# Fatigue: A Threat to Study Results

**Danalee K. Brehman, Shatoyia S. Burns, Nick S. Thaler, Stephanie L. Rojas, & Kimberly A. Barchard**

University of Nevada, Las Vegas

## Abstract

Mental fatigue causes distraction during everyday life tasks like driving and studying. It can also cause distraction during research studies. If participants become fatigued when completing an experiment, this can contaminate study results. Therefore, researchers should control factors that cause fatigue. One factor that can cause fatigue is test length. If a test is long, participants may be fatigued by the end. This may influence participants' motivation and their test scores.

The Levels of Emotional Awareness Scale (LEAS) is a 20-item open-ended test. The LEAS may require more effort than simple self-report measures because participants must imagine themselves in a situation and describe how they would feel. Because of the complexity of this task, participants may become more fatigued when completing the LEAS than other psychological measures. The purpose of this study was to determine if fatigue impairs responses on later LEAS items.

The LEAS was completed by 470 undergraduates. Each LEAS item was scored using the Program for Open-Ended Scoring. The length of the responses for each item was calculated using Microsoft Excel. Finally, two correlations were calculated: the correlation between item number and average LEAS score and the correlation between item number and average response length.

There was no evidence that fatigue influences LEAS scores or response length, on average. Although the correlation between item number and response length was moderate ($r$ = .30), neither correlation was statistically significant. These non-significant results might be due to two factors. First, although there was no significant relationship between item number and either response length or LEAS scores, on average, there may be a relationship for some participants. Second, this study used item number as a proxy variable for fatigue. The effects of fatigue on the LEAS may be clearer if a more precise measure of fatigue is used.

## Introduction

Emotional awareness is defined as the skill of recognizing emotions in the self and in others (Lane, Quinlan, Schwartz, Walker, & Zeitlin, 1990). To assess emotional awareness in clients, Lane et al. (1990) developed the Levels of Emotional Awareness Scale (LEAS). The LEAS has 20 items and can take more than half an hour for a test-taker to complete (Lane et al., 1990). Healy, Kole, Buck-Gengler, and Bourne (2004) found that tasks that are long in duration can cause fatigue that leads to performance deterioration. There is no research on fatigue as related to the LEAS, so we decided to examine the effect of fatigue on the item response length and item score. Boksem, Meijman, and Lorist (2005) referred to mental fatigue as effects that occur either during or after long periods of cognitive activity. Mental fatigue can cause individuals to become more easily distracted while completing everyday life tasks (such as driving, studying, and completing work related tasks) as well as tasks in a laboratory setting (such as data entry, filing, and writing). If participants become fatigued while participating in an experiment, this can be detrimental to the results of a study; therefore it is important to control for factors that may contribute to fatigue (Healy et al., 2004). The LEAS requires test-takers to read, contemplate, and respond to the items in a way that may require more mental effort than traditional self-report measures. This additional effort led us to hypothesize that participants will experience fatigue as they complete the LEAS. Participants might experience little to no fatigue at the beginning of the test, but more fatigue as they complete it. We hypothesize that participants will therefore respond with fewer words to later items on the LEAS, and that their score will also decrease for later items.

## Method

### *Participants*

A total of 470 (272 female, 198 male) undergraduate students participated in this online study for course credit at a large American university. They ranged in age from 18 to 50 ($M$ = 19.86 $SD$ = 3.25). The participants identified themselves as: 57.4% Caucasian, 13.0% Hispanic, 11.3% Asian, 7.7% African American, 6.0% Pacific Islander, 0.4% Native American, and 4.3% other.

### *Measures*

The Levels of Emotional Awareness Scale (LEAS; Lane et al., 1990) is an open-ended measure based on a cognitive-developmental model of emotional experience. It is designed to capture an individual's emotional awareness (Lane & Schwartz, 1987). It contains of 20 items. Each item presents a situation that involves the participant and one other person. Participants are asked to state how they would feel in that situation and how the other person would feel, using as much or as little space as necessary (Lane et al., 1990). For each item, we measured response length by using Excel to count the number of words.

The LEAS is usually scored by hand. Hand scoring consists of four steps (Lane, 1991). First, the scorer reads the response and locates words that are related to bodily sensations, personality characteristics, action tendencies, and discrete emotions. Second, the scorer examines the Scoring Manual to determine the score associated with that word. Words can score from zero to three. Third, the scorer calculates the score for words attributed to the self and for words attributed to the other person. The self and other scores are each calculated as the value of the highest word score. However, if there are two or more distinctly different words with a score of three, then the self or other score is increased to four. The total score can range from zero to five. It is calculated by taking the largest of the self and other scores. To score a five the participant must score four for both the self and other, and the emotions that are expressed for the self and other must be distinctly different emotions.

