

Reliability and Validity of Gujarati Version of Epworth Sleepiness Scale: A Cross-sectional Study

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ABSTRACT

Introduction: Daytime sleepiness is a common symptom of many sleep disorders. Epworth Sleepiness Scale (ESS) measures average sleep propensity of an individual for wide range of daily living activities. As it is a self-administered questionnaire, the Gujarati translation of ESS can be helpful for the evaluation of daytime sleepiness in clinical population.

Aim: To find reliability and validity of Gujarati version of ESS.

Materials and Methods: This cross-sectional study was conducted during August 2020 to February 2021. ESS is available in Gujarati language. Permission was taken to use and to find reliability and validity of Gujarati ESS from the Mapi Research Trust. This study was carried out in two phases: 1) Face and content validation by expert clinical review; 2) Test-retest reliability. The consensus method was used to find face and content validity of Gujarati ESS. The group of experts having mean experience of 10.5 years in different fields examined each item of Gujarati ESS. Each item of Gujarati ESS was scored either as rejected, accepted or accepted with modification. Procedure was continued till 80% of consensus for all items was achieved. Total 80 participants aged between

18-60 years were included in this study. To find reliability of Gujarati ESS, internal consistency and test-retest reliability was determined. The Statistical Package for Social Sciences (SPSS) version 24.0 was used to analyse the data. Test-retest reliability was determined by Intraclass Correlation Coefficient (ICC) and internal consistency was calculated by Chronbach's alpha.

Results: Total of 80 participants (mean age 42.68±13.37 years; 34 males and 46 females) were studied. Normal BMI was observed for 20 participants, overweight participants were 26 and obese participants were 34. Gujarati version of ESS showed excellent test-retest reliability as evidenced by high ICC (ICC=0.94) and high Internal consistency ($\alpha=0.97$). Mean score of Gujarati ESS at baseline 13±6.72 and after one week 12.98±5.65. Values for Content Validation Ratio (CVR), Item level Content Validation Index (I-CVI), Modified Kappa (K), and Proportion of agreement were 1. The content of translated items was understandable and were related to quality of sleep and its evaluation.

Conclusion: Gujarati version of the ESS has excellent reliability and good face and content validity. It is adequate and useful for evaluation of day time sleepiness in Gujarati speaking population.

Keywords: Consensus, Disorders of excessive somnolence, Gujarati language

INTRODUCTION

Excessive Daytime Sleepiness (EDS) is a most common symptom of many sleep disorders including sleep disordered breathing, obstructive sleep apnoea, narcolepsy, and habitual snoring. It is a leading symptom in patients visiting sleep clinic which interfere with daily living activities [1]. Poor quality of sleep, side effects of certain medications, or any other underlying medical condition can be the reason for EDS [2]. It can lead to serious consequences as risk of motor vehicle accidents is associated with daytime sleepiness [3]. Productivity of work is also impaired by EDS [4]. It is an independent predictor of cardiovascular risk after the myocardial infarction [5]. EDS is associated with central obesity and also associated with reduction in cortical thickness which can lead to brain aging and it can be one of the risk factor for dementia [6, 7].

Epworth Sleepiness Scale (ESS) measures sleep propensity for wide range of daily activities. It contains eight questions and subject has to rate each question on scale of 0-3. Sum of all the questions' score will be the total score of ESS. The total score of ESS ranges between 0-24. Score less than 8 indicate normal daytime alertness, score between 8-10 indicates mild sleepiness, score between 11-15 indicates moderate sleepiness, and score between 16-24 indicates severe sleepiness [8]. The present study is part of a large research project "to assess effectiveness of aerobic interval training on quality of sleep and daytime sleepiness in Gujarat, but reliability and validity of Gujarati ESS to measure daytime sleepiness is not known. As ESS is self-administered questionnaire, it is important to measure quality of sleep with a reliable and valid questionnaire in Gujarati

speaking population. So, aim of the present study was to find the reliability and validity of Gujarati ESS.

MATERIALS AND METHODS

The present study was a cross-sectional study conducted at Department of Nootan College of Physiotherapy, Sankalchand Patel University, Visnagar, Gujarat, India, from August 2020 to February 2021. Participants were recruited from Outpatient Department (OPD) of various physiotherapy clinics in Surat region after taking ethical approval (EC/SPB/025) from Institutional Ethics Committee (IEC). Mapi Research Trust granted permission to use Gujarati ESS in this study.

Inclusion criteria: Both male and female participants older than 18 years, who were able to read, write and understand Gujarati language were included in this study.

Exclusion criteria: Participants having night work during study period, pregnant or breastfeeding mothers and participants who were on steroids, hypnotics, antidepressants or antipsychotics were excluded from the study.

Sample size calculation: Sample size was calculated on basis of 1:10 ratio [9]. Hence 80 participants were included for this study.

