About the Epworth Sleepiness Scale

A quantitative subjective measure of sleepiness
http://epworthsleepinessscale.com/about-epworth-sleepiness/

The Epworth Sleepiness Scale (ESS) is a brief, self-administered questionnaire that was developed in 1990 at the Sleep Disorders Unit, Epworth Hospital, Melbourne, Australia (1). It measures a subject’s usual level of daytime sleepiness or average sleep propensity (APS) in daily life. Use of the Epworth Sleepiness Scale (ESS) requires an understanding of the conceptual framework within which it was developed. (2,3).

Conceptual Basis of the Epworth Sleepiness Scale (ESS)

Whether someone is awake or asleep at any particular time depends not just on the time of day, but also on many other variables, including what that person is doing at the time. Simply lying down rather than standing up increases the likelihood of falling asleep, i.e. increases one’s sleep propensity at that time. Thus, lying down can be considered a more soporific activity than standing up. Sleep propensity can be measured only within the context of the subject’s situation and activity, both physical and mental, at the time. A subject’s usual sleep propensity in the same situation can be called his situational sleep propensity, e.g. when sitting and watching TV. This is situation-specific for each subject.

The Epworth Sleepiness Scale (ESS) asks the subject to rate on a 4-point scale (0-3) his or her chances of dozing off in each of 8 different situations. These differ in their somnificity, or sleep-inducing characteristics for most subjects (4). Responses to the questionnaire depend on retrospective reports of dozing behaviour, mostly during activities while sitting, in the course of daily life in “recent times”. These may not be very accurate assessments, but they are reliable in a test-retest sense over periods of months (4,5). Most can be reported reliably and independently by a spouse or partner who would be likely to observe the dozing behaviour (eyes closing, head tilting forward, then up again upon arousal).

When the 8 Epworth Sleepiness Scale (ESS) item-scores representing different situational sleep propensities are added together they give a total Epworth Sleepiness Scale (ESS) score which is a measure of the subject’s average sleep propensity (ASP) in those 8 situations. Total Epworth Sleepiness Scale (ESS) scores can vary between zero and 24 in different subjects. The ASP is not synonymous with fatigue or tiredness as reported in some other scales such as the Stanford Sleepiness Scale.

Subjects with a moderately high ASP do not necessarily fall asleep during the day if they avoid soporific situations by keeping physically and mentally active, e.g. by not sitting down. By contrast, other subjects who, for various reasons, often lie down and consequently doze during the day may not have a high ASP. The Epworth Sleepiness Scale (ESS) does not assess how much sleep the subject has during the day. Nor is the Epworth Sleepiness Scale (ESS) a measure of “sleep debt” as some may claim. While Epworth Sleepiness Scale (ESS) scores are related to the usual duration of sleep at night and increase with relative sleep deprivation they are not a useful measure of hours of “sleep debt”.

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Validity and Reliability of Epworth Sleepiness Scale (ESS) Scores

The Multiple Sleep Latency Test (MSLT) has been regarded by some as the gold standard against which other measurements of “sleepiness” should be compared (7,8). Epworth Sleepiness Scale (ESS) scores in different people are related significantly but not very closely to their mean sleep latency in the MSLT (e.g. rho = -0.42, n = 44, p < 0.01) (4,7). However, within the conceptual framework of the Epworth Sleepiness Scale (ESS), the MSLT measures only one situational sleep propensity, albeit more accurately and objectively than item-scores of the Epworth Sleepiness Scale (ESS) can. A subject’s sleep propensity in any one situation is not always closely related to that in a different situation (4,5). In fact, the Epworth Sleepiness Scale (ESS) has been shown to be more accurate than either the MSLT or the MWT in distinguishing the sleepiness of narcoleptics from that of normal subjects (9). Currently we do not have a gold standard for measuring a subject’s ASP in daily life, which the Epworth Sleepiness Scale (ESS) is believed to do.

Other evidence for the validity of total Epworth Sleepiness Scale (ESS) scores comes from experimental findings that Epworth Sleepiness Scale (ESS) scores differ between normal subjects and patients with obstructive sleep apnea that is known to increase “sleepiness” (1,2). The higher-than-normal Epworth Sleepiness Scale (ESS) scores of such patients return to normal after successful treatment of their disorder by use of nasal continuous positive airway pressure (CPAP) treatment (2,10,12). The severity of obstructive sleep apnea, defined either by the frequency of apneas and hypopneas or by the level of arterial oxygen desaturation during sleep, has been correlated significantly with Epworth Sleepiness Scale (ESS) scores in some, but not all, investigations. The same is also true for the “sleepiness” measured by the MSLT. Epworth Sleepiness Scale (ESS) scores alone do not diagnose the nature of any sleep disorder.

