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Abstract

The Levels of Emotional Awareness Scale (LEAS; Lane, Quinlan, Schwartz, Walker, & Zeitlan, 1990) is an open-ended test that measures the ability to use emotion words in a complex and differentiated fashion. Previous research has demonstrated that the LEAS is reliable and valid when it is scored by hand, and that Emotional Awareness is associated with a variety of clinically important outcome variables. This research has inspired the development of alternative forms of the LEAS, including the LEAS-C (Bajgar, Ciarrochi, Lane, & Deane, 2005), which was designed to assess Emotional Awareness in children, and the Computerized LEAS (Barchard & Leaf, in prep), which allows data to be collected online.

Scoring the LEAS by hand is time-consuming. Therefore, previous research has explored the feasibility of using computerized scoring instead. Barchard and Leaf (in prep) found high correlations between hand scoring and computerized scoring of the original LEAS. These promising results suggest it may also be feasible to score alternative forms of the LEAS using the computer.

The purpose of the current study was to determine if computerized scoring is as reliable and valid as hand scoring for the two alternative forms of the LEAS discussed above. We used a sample of 51 children who completed the LEAS-C and a sample of 66 college students who completed the Computerized LEAS. We scored these tests using hand scoring and Program for Open-Ended Scoring (POES; Leaf & Barchard, 2006). POES uses four methods to calculate scores: these are called Highest-4, All-Sum, 334, and 3345. All scoring methods had high internal consistencies, but internal consistency for the Highest-4 and All-Sum methods was higher than the internal consistency for hand scoring. For the LEAS-C, POES scoring and hand scoring had similar – albeit small – correlations with Emotion Comprehension and Vocabulary, but Highest-4 and All-Sum had significantly higher correlations with Emotion Expressions (the ability to recognize emotions) than hand scoring did. We conclude POES scoring can be as reliable and valid as hand scoring of alternative forms of the LEAS, and the Highest-4 and All-Sum methods may in some cases be more reliable and valid than hand scoring.

Introduction

The Levels of Emotional Awareness Scale (LEAS; Lane, Quinlan, Schwartz, Walker, & Zeitlan, 1990) is an open-ended test of the ability to use emotion words in a complex and differentiated fashion. Respondents describe how they would feel in emotionally evocative situations, and their responses are scored based upon their structure. Because the LEAS is open-ended, it takes a long time to score. In the first author's lab, training a new LEAS scorer can take up to 10 hours. Once trained, LEAS scorers can take up to 20 minutes for each respondent. Thus, a new scorer may take up to 43 hours to score the LEAS for 100 respondents, and an experienced and efficient LEAS scorer will still take 10 minutes per respondent or roughly 17 hours for 100. The amount of time involved in training and scoring is perhaps the primary reason that researchers and clinicians have not used the LEAS more often.

LEAS scores are associated with both self-report and objective measures related to Emotional Awareness. First, LEAS scores are associated with lower scores on the Toronto Alexithymia Scale – Revised (TAS-20; Bagby, Taylor, & Parker, 1994), a self-report measure of difficulty expressing feelings (Lane, Sechrest, & Riedel, 1998; Rose, 2004; Waller & Scheidt, 2004; Walgren, 1996). Second, LEAS scores are correlated with changes in cerebral blood flow associated with film- and recall-induced emotional experiences (Lane, Reiman, Axelrod, Yun, Holmes, & Schwartz, 1998), and are related to higher accuracy in the perception of emotion (Lane, Sechrest, Reidel, Weldon, Kaszniak, & Schwartz, 1996; Lane, Sechrest, Riedel, Shapiro, & Kaszniak, 2000).

The strong reliability and validity evidence for the LEAS has inspired the development of alternative forms. The first of these is the Levels of Emotional Awareness Scale for Children (LEAS-C; Bajgar, Ciarrochi, Lane, & Deane, 2005). This 12-item paper-based measure was modeled after the adult LEAS, and is designed to measure Emotional Awareness in children. The second is the Computerized LEAS (Barchard & Leaf, in prep). This computer-administered measure is based directly upon the adult LEAS, and could be used when collecting data in an online study. The same 20 items are used, although they are divided into two web pages.

