

## **Using Computers for Administration and Scoring of an Open-Ended Test**

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### **ABSTRACT**

The Levels of Emotional Awareness Scale (LEAS; Lane & Schwartz, 1987) is an open-ended measure of the depth and breadth of one's knowledge of emotion concepts. This knowledge is an important aspect of Emotional Intelligence, which includes the ability to perceive, understand and manage emotions in oneself and others. Previously, the LEAS was always scored by hand according to criteria defined in the scoring manual (Lane, 1991). Hand-scoring the LEAS is an extremely time-consuming process. To accelerate LEAS scoring, a computer program called CompLEAS (Leaf, 2003) was created to score the test. Because the computer program cannot perfectly implement the subjective scoring rules contained in the manual, CompLEAS was designed to calculate scores in four different ways. The purpose of this study is to assess the effectiveness of the four different computerized scoring methods in comparison to hand-scoring.

In this study, 67 undergraduate students completed an online form of the LEAS. These protocols were hand-scored by trained research assistants as well as by CompLEAS. We correlated each of the four computer-calculated scores with the scores obtained from hand-scoring. The four correlations were all high. The best of these four scoring methods was the technique designed to most closely mimic human scoring.

Despite the good validity coefficients obtained, further improvement of the scoring program is still possible. A revision to the program is now being written, and a future study will examine the validity of the scores generated by the program. With further revisions and additional research, computerized scoring of the LEAS will likely be even more successful. Most psychological measurements use closed-ended questions because of the ease of scoring. This research suggests that using open-ended measures with computer scoring may be a feasible alternative in a wide variety of research and applied settings.

### **INTRODUCTION**

The Levels of Emotional Awareness Scale (LEAS; Lane & Schwartz, 1987) is an open-ended measure of Emotional Intelligence, designed to measure the depth and breadth of one's knowledge of emotion words. Knowledge of emotion concepts is one important facet of Emotional Intelligence (EI), which includes the ability to perceive, understand and manage one's own emotions and the emotions of others. Researchers have found the LEAS to be a "reliable, distinctive, and useful measure" in the area of Emotional Intelligence (Ciarrochi, Caputi, & Mayer, 2003, p. 1489).

The LEAS consists of 20 open-ended questions and is scored by hand according to the instructions given in the scoring manual (Lane, 1991). Traditionally, the LEAS is a pencil-and-paper measure. The current study used a computer-based form of the LEAS with the intention of developing a form of the LEAS that is both administered on and scored by a computer.

Hand-scoring has two major disadvantages. First, the process of scoring a response is time-consuming. Experienced scorers can score the 20 items from a single participant in about 10 minutes, but less experienced scorers often take 20 minutes or more to score each participant. As well, scoring is somewhat subjective. Often a LEAS scorer will have to make decisions about whether or not two words are synonyms and how the context of a word changes its interpretation.

Because hand-scoring is so time-consuming, the first author undertook to develop an objective computer scoring program for the LEAS, called CompLEAS (Leaf, 2003). A previous study used an older version of CompLEAS to score pencil-and-paper LEAS responses (Leaf, Charoenchote, Beisecker & Barchard, 2003). That study found a high correlation between computer- and human-generated LEAS scores, although later examination revealed that it was using a less-than-ideal algorithm for one part of the scoring process. However, because that study used a pencil-and-paper version of the LEAS, responses had to be typed before CompLEAS could score responses. CompLEAS is more suited to data where participants type their own responses. It was therefore important to examine the usefulness of CompLEAS in the context of computerized administration.

In the current study, we used a revised version of CompLEAS to score data from the computer-based LEAS and examined the correlation between computer- and human-generated scores for this new data.

## **METHOD**

### **Participants**

A total of 67 undergraduate psychology students participated in this study. Participants' ages ranged from 18 to 46. The mean age was 24.7 with a standard deviation of 6.1. The majority of the participants were female (79.1%). The largest ethnic groups were Caucasian (61.2%), African American (9%), Asian (7.5%), and Hispanic (7.5%).

### **Procedure**

Although the 20-item LEAS is usually completed in a single sitting, to avoid fatigue, in this study the LEAS was divided into two parts with 10 questions each. Each session lasted for about half an hour. Participants completed the LEAS in a university computer lab, without supervision.

## **MEASURE**

### **The Levels of Emotional Awareness Scale**

The LEAS (Lane, Quinlan, Schwartz, Walker, & Zeitlin, 1990) is a twenty-item open-ended test. For each LEAS item, participants are given a hypothetical scenario involving themselves and another person. Each scenario was designed to be emotionally evocative. Participants are asked to describe how they and the other person would feel in each situation.

In the paper-based form of the LEAS, each item is given at the top of an 8 ½ by 11 piece of paper, and is immediately followed by the two questions. In the computer-based LEAS there are two text input fields per item where participants can type their responses:

one for the question “How would you feel?” and one for the question “How would the other person feel?”