Total Epworth Sleepiness Scale (ESS) scores are reliable in a test-retest sense over a period of months (rho = 0.82, n = 87, p < 0.001) (6). There is a high level of internal consistency within the Epworth Sleepiness Scale (ESS), as assessed by Cronbach’s statistic, alpha (alpha = 0.88 - 0.74 in 4 different groups of subjects). Factor analysis performed on Epworth Sleepiness Scale (ESS) item-scores for separate groups of adult subjects revealed only one factor for each (4,5,6).

The Epworth Sleepiness Scale (ESS) is not suitable for measuring rapid changes in sleep propensity over periods of hours, e.g. to demonstrate the sedative affect of a single dose of a drug or to reveal a circadian rhythm of “sleepiness”. By contrast, the MSLT or the MWTis able to make such comparisons within the context of the situational sleep propensity that they measure.

Normal Epworth Sleepiness Scale (ESS) Scores

Data from Australia show that “normal” adults (N = 72) who do not have evidence of a chronic sleep disorder (including snoring) have a mean Epworth Sleepiness Scale (ESS) score of 4.6 (confidence intervals 3.9 - 5.3) with a standard deviation of 2.8 and a range from zero to 10. The normal range defined by the 2.5 and 97.5 percentiles is also zero to 10 (13). This is different from the results first published in 1991, in which the normal range was reported as 2-10 (1). Many people with a variety of sleep disorders, nevertheless, have normal Epworth Sleepiness Scale (ESS) scores. Very similar results have been reported from the United Kingdom
(mean = 4.5 ( 3.3, n = 188) (11) and from Italy (4.4+/ -2.8, n=54)(12). However, it is not yet clear whether the Epworth Sleepiness Scale (ESS) scores of normal subjects in other cultures are the same. Epworth Sleepiness Scale (ESS) scores do not differ significantly between normal men and women (13), nor do they change much with age. About 10 - 20 percent of the general population have Epworth Sleepiness Scale (ESS) scores > 10 (i.e. 11 +).

**Scoring Methods**

Most people can answer the Epworth Sleepiness Scale (ESS) without difficulty in a few minutes. Some cannot decide on one number (0-3) and instead write down 1/2 or 11/2, etc. when answering some questions. My recommendation is to take those at face value, adding up all 8 item-scores, including halves. If the total Epworth Sleepiness Scale (ESS) score includes a half (e.g. 61/2) that score should be rounded up the next whole number. If one or more item-scores is missing, that Epworth Sleepiness Scale (ESS) is invalid. It is not feasible, for example, to interpolate mean scores from other subjects.

**What Does “Recent Times” Mean?**

Respondents to the Epworth Sleepiness Scale (ESS) rate their chances of dozing in particular situations “in recent times”. This was deliberately not specified more accurately. It is intended to mean a few months or a year, long enough for the subject to have experienced each situation referred to and to have formed an estimate of his/her chances of dozing in each. However, the rapid changes in sleep propensity that occur when patients with obstructive sleep apnea are treated with nasal CPAP suggests that periods of recall as short as a month are possible to use with the Epworth Sleepiness Scale (ESS).

**Format of the Questionnaire**

It is essential that the words in the preamble and questions of the Epworth Sleepiness Scale (ESS) are not changed, but their spelling may be different in different countries e.g. theatre = theater.

The item-scores can be recorded as a number chosen from 0-3, written in a single box for each question, as originally described (1). Alternatively, 4 boxes, labelled 0 to 3, can be used for each Epworth Sleepiness Scale (ESS)-item, the subject ticking the appropriate box for each. The Epworth Sleepiness Scale (ESS) scores for these 2 formats are similar. No other formats, including telephone interviews about the Epworth Sleepiness Scale (ESS), have been validated. The Epworth Sleepiness Scale (ESS) scores that represent the normal range and degrees of excessive daytime sleepiness must not be reproduced with the questionnaire given to subjects.
The Epworth Sleepiness Scale (ESS) in languages other than English

The Epworth Sleepiness Scale (ESS) has been used in many different languages. It is important that translations are checked by several people without knowledge of the Epworth Sleepiness Scale (ESS) who would independently translate the questionnaire back to English. It is hoped that some degree of standardisation of translations will be achieved before long but, so far, this has not been the case.

References

5. Johns MW. Sleepiness in different situations measured by the Epworth Sleepiness Scale. Sleep 1994; 17:703-710.