Despite its clinical relevance and construct validity, the use of the LEAS has been constrained by lengthy scoring time. Therefore, previous research has explored the feasibility of using computerized scoring instead. Barchard and Leaf (in prep) found high correlations between hand scoring and computerized scoring of the original LEAS. These promising results suggest it may also be feasible to score alternative forms of the LEAS using the computer. The purpose of the current study was to determine if computerized scoring is as reliable and valid as hand scoring for the two alternative forms of the LEAS discussed above.

Method

Participants

Sample 1: Children

Fifty-one children between the ages of 10 and 11 were recruited from two private schools in a regional city with a population of 180,000. There were 25 females (M_{age} 10.3, SD .46) and 26 males (M_{age} 10.3, SD .49).

Sample 2: Adult University Students

Sixty-six university students (52 female, 14 male) participated in return for course credit. They ranged in age from 18 to 46 (mean 24.7, SD 8.1).

Measures

Levels of Emotional Awareness Scale

Levels of Emotional Awareness Scale for Children

The children in Sample 1 completed the paper-administered Levels of Emotional Awareness Scale for Children (LEAS-C; Bajgar et al., 2005). The LEAS-C consists of 12 scenarios, each involving oneself and another person. For each, children answer two questions: "How would you feel?" and "How would the other person feel?"

Computer-administered LEAS

The adult students in Sample 2 completed the computer-administered LEAS. It consists of two web pages, each containing ten of the adult LEAS items. For each item, the scenario description was followed by two prompts: "How would you feel?" and "How would the other person feel?" After each prompt, a text input box (8 rows by 40 columns) collected participants' responses.

Scoring

For both versions of the LEAS, responses were scored in two ways. First, responses were scored using the hand-scoring method described in the manual for the adult version of the paper-based LEAS (Lane, 1991). Second, responses were spell-checked and then scored using Program for Open-Ended Scoring (POES) version 1.2.2 (Leaf & Barchard, 2006), using LEAS Wordlist 2.1 (Barchard, 2006).

Method (con't)

Emotion Expressions

The children in Sample 1 were presented with a series of 18 photos of adults posing one of six emotions (anger, surprise, sadness, disgust, joy or fear). With each photo presentation, children wrote down what they thought the person was feeling. Responses were scored according to accuracy and valence.

Emotion Comprehension

The children in Sample 1 completed an Emotion Comprehension task (Cernele, Ackerman & Izard, 1995). In the 18 scenarios in the first section, children selected the emotional response of the protagonist from the following list: happy, sad, mad, interested, or ashamed. In the 9 scenarios in the second section, children selected from a slightly different array of emotional responses: happy, mad, proud, guilty, ashamed, or looking down on someone. Responses were scored according to accuracy and valence.

Vocabulary

The children in Sample 1 completed the vocabulary subtest of the Wechsler Intelligence Scale for Children (WISC-III; Wechsler, 1991). A list of fifteen words was read aloud to students, the starting point for the list corresponding to the lowest age of the participants (Sattler, 1992). As each word was presented, students wrote down its meaning. In this study, internal consistency of the vocabulary subtest was $\alpha = .71$.

Results

Internal Consistency

For both the child and adult samples, the four POES scoring methods had acceptable internal consistencies. See Table 1. The Highest-4 and All-Sum methods had the highest internal consistencies in both samples. The internal consistencies for the 334 and 3345 methods were the most similar to hand scoring, and in most cases, coefficient alpha for these two POES methods was not significantly different from coefficient alpha for hand scoring.