In this study, we used the Program for Open Ended Scoring (POES; Leaf & Barchard, 2006) to score the LEAS. POES uses two input files. The first file contains the participants' typed responses to the LEAS. The other file is the Wordlist (Barchard, 2006), which consists of 1,242 word phrases with specified scores. There are four POES scoring methods (Leaf & Barchard, 2007a, 2007b). We used the 3345 method, which is the most similar to LEAS hand scoring (Barchard, Bajgar, Leaf, & Lane, 2008). The 3345 method first calculates separate scores to the questions "How would you feel?" and "How would the other person feel?" POES scans each response for matches to the Wordlist, which are called Valuables. The Valuables are stored along with their associated Values, in a Valuables List. POES then calculates the self and other scores in a manner that is similar to hand scoring. The self and other scores are each calculated as the highest Value in the Valuables List, unless there are two or more Values of three for non-identical Valuables, in which case the score is four. If the self and other score are both four, then the total score is five. Otherwise, it is the maximum of the self and other scores.

### *Procedures*

The LEAS was given on-line as part of a larger study that participants could complete from any computer with internet access.

### *Analysis*

Mean item length was calculated in two steps. First, for each participant, we used Excel to count the number of words for each response. Second, we calculated the arithmetical average of response length across all participants.

Mean LEAS score was calculated in three steps. First, for each participant, we calculated the item scores using the 3345 method described above. Second, for each participant, we calculated the total score across the 20 items. Finally, we calculated the arithmetical average of LEAS total scores across all participants.

Finally, we calculated two Pearson correlations. The first was the correlation between item number and mean response length. The second was the correlation between item number and mean LEAS score.

## Results

We did not find a significant relationship between item number and mean length ($r$(18) = -.30, $p$ = .20). Also, the correlation between item number and mean LEAS score was non-significant ($r$(18) = .05, $p$ = .85).

## Conclusions

To examine the effect of fatigue on the LEAS, we calculated the correlation between item number and mean total score on the LEAS and the correlation between item number and mean response length. We hypothesized that both response length and LEAS score would decrease for later items. However, neither of these correlations was statistically significant, even though the correlation between item number and mean length was moderate ($r$ =.30). On average, fatigue does not appear to reduce the length of responses or LEAS scores. However, it might be that some participants do feel fatigue during the later items, and their scores and response lengths are reduced. To determine if scores and response length are reduced for some participants, future studies should calculate the correlations between item number and LEAS score and between item number and response length for each participant. If a large enough percentage of participants show evidence of fatigue, then this would argue for a reduction in the length of the LEAS, even though fatigue does not reduce response length or scores for all participants.

The non-significant results in this study might also be due to the fact that we used item number as a proxy variable for fatigue. This assumes that fatigue has a linear relationship with item number. Instead, it might be that participants do not feel fatigue until part-way through the LEAS. Future research should therefore consider the use of a more precise measure of fatigue. Using an EEG would be one way to measure fatigue without interfering with participants' ability to complete the LEAS.

Figure 1: The relationship between average score and item number

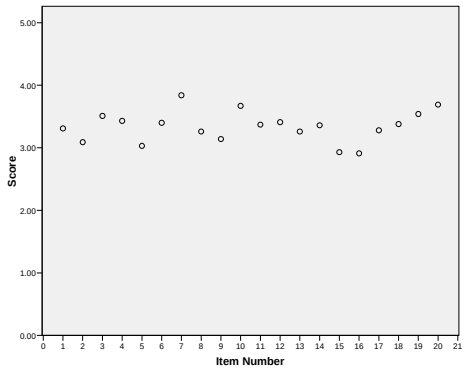
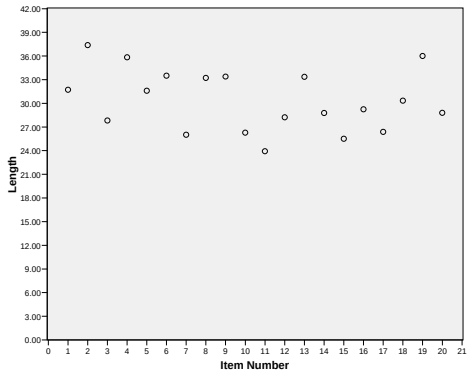



Figure 2: The relationship between average response length and item number




UNLV
UNIVERSITY OF NEVADA LAS VEGAS