



Validation of the Arabic version of the Epworth Sleepiness Scale

Anwar E. Ahmed ^a, Abdulhamid Fatani ^b, Abdullah Al-Harbi ^c,
Abdullah Al-Shimemeri ^c, Yosra Z. Ali ^a, Salim Baharoon ^c,
Hamdan Al-Jahdali ^{c,*}

^a Department of Epidemiology and Biostatistics, College of Public Health and Health Informatics, King Saud Bin Abdulaziz University for Health Sciences, Saudi Arabia

^b College of Public Health and Health Informatics, King Saud Bin Abdulaziz University for Health Sciences, Saudi Arabia

^c Department of Medicine, Pulmonary Division, Sleep Disorders Center, King Saud Bin Abdulaziz University for Health Sciences, Saudi Arabia

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Abstract *Background:* The Epworth Sleepiness Scale (ESS) is a questionnaire widely used in developed countries to measure daytime sleepiness and diagnose sleep disorders.

Objective: This study aimed to develop an ESS questionnaire for the Arabic population (ArESS), to determine ArESS internal consistency, and to measure ArESS test–retest reproducibility. It also investigated whether the normal range of ESS scores of healthy people in different cultures are similar.

Methods: The original ESS questionnaire was translated from English to Arabic and back-translated to English. In both the English and Arabic translations of the survey, ESS consists of eight different situations. The subject was asked to rate the chance of dozing in each situation on a scale of 0–3 with total scores ranging between 0 (normal sleep) and 24 (very sleepy). An Arabic translation of the ESS questionnaire was administered to 90 healthy subjects.

Results: Item analysis revealed high internal consistency within ArESS questionnaire (Cronbach's $\alpha = 0.86$ in the initial test, and 0.89 in the retest). The test–retest intra-class correlation coefficient (ICC) shows that the test–retest reliability was substantially high: ICC = 0.86 (95% confidence interval: 0.789–0.909, p -value < 0.001). The difference in ArESS scores between the initial test and retest was not significantly different from zero (average difference = -0.19 , $t = -0.51$, $df = 89$, p -value = 0.611). In this study, the averages of the ESS scores

* Corresponding author. Address: King Saud University for Health Sciences, Pulmonary Division, Sleep Disorders Center, King Abdulaziz Medical City, Riyadh, Saudi Arabia. Tel.: +966 12520088x17597, 17531 (work), mobile: +966 505224271.
E-mail address: Jahdali@gmail.com (H. Al-Jahdali).

(6.3 ± 4.7 , range 0–20 in the initial test and 6.5 ± 5.3 , range 0–20 in the retest) are considered high in Western cultures.

Conclusions: The study shows that the ArESS is a valid and reliable tool that can be used in Arabic-speaking populations to measure daytime sleepiness. The current study has shown that the average ESS score of healthy Arabian subjects is significantly higher than in Western cultures.

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1. Introduction

The daytime sleepiness problem is a common symptom of many sleep disorders, including obstructive sleep apnea. The Epworth Sleepiness Scale (ESS) questionnaire was developed by Johns as a simple, self-administered questionnaire for the assessment of daytime sleepiness [1–3]. Since its development in 1991, it has been used widely in clinical practice, sleep laboratory questionnaires, and research protocols as a simple rapid assessment of subjective sleepiness [2]. ESS is consistent with eight different situations, and the subject is asked to rate the probability of dozing in each situation on a scale of 0–3 (0 = no chance of dozing, 1 = slight chance of dozing, 2 = moderate chance of dozing, 3 = high chance of dozing; minimum score = 0, maximum score = 24), with total scores ranging between 0 (normal sleep) and 24 (very sleepy) [2].

The ESS questionnaire is developed in the English language and used among Western individuals; therefore, a direct translation may have some limitations for use in other countries, due to cultural and economic differences. Several studies have been conducted to translate and validate the ESS questionnaire into different languages. The ESS questionnaire has been validated and used by many non-English language speakers' countries, including: Spanish [4], German [5], Chinese [6,7], Japanese [8], Turkish [9], Italian [10], and Greek [11]. In healthy people who do not have evidence of which is considered a sleep disorder, the normal range of ESS scores as defined by the 2.5 and 97.5 percentiles was 0–10 with an average of 4.6 ± 2.8 [12]. There are wide variations across different cultures; the prevalence of excessive daytime sleepiness (ESS > 10) in Saudi healthcare workers is 39.3% (Wali et al. [18]), which is considered high in Western cultures. For instance, the prevalence of excessive daytime sleepiness in a normal Australian was found to be 11% at the cut-off point ESS > 10 [12]. It is not yet clear whether the normal range of ESS scores of healthy subjects in different cultures are similar.

It was found that there is a high level of internal consistency between the eight items in the ESS as measured by Cronbach's alpha, ranging from 0.74 to 0.88. Only one Arabic version of the ESS has been developed in three Lebanese sleep centers [16]. The investigators compared the ESS Arabic version between patients with sleep-related breathing diseases and healthy people. Their study revealed a high level of internal consistency; Cronbach's alpha was 0.76 and the intra-class correlation coefficient was 0.85. These investigators evaluated the internal consistency of the ESS scores at one time point [16]. The present study addresses the level of reliability of the ESS Arabic version at different settings, such as test and retest, where the same subjects are used to complete the survey on two different occasions. Further, the present study considers cultural differences in translating the current survey. The purpose of the study is to evaluate the reliability of the ArESS scores that were measured at different times by administering the same survey to healthy people. It was also investigated whether the normal range of ESS scores of healthy people in different cultures is similar.

2. Methodology

A test–retest design was conducted at King Abdulaziz Medical City–King Fahad National Guard Hospital (KAMC–KFNGH) in Riyadh, Saudi Arabia. The study was conducted between January and April 2013. This study was designed to evaluate and validate the ESS Arabic (ArESS) version as it measures daytime sleepiness. The original ESS questionnaire was translated from English to Arabic and back-translated to English by a professional translation office and then re-tested by two physicians and one sleep technologist, both of whom are fluent in Arabic and English. The ESS Arabic version and back-translation were compared by the two physicians to check for coherence and precision until both versions were considered completely interchangeable: conceptually and linguistically. Some cultural modifications must be considered in translating and evaluating the ArESS. One such modifica-

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