Title: The latent structure and predictors of mood in people with aphasia due to left hemisphere stroke.

Abstract

Most studies of post-stroke mood exclude people with aphasia. Two hundred individuals with aphasia due to left hemisphere stroke of varying acuity, completed a visual analog of mood scale. Factor analysis confirmed a two factor model best represents the relationships among scales, consisting of "anxiety/depression" and "vitality" factors. Unexpectedly, mood factors were not associated with stroke acuity, pre-stroke psychiatric history, or aphasia severity. Self-perceived quality of communication life was associated with "vitality". We conclude it is important to survey the person with aphasia regarding subjective experiences, and that mood state can be measured in the majority of people with aphasia.

Summary

Problem and Rationale. Depression or anxiety occurs in about 5 to 40% of people following stroke[1]. Unfortunately however, most studies of mood in stroke survivors specifically exclude people with aphasia, which limits generalizability[2]. Among inclusive studies, most have relied on communication partner-reports, clinician-observer ratings of patients' mood, or unstandardized adaptations of visual analog scales, rather than on direct survey of the individual with aphasia[3]. Thus, there is a great need for 1) appropriate measures of mood in people with aphasia, and 2) a better understanding of predictors of mood following stroke in people with aphasia.

Participants and Procedures. Two hundred individuals with aphasia due to single, left-hemisphere stroke completed the Visual Analog Mood Scale (VAMS)[4] as part of a comprehensive aphasia diagnostic and neuropsychological evaluation at our university-affiliated rehabilitation institute. The VAMS is a simple way to measure mood state, and is reliable and valid in healthy adults and non-aphasic stroke patients[5]. The VAMS has 8 individual scales measuring happy, confused, sad, tired, tense, energetic, afraid and angry mood states. Examiners give directions to the patient orally, visually, and with gestures, if necessary. Patients mark a line on a 100mm vertical bar to express the relative absence or presence of the mood on a continuum. Raw scores (in mm) are adjusted for age and gender, and transformed into normalized T-scores with a mean of 50 and a standard deviation of 10. Figure 1 illustrates a sample VAMS scale (sad). Inpatients and outpatients with a mean age of 59 ($\pm$15) who were 2 to 1248 weeks post-stroke (mean=38$\pm$126) completed the VAMS. Fluent (56%) and non-fluent (43%) aphasias of varying diagnostic subtypes were evaluated. A minority of patients (10%) were unable to complete the VAMS because of difficulty understanding the procedure. In addition to the mood scale (VAMS), participants also completed an aphasia diagnostic measure (Boston Diagnostic Aphasia Examination; BDAE)[6], and a standardized measure of functional communication (Communication Activities of Daily Living-2nd Edition; CADL-2)[7],and measures of nonverbal cognitive ability. A subset of participants (n=64) also completed a self-report measure of quality of communication life (Quality of Communication Life Scale; ASHA QCL)[8], and a family member completed a rating scale of the participant's social interaction/communication (Communicative Effectiveness Inventory; CETI)[9].

Results. Descriptive statistics were used to summarize demographic data. Comparing the 21 individuals unable to complete the VAMS against completers (n=200), non-completers were fewer weeks post-stroke, had greater language severity, and had lower CETI and nonverbal cognitive function scores (all ps<.05). There were no differences in gender, age or years of education. Non-completers were more likely to be classified as having Wernicke's aphasia compared to completers (Pearson Chi-square=36.7, p<.0001). Test-retest reliability for the VAMS was calculated in a subset of participants (n=45) who completed the VAMS about four hours apart, and we observed moderate correlations (range=0.33/tired to 0.57/sad), comparable to those observed in non-aphasic stroke survivors[5]. A Cronbach's alpha analysis of the eight VAMS scales revealed lower internal consistency (alpha=0.628), suggesting the scales measure different latent constructs. In order to explore the factor analytic structure of the VAMS, a principal component analysis with varimax rotation was performed. Factors with eigenvalues >1 were retained, and a Scree plot was used to confirm the factor solution. The factor analysis revealed two factors with eigenvalues of 3.47 and 1.24, which together accounted for 59 percent of the total variance in VAMS. VAMS scales constituting the two factors are presented in Table 2. The first factor accounted for 43% of the total variance with six VAMS scales loading >0.60 on the factor. This factor included scales associated with anxiety and/or depression (sadness, anger, confusion, tiredness, tension and fear). The second factor accounted for 16% of the variance and was composed of scales associated with vitality (energy and happiness), which loaded >.80 on the factor.

