Visual analogue mood scales to measure internal mood state in neurologically impaired patients : description and initial validity evidence

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Abstract:

This report describes the development of seven visual analogue mood scales (VAMS), using vertical 100 mm lines and simple, schematic faces representing the following mood states : sad, afraid, angry, tired, energetic, happy, and confused. Two studies are described in which 311 normal volunteers completed the VAMS, as well as the Profile of Mood States (in both studies) and the Beck Depression Inventory (in one study). Using the multitrait-multimethod technique, the VAMS were found to have excellent discriminant and convergent validity. In one study a separate set of VAMS, in which all words were removed from the scales, was also used. Participants' ratings on these No- Word VAMS were highly correlated with their ratings on the VAMS with corresponding words, indicating that the VAMS have content validity and would be accurately completed by patients with impaired language comprehension. These brief mood scales may prove useful in both clinical and research settings in which valid assessment of internal mood states in aphasic patients is required.

Article:

INTRODUCTION

Depressive symptomatology is common following stroke (Starkstein and Robinson 1989), can have a negative impact on rehabilitation success (Sinyor et al. 1986), and can be treated effectively with antidepressant and other medications (Lazarus et al. 1992, Lipsey et al. 1984). Accurate diagnosis and assessment of symptom severity is therefore crucial in order to treat mood disorders following stroke appropriately.

Valid assessment of internal mood state is especially important in this population because subjective mood state is often masked or mimicked by a variety of neurobehavioural consequences of stroke (e.g. dysprosodia, pseudobulbar palsy, abulia, bradykinesia), in which the outward expression of mood (i.e. affect) may be incongruent with the internal emotional state (i.e. mood) (Code and Muller 1992,

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Fogel and Stone 1992, Starkstein and Robinson 1988, Stern 1996). In fact, clinicians' interpretations of patients' moods have been found to be more highly correlated with such variables as bradykinesia and diminished facial expression, than with the patients' own report of mood (Stern and Bachman 1994). Furthermore, traditional interview methods, as well as paper-and-pencil assessments of mood (e.g. Beck Depression Inventory, Zung Depression Inventory) are difficult, if not impossible, to administer to many stroke patients because of aphasia (Code and Müller 1992, Starkstein and Robinson 1988). For example, patients with non-fluent language output cannot provide adequate self-report of mood state during a clinical interview. Patients with comprehension deficits likewise may have difficulty in interviews, and they may provide unreliable responses to traditional written self-report instruments. Because of these limitations, patients with significant comprehension deficits have been excluded from most studies of post-stroke mood disorders. In addition, both clinicians and researchers have been limited in their ability to assess specific mood states in aphasic patients.

Visual analogue scales have been widely used in psychiatric research as brief measures of subjective distress (e.g. dysphoria, pain). Typically, these scales involve a 100 mm horizontal line with written descriptors at either side of the line (e.g. ' not at all sad' versus ' very sad'). These scales, first described by Aitken (1969), have been shown to be reliable and valid measures in psychiatric populations (Bech et al. 1986).

Modified versions of the traditional visual analogue scales have been employed in two studies of post-stroke mood disorders (Robinson and Benson 1981, Stern and Bachman 1991) in order to enhance the ability to obtain ratings from aphasic participants. For example, in the study by Stern and Bachman (1991), a single bipolar Visual Analogue Dysphoria Scale (VADS) was used. The scale involved a 100 mm vertical line with a simple schematic `happy face' at the top pole and a `sad face' at the bottom; corresponding words (i.e. ' happy ' and ' sad ') appeared above and below the two faces, respectively (Figure 1). The patients were instructed, either with words or gesture, to place a mark on the line at the point that represented their degree of sadness. The scale is scored from 0 to 100, based on the number of millimetres from the ' happy ' pole. Results of the Stern and Bachman (1991) study of stroke patients (which included many aphasic patients with significant comprehension deficits), and of a subsequent validity study using a general outpatient sample of patients with various neurological disorders (Stern et al. 1991), indicated that the bipolar VADS was highly correlated with other, more extensive and more verbally demanding measures of mood state (e.g. with the Depression Adjective Check List, r = 0.81; with the Profile of Mood States Depression Scale, r = 0-51). In these studies the VADS was reported to be reliably completed by all of the aphasic and other cognitively impaired patients.

Although promising, the bipolar VADS has two limitations : (1) the use of happy on one pole and sad on the opposite pole resulted in potentially misleading low scores ; that is, a score of zero (at the happy pole) could be interpreted as either the lack of any sadness or the presence of extreme happiness; and (2) the bipolar approach precludes the ability to expand the number of mood states to be assessed.

