirement for intraclass correlation with power=90%; alpha=0.05, observation per subject 2 times was 50 as Bujang and Baharum (23) suggested. All participants completed the ASBQ-TR twice, 7 days apart. Tests were conducted during in-season period, on rest days.

The Cronbach's alpha technique was also used. Cronbach's alpha coefficient indicates no reliability when $\alpha<0.40$, low reliability between 0.40 and 0.59, quite good reliability between 0.60 and 0.79, and extremely good reliability between 0.80 and 1 (24).

Ethics Approval

The study was approved by the Cumhuriyet University Social and Human Sciences Ethics Committee (no: 04-E.14439) and carried out according to the standards of ethics. Informed consent forms were signed by participants in data collection process.

Statistical Analysis

Statistical analysis was performed using IBM SPSS Statistics for Windows, Version 24.0 (SPSS, Armonk, NY: IBM Corp). The significance level was set at 0.05. Total scores of ASBQ-TR were normally distributed for the two groups and overall items as Shapiro-Wilk's test showed ($p>0.05$). Levene's test verified the homogeneity of two groups ($p>0.05$). Demographics and ASBQ-TR scores of the athletes and the non-athletes were compared using independent samples t-test. Construct validity of the ASBQ-TR was determined using exploratory factor analysis. For the size of the factor loading, the determination whether to select an item was based on 0.40 as suggested by Kline (25). Varimax rotation was used to identify dimensions of the questionnaire which indicated four components (1: sport-related factors, 2: sleep quality factors, 3: habitual sleep efficiency factors, 4: sleep disturbance factors). Suitability of the principal component analysis (PCA) was evaluated via Kaiser-Meyer-Olkin test.

Test-retest reliability was assessed using ICC. Internal consistency of the ASBQ-TR was assessed via Cronbach's alpha. Driller et al. (21) pointed out that the ASBQ was specifically designed to measure diverse aspects of sleep behavior, consequently, it was not considered as critical that all items are related. Therefore, the Cronbach's α below the 0.70 does not have a negative impact on the validity or reliability of this questionnaire.

Results

The mean age of athlete (21±4) and non- athlete (22±3) groups showed no significant difference ($p=0.09$). However, team-sport athletes constituted 59% of the athlete population when individual-sport athletes were 41% (Table 1). There was no significant difference between male and female participants for ASBQ-TR total scores ($p>0.05$). The PCA with varimax rotation outputs showed that the ASBQ-TR contained four major factors. Factor loading for 1 of 18 items was under 0.40, and this item was discarded from the questionnaire. Consequently, ASBQ-TR contained 17 items and the factor loadings ranged between 0.418 and 0.825 (Table 2).

There was a significant difference between the athlete and non-athlete groups in ASBQ-TR total score (38.4 and 36.2 respectively, $p<0.05$, Figure 1). The total score for sport-related factors was significantly different between the two groups (athlete; 13.6 and non-athlete; 10.0, $p<0.01$, Figure 2). There was no significant difference in other factors between the two groups ($p>0.05$, Figure 2).

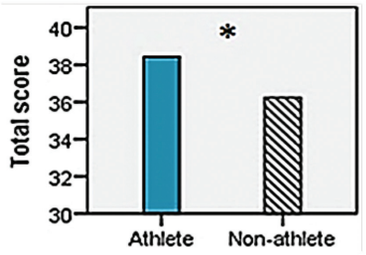

Figure 1. Mean total score of the athlete and non-athlete groups (*$p<0.05$)

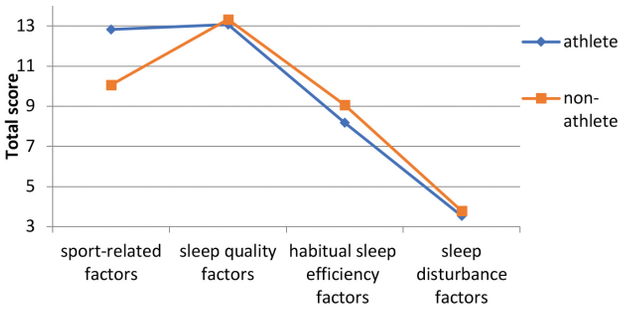

Figure 2. Athlete and non-athlete mean total score for each factor

Reliability levels for ASBQ-TR was acceptable (ICC=0.85, r=74, CV=5.6). The raw difference was only 0.5±3.8 and confidence intervals (CI) was set at 95%. Cronbach's α coefficient for internal consistency of the total score of the ASBQ-TR was 0.62. Similarly, the test-retest results of the factors (sport-related factors; ICC=0.89, α=0.89, sleep quality factors; ICC=0.78, α=0.78, habitual sleep efficiency factors; ICC=0.88, α=0.87, sleep disturbance factors; ICC=0.68, α=0.67) were acceptable.