In order to understand the relationship between mood factor scores and aphasia, Spearman correlations between the two VAMS factor scores and demographics, language, functional communication, quality of communication life, nonverbal cognition, and family ratings were calculated. There were no significant correlations between either VAMS factor score and years of education, weeks post stroke, or nonverbal cognitive functioning. Factor scores did not differ in those with and without a pre-stroke mental illness. Correlations between factor scores and aphasia severity (BDAE Language Competency indices) or naming (BNT) were significant, but very small (r_s=-0.14 to -0.18). All correlations between factor scores and specific aspects of language as measured by the BDAE (e.g., expression, comprehension, reading, writing, limb praxis, oral agility) were very small (all r_s <0.27) and mostly non-significant. Some correlations between factor scores and functional communication (CADL-2), family rating of social interaction (CETI), and self-reported quality of communication life (QCL) were significant, but modest (r_s=-0.15 to 0.26). Nonfluent participants had higher "vitality" factor scores than fluent participants, although this was explained by an interaction with weeks post stroke (i.e., in our sample, fluent participants were more likely to be acute than those nonfluent).

Linear regression analyses with each of the two latent mood factors as dependent variables was completed in a subset of participants (n=64) who completed all measures, in order to determine the amount of variance in mood accounted by various demographic, language and other characteristics that were significantly correlated in univariate analyses. Illness variables (the fluency x stroke acuity interaction), was first entered into the stepwise regression. Next, aphasia severity (LCI) and CADL-2 were entered. Finally, QCL, and CETI were entered. No significant variance in factor1 ("anxiety/depression") was accounted for by any illness variables, self reported quality of communication life (QCL), family rating of social interaction (CETI) or functional communication (CADL-2). However, significant predictors of "vitality" (factor 2) in the regression were: the interaction of fluency and stroke acuity, QCL, and CETI, but not aphasia severity or CADL-2 (Adjusted R^2=.26, $\underline{F}(3,63)=8.29$, $\underline{p}<.0001$) (see Table 3). Higher levels of "vitality" were predicted by higher self-rated quality of communication, but lower levels of social interaction per family ratings.

Conclusions. The results of this study revealed that a two factor model of mood state best represents the relationships among the eight VAMS scales, consisting of an "anxiety/depression" factor and a "vitality" factor. These latent mood factors were not associated with stroke acuity, pre-stroke history of mental illness, or aphasia severity. In the regression analysis, the "anxiety/depression" factor was not predicted by stroke acuity, aphasia severity, family ratings of social interaction, or functional communication. The "vitality" factor was predicted by patient's self-reported quality of communication life and family report of social interaction, above the effects of the aphasia (accounting for about ¼ of the variance in "vitality"). We conclude mood states in people with aphasia are not necessarily determined by the severity of language impairment or the acuity of the stroke; personal (e.g., pre-stroke adjustment, resilience), social (e.g., social support, economic advantage), or other factors (e.g., physical disability) may be more important. People with aphasia who experienced less "vitality" had lower levels of self-perceived quality of communication life, but were actually rated as more socially interactive by family members. The results underscore the importance of efforts to survey the person with aphasia regarding his or her subjective experience, and emphasize that mood state can be measured in the majority of people with aphasia following stroke.

References

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Figure 1. VAMS sad item.

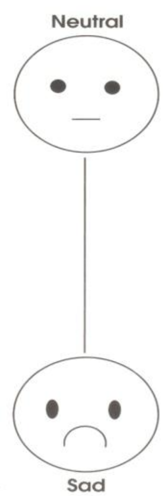

Table 2. Results of principal component analysis of VAMS with varimax rotation.

	Factor	
VAMS scale	1	2
Afraid	.760	.002
Confused	.721	-.074
Sad	.687	-.327
Angry	.698	-.140
Energetic	-.041	.887
Tired	.599	-.374
Happy	-.228	.880
Tense	.721	-.139

Table 3. Final stepwise linear regression model results for factor 2 (“vitality”): 26 % of variance accounted for.

Variable	Beta	t	p
Fluency x acuity	-.218	-1.99	.051
QCL	.443	3.96	<.0001
CETI	-.289	-2.584	.012

Excluded variables: BDAE LCI-comprehension, BDAE LCI-expression, CADL-2