We present below the description of, and reliability and validity evidence for, a set of seven Visual Analogue Mood Scales (VAMS) specifically created for use with post-stroke and other neurologically impaired patients with aphasia and other communication disorders. These new measures are presented in a unipolar fashion (i.e. neutral at one pole and the mood state at the other) and assess the following moods : sad, afraid, tired, angry, confused, happy,

and energetic. Two studies are presented in which young, healthy volunteers are included as participants. This may, at first, appear inappropriate for a test designed for neurologically impaired patients. However, in order to establish validity in a clinical sample, one would need to administer a `gold standard' test (e.g. Profile of Mood States, Beck Depression Inventory, Hamilton Depression Rating Scale) to that sample with which the scores on the VAMS would be compared. The reason why there is a need for these new scales, however, is that patients with aphasia and other communication disorders cannot reliably complete standardized paper-and-pencil or interview-based instruments. We therefore first chose to determine the scales' validity in a sample of participants who can be administered the VAMS and the ' gold standard' instruments. In an attempt to estimate how a person with impaired language comprehension might complete the VAMS, participants completed the VAMS without accompanying words (i.e. relying solely on the faces) and then with words; these correlations are presented as an indicator of content validity.

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Study 1

METHOD

Participants

Participants were 184 students enrolled in either undergraduate introductory psychology or graduate speech and language classes at the University of North Carolina at Chapel Hill. Participants were excluded if English was not their primary language (n = 3), or if their final questionnaires contained missing data (n = 10). This resulted in a total of 171 participants, with 23 % and 77 % of the sample being composed of males and females, respectively. The mean age was 20.4 years (SD = 2.6).

Instrumentation

The VAMS consist of eight simple, cartoon faces which were produced by an artist using computerized graphics. One face was designed to depict a neutral mood. The remaining faces were meant to represent seven distinct moods : sad, afraid, tired, angry, confused, happy, and energetic. The faces were used to create seven distinct scales, each with the neutral face on the top of the page and an individual mood face at the bottom of the page, with a 100 mm vertical line connecting the two faces. The word ' neutral ' is printed above the neutral face, and the appropriate mood word is printed below the corresponding face (see Figures 2 and 3 for examples). The scales are presented in a vertical orientation to avoid response distortions due to hemispatial neglect or hemianopsia. The words are included to provide additional information to aphasic patients with single word recognition, as well as to improve the understanding of the scales if given to patients with non-dominant hemisphere impairment and difficulty comprehending subtleties in schematic faces of emotions.

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In order to assess the validity of the scales without attached linguistic information (i.e. estimating what an aphasic patient might experience), a separate set of scales was created. These *No-Word VAMS* involved the same presentation as the original YAMS described above, with the words deleted. Directions for both sets of scales required the subject to place a mark somewhere on the vertical line to indicate his or her current mood. The score for each scale was the number of millimetres from the neutral pole.

As an estimate of the YAMS' test—retest (r_{tt}) reliability, correlations were calculated between the first and second sets of original (i e with words) YAMS. Although test—retest reliability is typically assessed with a longer time interval between sessions, when measuring mood state, which by definition is transient and unstable, it was believed that the short duration between completing the two sets of measures was appropriate. Internal consistency, another measure of reliability, is not appropriate for this type of data, in which each test is composed of only one score.

Construct validity of the VAMS was assessed by comparison to scores on the *Profile of Mood States* (POMS) (McNair *et al.* 1981). The POMS is a commonly used 65-item adjective checklist with documented reliability and validity. Scores are derived for each of six mood states : tension—anxiety, depression—dejection, anger—hostility, vigour, fatigue, and confusion.

Procedure

Participants received one of two self-administered questionnaire packets. The first packet, given to 75 participants, consisted of the seven YAMS, the POMS, and the same seven VAMS presented in a different order. The second packet, administered to 96 participants, differed from the first packet in that the No-Word VAMS were substituted for the first set of YAMS. All test material was kept strictly confidential without any identifying information appearing on the forms.