Table 1

Internal Consistency

| Scoring Method | Coefficient Alpha ¹ |
|-----------------------------|--------------------------------|
| Sample 1, Paper LEAS-C | |
| POES Highest-4 | .78** ^a [.68, .86] |
| POES All-Sum | .76** ^{ab} [.65, .84] |
| POES 334 | .60** ^c [.41, .74] |
| Hand Scoring | .66** ^{bc} [.51, .78] |
| Sample 2, Computerized LEAS | |
| POES Highest-4 | .91** ^a [.88, .94] |
| POES All-Sum | .92** ^a [.89, .94] |
| POES 334 | .79** ^{ab} [.71, .86] |
| POES 3345 | .86** ^{ac} [.81, .90] |
| Hand Scoring | .88** ^{ac} [.83, .92] |

* $p < .05$. ** $p < .001$.

Correlations of the Four POES Scores with Hand Scoring

For both samples, each of the four POES scores had high correlations with hand scoring, indicating that all POES scoring methods are tapping the same general construct as hand scoring. See the second column of Table 2.

Table 2

Correlations of POES Total Scores with Hand-Scoring Total Scores

| POES Method | Correlation ¹ | Correlation when Corrected for Attenuation ² |
|--|--------------------------------|---|
| Sample 1 (Children), Paper LEAS-C | | |
| Highest-4 | .61** ^a [.40, .76] | .65* [.18, 1.02] |
| All-Sum | .61** ^a [.40, .76] | .65* [.18, 1.04] |
| 334 | .69** ^a [.51, .81] | .84* [.23, 1.34] |
| Sample 2 (Adult Students), Computerized LEAS | | |
| Highest-4 | .80** ^a [.68, .87] | .87** [.69, 1.01] |
| All-Sum | .76** ^{ab} [.64, .85] | .82** [.61, .96] |
| 334 | .80** ^a [.70, .88] | .97** [.74, 1.13] |
| 3345 | .86** ^{ac} [.79, .92] | .98** [.81, 1.10] |

* $p < .05$ ** $p < .001$.

Next, we wanted to determine which POES methods had the highest correlations with hand scoring. We had hypothesized that the methods that were logically most similar to hand scoring – the 3345 and 334 methods – would have higher correlations with hand scoring than the All-Sum and Highest-4 methods. This was not uniformly true. In both samples, the 334 method did have higher correlations with hand scoring than the All-Sum method had, and in one of the samples this difference reached statistical significance. However, the 334 method did not always have higher correlations than the Highest-4 method, and these differences never reached statistical significance. We conclude that the 334 method and Highest-4 methods are roughly comparable in terms of their correlation with hand scoring.

The 3345 method had a significantly higher correlation with hand scoring than any of the other POES scoring methods, in the one sample (adult students) in which it was calculated. Because it was possible to use this scoring method only in the sample that used the computer-administered LEAS, this result requires replication before we can be confident that the 3345 method has the highest correlation with hand scoring.

To further examine the similarity of the constructs underlying these scoring methods, two additional analyses were conducted. First, we corrected these correlations for attenuation due to lack of internal consistency. See Table 2 column 3. These corrected correlations were often quite high, and for the Computerized LEAS used in Sample 2 (adult students) the corrected correlations for the 334 and 3345 method were very close to 1. For the LEAS-C used in Sample 1 (children), the corrected correlations were somewhat low. It may be that the lower Emotional Awareness of children results in restriction of range, which reduces these correlations.

Results (con't)

Correlations with Criterion Variables

Bajgar et al. (2005) correlated hand scoring with Emotion Expressions, Emotion Comprehension, and Vocabulary for the children in Sample 1. The purpose of the current study was to determine if the correlations for POES scoring would be similar to the correlations reported by Bajgar et al. for hand scoring. We therefore correlated the three POES scores with each of the three criterion variables. The second column in Table 3 shows that all three POES scoring methods had significant (or nearly significant) correlations with each of the three criterion variables. These results provide evidence for the validity of all three POES scoring methods. The correlations for the Highest-4 and All-Sum methods were significantly higher than the correlations for hand scoring, but because these results were obtained in only one sample, these results require replication before we could state that some POES methods have higher correlations with Emotional Expressions than hand scoring does.