Questionnaire

Epworth Sleepiness Scale (ESS) is a self-administered questionnaire that measures the degree of daytime sleepiness. It has a total of eight items- 1) sitting and reading, 2) watching TV, 3) sitting inactive in a public place (e.g. a theatre or meeting), 4) as a passenger in a car for an hour without a break 5) lying down to rest in the

afternoon when circumstances permit 6) sitting and talking to someone 7) sitting quietly after a lunch without alcohol 8) in a car, while stopped for a few minutes in the traffic. All the above items can be answered by the participant on a scale of 0 to 3 where 0=never doze, 1=slight chance of dozing, 2=moderate chance of dozing, 3=high chance of dozing. The hard copies of the scale were distributed to all participants and once it was filled by participants, those completed hard copies were collected as responses of all subjects.

Procedure

The study was conducted in two phases:

I. Face and content validity: Consensus method was used for the face and content validation of Gujarati ESS. Eight experts having mean experience of 10.5 years from field of Orthopaedic physiotherapy, Neuro Physiotherapy, Cardiorespiratory Physiotherapy, Community physiotherapy, Neurologists and psychiatrists were recruited for the face and content validation of Gujarati ESS. Each item of Gujarati ESS was examined for wording, meaning, format, and ease of administration by all the experts. Procedure was continued till 80% of consensus was achieved. All the reviews and suggestions of experts were considered. All the items of Gujarati ESS were accepted for appropriate wording, meaning, format and ease of administration by experts during review process.

For content validation, all the experts were requested to score each item of the questionnaire from 1 to 3 where 1 indicated “rejected”, 2 indicated “accepted with modification” and 3 indicated “accepted”.

1. **Content Validation Ratio (CVR)** was calculated using below formula [10]:

$$CVR = \frac{N_e - (N/2)}{N/2}$$

Where, N_e =number of expert indicating “accepted”, N =total number of expert, CVR value more than 0.62 was approved [10].

2. **I-CVI** was calculated using below formula [11]:

$$I-CVI = \frac{\text{Number of experts offering rating 3}}{\text{Number of total experts}}$$

Interpretation of I-CVIs [11]:

>0.79-appropriate; 0.70-0.79-needs revision; <0.70-eliminated

3. **Modified Kappa (K) for chance Agreement** was calculated using below formula [10,12]:

$$K = \frac{(I-CVI) - P_c}{(1 - P_c)}$$

Where,

Probability of chance agreement (P_c) was calculated using below formula:

$$P_c = \{N/A (N-A)\} * 0.5N$$

Here, N =number of experts in a panel, A =number of experts who agree that the item is relevant. Interpretation of the K values [13]:

>0.74: excellent; 0.60-0.74: good; 0.40-0.59: fair

4. **Proportion of agreement** was calculated using below formula [10,11]:

$$\text{Proportion of agreement} = \frac{\text{Number of experts who have identified questionnaire comprehensiveness favourable}}{\text{Total number of experts}}$$

II. Reliability: Total $n=80$ participants were recruited to find out the reliability of Gujarati ESS. After obtaining the written informed consent, Gujarati ESS was administered to same participant for two times with the gap of one week by one administrator. The ICC was calculated to find test-retest reliability of Gujarati ESS. Internal consistency was calculated by Chronbach’s alpha. ICC of <0.40 identified as a fair, 0.40-0.59 identified as a moderate,

0.60-0.79 identified as substantial, ≥ 0.80 identified as excellent [14]. ICC >0.70 was considered as minimum acceptable level of reliability [15].

STATISTICAL ANALYSIS

The SPSS version 24.0 was used to analyse the data. Descriptive data was presented as mean and standard deviation. Test-retest reliability was determined by ICC and internal consistency was calculated by Chronbach’s alpha. Level of significance was set as $p < 0.05$.

RESULTS

Total participants were 80 with mean age of 42.68 ± 13.37 years. Out of 80 participants, 34 were males and 46 were females. Mean Body Mass Index (BMI) of all participants was 27.2 ± 4.72 kg/m². Mean score of Gujarati ESS was 13 ± 6.72 [Table/Fig-1]. Numbers of normal BMI participants were 20, numbers of overweight participants were 26, and numbers of obese participants were 34.

Parameters	Mean±SD
Age (years)	42.68±13.37
BMI (kg/m ²)	27.2±4.72
Mean score of Gujarati ESS	13±6.72

[Table/Fig-1]: Demographic details of participants. ESS: Epworth sleepiness scale

Face and Content Validity

All the experts ($n=8$) accepted (A) each item of Gujarati ESS. So, CVR values for each item of Gujarati ESS was 1, which was more than 0.62, suggested an approval for the each item [Table/Fig-2].