Discussion

This study was conducted to examine the reliability and validity of the Turkish version of the ASBQ in elite athletes. It was concluded that the ASBQ-TR is a practical, consistent, reliable and valid scale in identifying maladaptive sleep behaviors. The ASBQ-TR was sensitive in separating the questionnaire score of athletes from non-athletes. The results obtained from the current study were comparable with the original version of the ASBQ which was previously conducted by Driller et al. (21) The factor analysis showed that 17-item ASBQ-TR consists of four factors. Driller et al. (21) extracted three factors from the 18-item ASBQ and found that the ASBQ have high levels of test-retest reliability which was quite similar with the results obtained from the present study.

Out of 4 factors of the ASBQ-TR, sport-related factors were significantly different when athlete and non-athlete groups were compared in terms of the total score which indicated that athletes have poorer sleep behaviors. However, the sleep quality, habitual sleep efficiency, and sleep disturbance factors were similar in total scores for both groups and were not significantly different. Authors suggest that the main discriminating factor was fairly sensible due to the items specific to athlete life. As in question #3- "I exercise (train or compete) late at night" and as other four question listed in Table 2. As we expected the sleep quality, habitual sleep efficiency and sleep disturbance factors were quite similar between the groups, considering the items in these factors applied to both athlete and non-athlete groups closely. As in question #8- I use light-emitting technology in the hour leading up to bedtime (e.g laptop, phone, television, video games).

Table 2. Factor loadings of the Turkish version of the athlete sleep behavior questionnaire

ASBQ-TR items	**Factor loading**
Factor 1 - sport-related factors	
Q2. I use stimulants when I train/compete (e.g. caffeine)	0.423
Q3. I exercise (train or compete) late at night (after 7 pm)	0.568
Q9. I think, plan and worry about my sporting performance when I am in bed	0.825
Q10. I think, plan and worry about issues not related to my sport when I am in bed	0.639
Q16. I sleep in foreign environments (e.g. hotel rooms)	0.419
Factor 2 - Sleep quality factors	
Q1. I take afternoon naps lasting two or more hours	0.490
Q7. I go to bed with sore muscles	0.477
Q8. I use light-emitting technology in the hour leading up to bedtime (e.g. laptop, phone, television, video games)	0.446
Q12. I wake to go to the bathroom more than once per night	0.418
Q17. Travel gets in the way of building a consistent sleep-wake routine	0.725
Factor 3 - Habitual sleep efficiency factors	
Q4. I consume alcohol within 4 hours of going to bed	0.445
Q5. I go to bed at different times each night (more than ±1 hour variation)	0.758
Q6. I go to bed feeling thirsty	0.421
Q15. I get up at different times each morning (more than ±1 hour variation)	0.724
Factor 4 - sleep disturbance factors	
Q11. I use sleeping pills/tablets to help me sleep	0.527
Q13. I wake myself and/or my bed partner with my snoring	0.719
Q14. I wake myself and/or my bed partner with my muscle twitching	0.689
ASBQ-TR: Turkish version of the ASBQ	

1 out of 18 items of ASBQ was removed from the questionnaire due to the factor loading of the item which was below 0.40. As a result, the Turkish version of the questionnaire consisted of 17 items. Factor loadings of the items were ranged between 0.418-0.825. In the original ASBQ, authors found factor loadings between 0.45-0.61.

The test-retest reliability of the ASBQ-TR was found to be very high. Mean difference was just 0.5 between the test total scores. With CI set at 95%, r value of 0.74, ICC 0.85 and CV 5.6% values indicated that ASBQ-TR did not vary with time and remained fixed (Table 3, Table 4). Similarly, the original ASBQ was found to have high test-retest reliability with the mean difference of 0.1 between the test total scores and authors of the previous study revealed that value of r 0.88, ICC 0.87, typical error of measurement 2.3 and CV 6.4% with CI set at 90%. The time duration between the tests was 7 days just as the authors of the ASBQ set the same duration of time which made it easier to compare the reliability of ASBQ-TR to the previous study. We used the CI level of 95% and in original ASBQ, the CI was 90%. Typically, 95% (0.05) is mostly used but using 90% (0.10) also may not affect the findings dramatically. Due to the different % use of CI, the r value used in the current study (0.74) was lower than the r value in the original study (0.88).

Kline (26) (1999) points out that although a value 0.7-0.8 is an acceptable value for Cronbach's alpha, in some constructs, values below 0.7 can realistically be expected due to the constructs. Driller et al. (21) also pointed out that the ASBQ was specifically designed to measure diverse aspects of sleep behavior, consequently, it was not considered as critical that all items are related. In this study, Cronbach's alpha was 0.62 similar to the Cronbach's alpha value of the original ASBQ (0.63). Also, the male–female ratio (57-40) of the athlete population in the present study is thought to have no impact on the validity and reliability of the questionnaire. Similarly, Driller et al. (21) had an athlete group with 87 male and 155 female participants.

