Introduction

The Functional Outcome Questionnaire- Aphasia (FOQ-A) is a conceptually-driven outcome measure that was developed to address the growing need for an ecologically valid functional communication measure that is easy for caregivers and clinicians to interpret (Glueckauf et al., 2003). The psychometric properties of the FOQ-A have been studied with classical test theory methods (Glueckauf et al., 2003; Ketterson et al., 2008). Recently, Ketterson et al's exploratory factor analysis revealed that the FOQ-A has two factors that comprise *basic verbal skills* (Factor 1) and *conversation response skills* (Factor 2), which account for 54.15% and 9.68% of the variance, respectively.

The purpose of this study was two-fold. First, we sought to evaluate the item-level psychometric properties of the two-factor FOQ-A using Rasch analysis. From a methodological standpoint, Rasch analysis provides a means of analyzing two important aspects of objective measurement that factor analysis does not provide: 1) verifying or improving how a rating scale functions, 2) converting raw scores (no measurement value) into interval data which provides an objective measure of one's ability (Linacre, 2002). The provision of an interval score (called a logit) and item difficulty hierarchy makes the measure more useful to clinicians and researchers. This leads to the second purpose of the study, which was to develop computer scoring to enhance the FOQ-A's clinical utility.

Methods

Participants

The caregivers of 127 community-dwelling individuals with aphasia secondary to left hemisphere stroke participated in the current study by completing the FOQ-A. Caregivers were native speakers of English who, over the previous six months, were in direct contact with the

individual for more than 10 hours per week. All individuals rated by caregivers were right-handed, native speakers of English, at least six months post onset a unilateral, left hemisphere stroke with mild-moderate to severe aphasia and no history learning disorders or other neurological disease.

Instrument

The FOQ-A is a 32-item caregiver questionnaire originally designed to measure verbal communication (i.e., expressing basic needs, making routine requests, communicating new information) and other cognitive-communicative behaviors (i.e., turn-taking, paying attention). The five-point rating scale is used to indicate percent of time an individual "Can perform behavior successfully", 1= 0%, 2= 25%, 3= 50%, 4= 75%, and 5= 100%. A "Don't Know" option is available for communication behaviors not directly observed by the caregiver.

Data Collection and Analysis

FOQ-A data was retrieved retrospectively from an approved research database. Caregiver ratings were submitted to *Winsteps*, a Rasch analysis software program (Linacre, 2005) that provides the means for assessing rating scale utilization, unidimensionality, and internal consistency. Rasch analysis was completed on the two-factor FOQ-A.

Results

Rating Scale Utilization

Factor 1 met all of the criteria and Factor 2 met three of the four essential criteria for rating scale effectiveness (Linacre, 2002).

Unidimensionality

Four of the 20 items in Factor 1 (*basic verbal skills*) demonstrated extremely high infit statistics. The four misfitting items were removed and the Rasch analysis was conducted on the

remaining items. All further results are based on the revised scale.

Fifteen of the remaining 16 items met the established infit criteria in Factor 1. One item, "Can communicate basic needs by gesturing", continued to show poor infit but was not removed because it represents the most basic communication skill for individuals with aphasia. Point-measure correlations ranged from .50 to .88, indicating moderate to strong correlations between the items in Factor 1.

Analysis of the 12 items in Factor 2 revealed that one item, "Takes turns in conversations with others", had infit values outside the acceptable range. The item was removed and the data re-analyzed. All other items met established infit criteria. Point-measure correlations for Factor 2 items ranged from .57 to .82, indicating at least moderate correlations between the items.

Internal Consistency

Item Hierarchy

Factor 1 (*basic verbal skills*) item difficulty hierarchy revealed that item difficulty increased with increased complexity of response. The easiest item on the scale was "Can communicate basic needs by gesturing" (-4.09 logits) and the hardest item was "Can verbally communicate new info in complete sentences" (1.87 logits).

Factor 2 (*conversation response skills*) item difficulty hierarchy demonstrated that these functional communication behaviors also conform to the conventional understanding that increased complexity leads to increased difficulty. Review of Factor 2 items listed hierarchically shows that the range of difficulty of items (-.85 to 1.10 logits) is somewhat restricted compared to the range of difficulty for items in Factor (-4.09 to 1.84 logits).

Item Redundancy

Factor 1 contained five redundant items, while Factor 2 contained four redundant items.

However, most of these items sampled different behaviors deemed important for measuring functional communication.

Ceiling and Floor Effects

Factor 1 indicated that 12 individuals were at the ceiling (i.e., rated as a 5 on every item) and one individual was at the floor (i.e., rated as 0 on every item) of the measure. Factor 2 demonstrated 13 individuals were at the ceiling and no respondents were at the floor.

Reliability

Person reliability index (analogous to Cronbach's alpha) was high at .95 for Factor 1 but somewhat less robust for Factor 2 at .79. The person separation index for Factor 1 was 4.43, indicating that the measure was able to categorize the ratings of individuals with aphasia into 5 statistically distinct levels of ability with centers three measurement errors apart.

FOQ-A Scoring System

As previously mentioned, Rasch analysis provides an interval score for each item, but even more importantly for scoring purposes, it provides an interval measure for each rating scale unit for each item. Thus, an interval score can be obtained for each person's responses making it possible to obtain an interval score for Factor 1 (*basic verbal skills)* and an interval score for Factor 2 (*communicative response skills*). These interval scores for the two factors reflect distinct dimensions of functional communication and are thus used independently, not added for a total score as in classical test theory methodology.

Conclusion

Results of our item-level psychometric analysis provide further evidence that the two-factor FOQ-A is a valid and reliable measure of functional communication. Computer scoring, based on the hierarchically organized interval scale, provides a visual representation of the item

hierarchy and 5-unit rating scale, which may be useful to clinicians and researchers. Review of pre-treatment scores can indicate functional communication behaviors not yet acquired and may be used to determine starting points for treatment. Additionally, pre- and post-treatment scores can be efficiently documented as a means for providing evidence of change in functional communication behaviors.

References

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