Items	Experts opinion about acceptability of items in Gujarati ESS								Number of experts indicated “Accepted” (N _j)	CVR
	E1	E2	E3	E4	E5	E6	E7	E8		
1	A	A	A	A	A	A	A	A	8	1
2	A	A	A	A	A	A	A	A	8	1
3	A	A	A	A	A	A	A	A	8	1
4	A	A	A	A	A	A	A	A	8	1
5	A	A	A	A	A	A	A	A	8	1
6	A	A	A	A	A	A	A	A	8	1
7	A	A	A	A	A	A	A	A	8	1
8	A	A	A	A	A	A	A	A	8	1

[Table/Fig-2]: Values of CVR for each item of Gujarati ESS. E1, E2, E3, E4, etc., suggest the number of expert member A: Accepted; CVR: Content validation ratio

I-CVI values for each item of Gujarati ESS were 1, which suggested that each item of Gujarati ESS was appropriate. K values for each item of Gujarati ESS was 1. Proportion of agreement for each item of Gujarati ESS was also 1 [Table/Fig-3].

Item no.	I-CVI	K	Interpretation	No. of experts agreed to the comprehensiveness	Proportion of agreement
1	1	1	Excellent	8	1
2	1	1	Excellent	8	1
3	1	1	Excellent	8	1
4	1	1	Excellent	8	1
5	1	1	Excellent	8	1
6	1	1	Excellent	8	1
7	1	1	Excellent	8	1
8	1	1	Excellent	8	1

[Table/Fig-3]: Values of I-CVI, Modified kappa (K) and Proportion of agreement for items in Gujarati ESS. I-CVI: Item level content validity index; K: Modified kappa

For the face validation, 10 participants were requested to judge on the understandability and simplicity of the items during expert review procedure. According to their opinion, Gujarati ESS was simple and easy to understand. All the items of Gujarati ESS were accepted for appropriate words, meaning, format and ease of administration by experts during review process. The content of translated items was understandable and they were related to quality of sleep and can be used for the evaluation of the quality of sleep.

Reliability

The baseline mean total score of Gujarati ESS was 13 ± 6.72 and at the end of 1 week it was 12.98 ± 5.65 [Table/Fig-4]. The Gujarati ESS showed excellent test-retest reliability as evidenced by high ICC=0.94 and high internal consistency ($\alpha=0.97$) [Table/Fig-5].

Mean total score of ESS at baseline	Mean total score of ESS after one week
13±6.72	12.98±5.65

[Table/Fig-4]: Comparison between Gujarati ESS score at baseline and after 1 week.

Analysis	Values
Intraclass Correlation Coefficient (ICC)	0.94
Cronbach's alpha (α)	0.97

[Table/Fig-5]: Reliability of Gujarati ESS.

DISCUSSION

The original English version of Epworth daytime sleepiness scale was developed by Johns MW in 1990 and revised in 1997 [8]. As per this date, total 96 translations of ESS are available and it is freely provided by Mapi trust for the research purpose. The original English version has good reliability and validity. ESS is a self-administered scale and it is available in Gujarati language but its reliability and validity is not known. As this study is a part of large research project, to evaluate effect of "aerobic interval training on quality of sleep and daytime sleepiness in Gujarat region", there is a need to make use of reliable and valid scale to evaluate daytime sleepiness in Gujarati speaking population. So, permission to conduct a study to find reliability and validity of Gujarati ESS was taken from Mapi trust via mail.

Gujarati ESS was validated by team of experienced experts in various fields. During procedure of validation, it was found that Gujarati ESS is valid tool to measure daytime sleepiness in Gujarati speaking population. Gujarati ESS has excellent reliability as evidenced by high test-retest reliability (ICC=0.94) and high internal consistency ($\alpha=0.97$). It is similar to the other translations studies [8,16-23].

In India validation of Hindi version of ESS was done by Kanabar K et al., who found high level of internal consistency ($\alpha=0.84$). Hindi version of ESS was strongly correlated with English version of ESS ($r=0.98$) [24].

Limitation(s)

Multiple Sleep Latency Test (MSLT) and Polysomnography (PSG) are gold standard procedures to check daytime sleepiness but these are very costly procedures so comparison of Gujarati ESS with MSLT and PSG was not done to check concurrent validity of Gujarati ESS. So, it can be conducted in future.

CONCLUSION(S)

Results concluded that Gujarati ESS is reliable and valid scale to measure and evaluate daytime sleepiness in Gujarati speaking population. Excessive Daytime Sleepiness (EDS) is one of the key indicators of poor quality of sleep. As poor quality of sleep is one of the important causative factors for obesity, diabetes, hypertension and sleep disorders, daytime sleepiness must be evaluated in those clinical populations along with quality of sleep. As ESS is

self-administered questionnaire, the Gujarati translation of ESS can be helpful for the subjective evaluation of day time sleepiness and thereby it can be helpful to provide better health outcomes.

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