The main limitation of our study was the time duration between the test-retest days. Tests were completed 7 days apart which may be considered as a short time. However, considering that the potential rapid changes may occur in long time frames in an individuals' habits. Besides, in the questionnaire "In recent times (over the last month)" expression was used. Consequently, using a longer period of time for this questionnaire may affect the reliability of the tool.

For the 17 item ASBQ-TR, we suggest a total score of ≤34 means "good sleep behavior" and ≥40 means "poor sleep behaviour". The thresholds were slightly different in original ASBQ (≤36, ≥42 respectively) due to the number of items. These thresholds are determined to be used as a directory in future studies (Table 5).

Table 3. Test-retest reliability of the Turkish version of the athlete sleep behavior questionnaire (n=50)						
	Test 1 (mean ± SD)	**Test 2 (mean ± SD)**	**Raw difference (mean ± SD)**	**r (95% CI)**	**ICC (95% CI)**	**CV% (95% CI)**
ASBQ-TR total score	38.4±5.6	38.9±5.3	0.5±3.8	0.74	0.85	5.6 (4.2-6.9)
ASBQ-TR: Turkish version of the athlete sleep behavior questionnaire, CI: Confidence intervals, ICC: Intraclass correlation coefficients, CV: Coefficient of variation, SD: Standard deviation						

Table 4. Correlation coefficients of four components of Turkish version of the athlete sleep behavior questionnaire for test-retest reliability (n=50)					
	Test 1 (mean ± SD)	**Test 2 (mean ± SD)**	**Raw difference (mean ± SD)**	**Cronbach's α**	**ICC**
1. Sport-related factors	13.6±3.1	13.9±3.1	0.3±1.9	0.899	0.898
2. Sleep quality factors	12.9±2.6	13.2±2.4	0.3±2.1	0.784	0.785
3. Habitual sleep efficiency factors	8.3±2.2	8.0±2.2	0.4±1.4	0.882	0.877
4. Sleep disturbance factors	3.5±1	3.8±1.1	0.3±1	0.682	0.670
SD: Standard Deviation, ICC: Intraclass correlation coefficients					

Table 5. Seventeen-item Turkish version of the athlete sleep behavior questionnaire						
NO	**Son zamanlarda (geçtiğimiz bir ay içerisinde)**	**Hiçbir Zaman**	**Nadiren**	**Bazen**	**Sıklıkla**	**Her Zaman**
1	Öğleden sonraları iki saat ya da daha fazla uyurum					
2	Yarışma/antrenman esnasında, uyarıcı kullanırım (kafein gibi)					
3	Geç saatlerde (akşam 7'den sonra) egzersiz (antrenman ya da yarışma) yaparım					
4	Uykudan önceki dört saat içerisinde alkol tüketirim					
5	Her gece farklı zamanlarda uyurum (±1 saat fark vardır)					
6	Susamış şekilde yatarım					
7	Kas ağrılarıyla yatarım					
8	Yatmadan önceki bir saat ışık yayan teknolojik aletleri kullanırım (dizüstü bilgisayar, telefon, televizyon, video oyunlar gibi)					
9	Yatağımdayken spor performansım hakkında düşünür, plan yapar, endişelenirim					
10	Yatağımdayken yaptığım sporla ilişkili olmayan konular hakkında düşünür, plan yapar, endişelenirim					
11	Uyumama yardım etmesi için uyku hapları/tabletleri kullanırım					
12	Her gece lavaboya gitmek için bir defadan fazla uyanırım					
13	Kendimi ve/veya partnerimi horlamamla uyandırırım					
14	Kendimi ve/veya partnerimi kas seğirmesi ile uyandırırım					
15	Her sabah farklı zamanlarda uyanırım (±1 saat fark vardır)					
16	Yabancı ortamlarda uyurum (otel odaları gibi)					
17	Yolculuk, tutarlı uyuyup-uyanma düzeni oluşturmamın önünde engel oluşturur					

Conclusion

The ASBQ-TR is a valid and reliable 17-item tool that can be used to identify the maladaptive sleep challenges athletes deal with. The ASBQ-TR developed as a practical tool for researchers and coaches evaluating the sleep behaviors of elite athletes. This tool may also be used to examine the sleep behavior differences among sports with different recovery needs and training loads.

Ethics

Ethics Committee Approval: The study was approved by the Cumhuriyet University Social and Human Sciences Ethics Committee (no: 04-E.14439) and carried out according to the standards of ethics.
Informed Consent: Informed consent forms were signed by participants in data collection process.
Peer-review: Internally peer-reviewed.

Authorship Contributions

Concept: A.D., G.D., Z.Ç., Design: A.D., G.D., Z.Ç., Data Collection or Processing: A.D., Z.Ç., Analysis or Interpretation: A.D., G.D., Z.Ç., Literature Search: A.D., Writing: A.D.
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