Statistical analyses

As a measure of each scale's accuracy in depicting a specific mood state when words do not accompany the face (i.e. content validity), Pearson product—moment correlation coefficients were calculated for the corresponding pairs of the original (i.e. Word VAMS) and the No-Word versions of the \TAMS. Convergent and discriminant validities of the original and the No-Word VAMS were evaluated using the multitrait—multimethod analysis procedure (Campbell and Fiske 1959). Two matrices were created using: (1) the correlations among and between six of the VAMS and the six POMS scores (the ' happy ' YAMS was omitted because of no corresponding POMS scale), and (2) the correlations among and between the six No-Word YAMS and the six POMS. The two correlation matrices were then used to statistically test the construct validity of the YAMS and the No-Word YAMS, respectively. Analyses were performed on an IBM-compatible personal computer using the Monte Carlo Multitrait—Multimethod Analysis Package (Iwaniszek and Knoeller 1990). Adequate convergent validity is evidenced by a significant effect for trait. This would indicate that the correlations between corresponding scales of the two methods significantly differed from zero.

RESULTS

Reliability

Results indicated a mean test—retest reliability of 0.68. The following are the individual reliability coefficients for each scale: tired, $r_{tt} = 0.76$; Angry, $r_{tt} = 0.73$; Happy, $r_{tt} = 0.73$; Energetic, $r_{tt} = 0.72$; Afraid, $r_{tt} = 0.69$; Confused, $r_{tt} = 0.67$; Sad, $r_{tt} = 0.49$.

Content validity

The correlation coefficients between the original (with words) and No-Word YAMS for Angry, Happy, Energetic, Afraid, Confused, and Sad were 0.70, 0.90, 0.77, 0.50, 0.48, and 0.81, respectively. All correlation coefficients were statistically significant ($p < 0.001$), indicating that when linguistic information is not available for each of the scales, the differential meaning of the faces is readily apparent.

Convergent and discriminant validity

Based on the multitrait—multimethod analysis, a significant effect for trait (i.e. monotrait—heteromethod) was found for the original VAMS, indicating that the correlations between the corresponding scales of the two methods significantly differed from zero and were large relative to those correlations found between the non-corresponding scales of the two methods (monotrait—heteromethod, $p < 0.01$). Convergent validity was supported by the findings that the correlation coefficients between the VAMS and those POMS scales expected to be similar were quite high (M_{ir}, = 0.51; $range_{|r|}$ = 0.33 to 0.66, $p < 0.001$.[**] Discriminant validity was supported by the findings that : (1) the correlations between each of the YAMS and the remaining YAMS were small ($M_{|r|}$ = 0.14; $range_{|r|}$ = 0.005 to 0.57) ; and (2) the correlations between each of the YAMS and those POMS scales not expected to be similar were also small (M_{ir}, = 0.16; $range_{|r|}$ = 0.003 to 0.46) (Table 1).

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Similar results were found for the No-Word YAMS. The corresponding scales of the two methods significantly differed from zero and were large relative to those correlations found between the non-corresponding scales of the two methods (monotrait—heteromethod, p = 0.001). As with the original YAMS, discriminant validity of the No-Word VAMS was supported by the findings that: (1) the correlations between each of the No-Word YAMS and the remaining No-Word YAMS were small (Mir, = 0.29; range|r| = 0.15 to 0.55); and (2) the correlations between each of the No-Word YAMS and those POMS scales not expected to be similar were also small (Mir, = 0.34; range|r| = 0.13 to 0.53). Convergent validity was supported by the high correlation coefficients between the No-Word \TAMS and those POMS scales expected to be similar (Mir, = 0.55; range|r| = 0.33 to 0.77, p < 0.001) (Table 2).

Study 2

METHOD

Participants

In order to assess the validity of the YAMS in an additional, independent sample, a second group of normal volunteers, from another region of the United States, was assessed. Participants were 150 students enrolled in an undergraduate introductory psychology course at the University of Rhode Island. All participants spoke English as their primary language. Participants were excluded from the study if their questionnaires contained missing data (n = 10). This resulted in a total of 140 participants, with 59 % and 41 % of the sample being composed of males and females, respectively. The mean age was 22.9 years (SD = 4.64).

Instrumentation

The YAMS (only those with words) and the POMS, described in Study 1, were also used in Study 2. In addition, the Beck Depression Inventory (BDI; Beck et al. 1961, Beck and Steer 1987) was also administered. The BDI is a commonly used 21- item, self-report measure of overall depressive symptomatology. Although many of its items pertain to mood, per se, several items assess the vegetative and cognitive symptoms of depressive disorders.

[**] The subscript Irl refers to the absolute value of the correlation coefficients.