Hand-scoring is a three-step process (Lane, 1991). First, scorers assign a rating to each emotion word/phrase in the response using the scoring rules in the manual and example words in the glossary. From the scores for each phrase, scores for Self and Other are derived. Lastly, a Total score is calculated based on the scores for Self and Other. This process is repeated for all twenty scenarios and the Total scores for each respondent are calculated by summing the scores across the twenty items.

### **CompLEAS**

CompLEAS is a computer program designed to score the LEAS. However, the CompLEAS program does not exactly mimic human scoring. Many of the scoring rules in the LEAS manual are subjective and cannot be easily converted into computational procedures. For instance, accurately distinguishing whether a particular emotion is related to Self or Other would be extremely complicated for a computer program. CompLEAS calculates the Self score from the words in the first text input field and the Other score based on the words in the second field. Additionally, whether or not two words are synonyms (which influences the scores for Self and Other) often depends upon context. Again, this decision is difficult to implement in a computer program. Thus, for these two reasons, the four different scoring methods used by CompLEAS are only intended to *approximate* hand-scoring.

CompLEAS uses a glossary that is based upon (but not identical to) the glossary in the LEAS manual (Lane, 1991). This glossary consists of about 1,000 words and phrases, which we call “valuables”. Each valuable is assigned a point value [0-3]. In cases where the LEAS manual states that a valuable has more than one possible value (depending upon context), experienced hand-scorers determined the most common value, and this value is used by CompLEAS. CompLEAS uses the glossary to find all the valuables within a response. The point values of these valuables are then used to calculate scores via four different Scoring Methods (Table 1). Regardless of which method was used to calculate total scores for an individual item, the scores were then summed across the 20 items to obtain the total scores for each participant.

### **DATA PREPARATION AND STATISTICAL ANALYSIS**

The response data were printed and hand scored by trained research assistants. Unlike human scorers, CompLEAS cannot account for spelling errors. Thus, the data were also spell-checked and reformatted for scoring by CompLEAS.

CompLEAS was run on the reformatted response set and total scores were calculated by CompLEAS’ four different scoring methods. Correlations were calculated between the total scores for each scoring method and the hand-scoring total scores.

**Table 1**  
*The Four CompLEAS Scoring Methods*

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<b>AllSum</b>	Total scores are calculated as the sum of all values found in both fields. Self and Other scores are calculated the same way, using the first and second fields respectively, but these scores were not used in this analysis.
<b>Highest-4</b>	Total scores are the sum of the four highest values in both fields. Self and Other scores are calculated the same way, using the first and second fields, respectively, but were not used in this analysis.
<b>334</b>	Total scores are calculated as the highest value in either field, unless there are two different valuables that both have a value of 3: in this case, the score is 4. For example, the words “happy” and “guilty” both have the value 3. If the first field contains “happy” and the second field contains “guilty”, the Total score will be 4. However, if a response contains the word “happy” twice, this is not sufficient for a score of 4. The 334 method was designed to mimic the scoring rule that gives a score of 4 when two or more level 3 emotions are present and distinguishable from each other. Self and Other scores are calculated using the same method, but restricting the analysis to those valuables found in the first and second fields, respectively. However, separate Self and Other scores were not used in this analysis.
<b>3345</b>	Total scores are calculated using the Self and Other scores from the 334 method, described above. The Total score for the 3345 method is the maximum of the Self and Other scores for the 334 method, unless both Self and Other are 4: in this case, the Total score is 5. The 3345 method is conceptually the closest to the hand scoring method. The 3345 method uses the same Self and Other scores as the 334 method, but these scores were not used in this analysis.

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## RESULTS

Table 2 shows the correlations between the four CompLEAS total scores and the hand-scoring results. While all of the scoring methods had strong correlations, the 3345 method had the highest ( $r = .85, p < .01$ ).

**Table 2**  
*Correlations Between CompLEAS-Generated and Human-Generated LEAS Scores*

		<b>CompLEAS Method</b>	<b>Correlation</b>	
<b>DISCUSSION</b>		AllSum	.72*	
		Highest-4	.76*	
This study correlations between by the CompLEAS	334	.78*	examined the LEAS scores generated program and those	
	3345	.85*		

generated by hand-scoring. Four different scoring methods are used within the CompLEAS program. All four methods had high correlations with the human-generated scores.

There are two ways in which the CompLEAS program could be further improved:

- ◆ Incorporate automatic spell-checking
- ◆ Expand word list

Future revisions of CompLEAS could have even higher correlations with hand-scoring.

The present study has demonstrated that CompLEAS is an efficient and effective method of scoring the LEAS. It could also be used in any other context in which objective scores need to be assigned to a body of text based upon scores assigned to the individual words or phrases used, and may be useful for scoring many kinds of open-ended tests. Future research should examine other uses for computerized scoring of open-ended responses.

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