We wanted to determine which of the POES scoring methods had the highest correlations with the criterion variables. Because the LEAS-C was not computer-administered, it was not possible to calculate the 3345 method. Of the remaining three methods, the correlations for the 334 method were the most similar to the correlations for hand-scoring, as was expected. However, the Highest-4 method had consistently higher correlations than the other POES methods, and for Emotion Expressions this difference reached statistical significance. We conclude that the Highest-4 method has stronger validity evidence than the other POES methods.

Table 3

Correlations between LEAS-C and Criterion Variables – Sample 1 (Children)

| Scoring Method | Correlations | |
|-----------------------|--------------------|----------------|
| | R | R ² |
| Emotion Expressions | | |
| POES Highest-4 | .46** ^a | .21** |
| POES All-Sum | .40 ^{ab} | .16* |
| POES 334 | .29 ^{abc} | .09* |
| Hand Scoring | .15 ^c | 0.02 |
| Emotion Comprehension | | |
| POES Highest-4 | .29** | .08* |
| POES All-Sum | .27 ^a | .07+ |
| POES 334 | .28** | .08* |
| Hand Scoring | .28 ^a | .08+ |
| Vocabulary | | |
| POES Highest-4 | .46** ^a | .21** |
| POES All-Sum | .44** | .19* |
| POES 334 | .38** | .15* |
| Hand Scoring | .31** | .09* |

+ $p < .10$. * $p < .05$. ** $p < .001$.

Conclusions

A growing body of evidence supports the validity and clinical relevance of the adult paper-based LEAS. This has inspired the development of alternative forms of the LEAS: a child form and a computerized form. However, LEAS hand scoring is time-consuming. Lane et al. (1990) recommended automating the LEAS, which would greatly reduce scoring time. The purpose of this study was to examine the usefulness of our attempt to automate the scoring of these alternative versions of the LEAS. The results were highly encouraging. Computer scoring resulted in high internal consistencies and high correlations with hand scoring. Computer scoring also resulted in moderate correlations with Emotion Expressions, Emotion Comprehension and Vocabulary.

These results indicate that computer scoring and hand scoring are tapping the same general construct and that computer scoring may be used instead of hand scoring in some contexts. This could facilitate the measurement of Emotional Awareness in applied settings, where clinicians, educators, and Human Resource personnel may not have time to learn the hand scoring method. Although it is possible to convert hand-written LEAS responses to computer-typed responses, this takes approximately the same length of time as hand scoring the LEAS responses. Because of this, computer scoring will only save time if respondents do their own typing. Therefore, future research should also examine different formats for the computer-administered LEAS, and should then select a single standardized format for computer administration.

Some differences were found between the four computerized scoring methods. The 334 and 3345 methods had the highest correlations with hand scoring, as expected. Of these two, the 3345 method had a higher correlation with hand scoring and higher internal consistency and therefore is preferred. If researchers or applied psychologists are trying to select a computerized scoring method that is as similar as possible to the well-validated hand scoring method, then the 334 or 3345 methods should be used. If the data have been collected with separate areas for responses to the questions "How would you feel?" and "How would the other person feel?", it is possible to calculate the 3345 method. If the data have been collected with both of these questions at the top and then one area for responses (as is the case in the original paper-based adult LEAS and the paper-based LEAS-C), then only the 334 method can be calculated.

On the other hand, the Highest-4 and All-Sum methods had higher internal consistencies and higher correlations with Emotion Expressions. Of these two, the Highest-4 method had a significantly higher correlation with hand scoring and with Emotion Expressions, and is therefore preferred. Therefore, if a researcher or applied psychologist is trying to select the computerized scoring method with the greatest validity evidence, the Highest-4 method is recommended at this time.

Additional validity studies are needed to replicate and extend these findings. Only a limited number of criterion variables have been examined at this point, and in some cases the differences between the POES scoring methods were not statistically significant. Therefore, more research is needed to determine which POES method is to be preferred for each version of the LEAS and for any particular research or applied setting. Unless there is a compelling pragmatic or theoretical reason to avoid doing so, we recommend that researchers use all four POES methods until we have sufficient evidence to determine which method usually has the highest validity for each version of the LEAS.