Procedure

Participants were given a questionnaire packet containing the three measures (i.e. YAMS, BDI, POMS) along with additional questionnaires, as part of a larger study of mood. They received the packet upon entering class, completed it within the first 10-15 minutes (there was no lecture given during that time), and returned the completed instruments on their way out of the classroom. Instructions directed participants to complete all three measures during the time allotted, and assured confidentiality of the data. The instructions to each of the measures differed slightly with regard to timing of response: for the BDI and POMS, participants were asked to respond according to how they had been feeling for the `past week, including today ' ; for the YAMS they responded according to how they had been `feeling today'.

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Statistical analysis

The same multitrait—multimethod procedure described in Study 1 was employed in Study 2 to assess the convergent and discriminant validity of the VAMS when compared to the POMS. In addition, Pearson correlation coefficients were calculated between the BDI and each of the VAMS.

Results

Using the multitrait—multimethod procedure, a significant trait effect was found, indicating that the correlations between the corresponding scales of the two methods (i.e. VAMS and POMS) were significantly different from zero (monotrait—heteromethod, $p < 0.01$). As expected, the correlations between each of the VAMS and the remaining VAMS were small ($M_{|r|} = 0.29$; $range_{|r|} = 0.05$ to 0.59); and the correlations between each of the VAMS and those POMS scales that were not expected to be similar were also small ($M_{|r|} = 0.35$; $range_{|r|} = 0.13$ to 0.56). Convergent validity was evidenced by the large correlation coefficients obtained between the VAMS and those POMS scales expected to be similar (M_{ir}, = 0.64; $range_{|r|} =$ 0.51 to 0.72) (Table 3).

Correlations between the BDI and the VAMS also provided evidence of convergent and discriminant validity. The VAMS with the two largest absolute correlations with the BDI were the Sad ($r = 0.53$, $p < 0.001$) and Angry ($r = 0.51$, $p < 0.001$) scales. The two smallest absolute correlations with the BDI were with the Energetic ($r = —0.28$, $p = 0.001$) and Confused ($r = 0.31$, $p < 0.001$) scales.

DISCUSSION

The visual analogue mood scales (VAMS) described above provide brief, valid measures of internal mood states. These scales have been designed specifically for use with aphasic patients and other neurologically impaired individuals. Pertinent features of the scales for these populations include the use of simple, schematically drawn faces depicting individual emotions, the use of a neutral pole, vertical rather than horizontal presentation, and single mood words associated with each face. The use of a 100 mm line provides a range of scores from 0 to 100, thus allowing for measurement of subtle changes over time. In previous studies using similar visual analogue scales, in aphasic and other neurologically impaired patients, the scales have been able to be easily completed by all patients, even those with significant auditory comprehension deficits (Stern and Bachman 1991, Stern et a/. 1991). In clinical use (i.e. with a variety of stroke and other rehabilitation patients) by our group and by

others, the VAMS reported herein have been completed by all but the most severely aphasic or perseverative patients.

Results of the present studies indicate that these newly developed VAMS demonstrate excellent convergent and discriminant validity in two independent samples of normal, non-aphasic volunteers. In fact, these simple, brief scales accounted for over 50 % of the variance of many of the more extensive, linguistically demanding measures of mood state. In addition, participants responded to the VAMS in a similar fashion when words were associated with the faces or when no words were present. This suggests that the faces themselves have content validity and should be interpreted accurately by individuals with impaired language comprehension.

A not-unexpected result of the current studies was that the test—retest reliability coefficients were not as large as one would desire in standardized tests. However, the fluctuating nature of mood state is a common problem in establishing test—retest reliability in self-report measures of depressive symptomatology (Rush 1987). In multi-item mood scales an alternative assessment of reliability is the use of internal consistency procedures such as Chronbach's alpha. However, given the fact that each of the VAMS is a single item (with a range of 0-100), these procedures are not feasible.

VAMS, such as those used in the present study, should prove useful in the clinic as well as in research studies. For example, clinicians can easily administer these brief scales to patients or clients periodically throughout treatment, to assess alterations in mood states. The scales might also serve as brief screening measures of underlying mood disorders, thus leading to appropriate referrals and treatment. In research settings, VAMS can be used for a variety of purposes, including the assessment of the efficacy of various antidepressant treatments, the investigation of the relationship between internal mood state and outward affective behaviour, or the study of the relationship between mood state and specific lesion locations. In each of these settings, the use of VAMS is likely to improve the assessment of mood state in individuals who cannot provide meaningful responses to traditional self- report and interview measures of depressive symptomatology.

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