

Measuring premorbid IQ in aphasia using indirect lexical access

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Abstract:

Estimating premorbid IQ is an important facet to neuropsychological or language evaluations, as it can provide valuable information when determining if performance represents a decline or impairment. In aphasia, assessment of premorbid abilities is difficult due to expressive and receptive language deficits. Past research has demonstrated that despite impairments in several cognitive domains, aphasic patients may retain some aspects of premorbid intelligence. In fact, performance on tests of intelligence has been shown to be unrelated to the severity or degree of language impairment. Previous research has also indicated that aphasic patients can access lexical items under indirect, or implicit conditions. For example, several studies have shown that despite an inability to overtly pronounce or understand words, aphasic patients demonstrate intact semantic priming, indicating successful retrieval of lexical-semantic information (Milberg & Blumstein, 1981). There is also evidence to suggest that patients with aphasia can differentiate orthographically regular from irregular words, indicating potential preservation of lexical-orthographic knowledge. In the current study, we evaluated a new test that indexes preserved lexical information to estimate premorbid intelligence in language-disordered individuals. We developed the lexical-orthographic familiarity test (LOFT), a lexical-familiarity measure containing words from a standardized test of word reading (Wechsler Test of Adult Reading; WTAR) paired with antiquated but real English words. Antiquated English words were selected from a previous study (Barnhardt, Glisky, Polster, & Elam, 1996) and were chosen to represent words that would be unfamiliar due to their low frequency and rare usage in current English language but were nevertheless pronounceable, and morphologically similar to more familiar

English words. The test was modeled after the Spot-A-word test, a lexical-decision task proven to be highly correlated with verbal intelligence (Baddeley, Emslie, & Nimmo-Smith, 1993). Successful LOFT performance does not require correct pronunciation, and as a result, can provide information regarding word knowledge in patients who may have difficulty reading. Task instructions were to identify the word in each pair that is ‘most familiar’ and correct responses required selection of the word taken from the WTAR.

Keywords: aphasia | premorbid IQ | Language

Article:

Background

Estimating premorbid IQ is an important facet to neuropsychological or language evaluations, as it can provide valuable information when determining if performance represents a decline or impairment. In aphasia, assessment of premorbid abilities is difficult due to expressive and receptive language deficits. Past research has demonstrated that despite impairments in several cognitive domains, aphasic patients may retain some aspects of premorbid intelligence. In fact, performance on tests of intelligence has been shown to be unrelated to the severity or degree of language impairment. Previous research has also indicated that aphasic patients can access lexical items under indirect, or implicit conditions. For example, several studies have shown that despite an inability to overtly pronounce or understand words, aphasic patients demonstrate intact semantic priming, indicating successful retrieval of lexical-semantic information (Milberg & Blumstein, 1981). There is also evidence to suggest that patients with aphasia can differentiate orthographically regular from irregular words, indicating potential preservation of lexical-orthographic knowledge. In the current study, we evaluated a new test that indexes preserved lexical information to estimate premorbid intelligence in language-disordered individuals. We developed the lexical-orthographic familiarity test (LOFT), a lexical-familiarity measure containing words from a standardized test of word reading (Wechsler Test of Adult Reading; WTAR) paired with antiquated but real English words. Antiquated English words were selected from a previous study (Barnhardt, Glisky, Polster, & Elam, 1996) and were chosen to represent words that would be unfamiliar due to their low frequency and rare usage in current English language but were nevertheless pronounceable, and morphologically similar to more familiar English words. The test was modeled after the Spot-A-word test, a lexical-decision task proven to be highly correlated with verbal intelligence (Baddeley, Emslie, & Nimmo-Smith, 1993). Successful LOFT performance does not require correct pronunciation, and as a result, can provide information regarding word knowledge in patients who may have difficulty reading. Task instructions were to identify the word in each pair that is ‘most familiar’ and correct responses required selection of the word taken from the WTAR.

Study aims

The primary goal of the present study was to validate the use of a premorbid intelligence screen in a population with speech and language deficits. An additional goal of this study was to determine if a group of aphasic patients with mild to severe degrees of language dysfunction were able to access lexical items under indirect or implicit conditions.

Results

Twenty-five aphasic patients were administered the LOFT and WTAR as part of a larger neuropsychological battery. Average severity rating, an estimate of receptive and expressive language functioning, was 2.83 (on a scale of 1-5 where 5 represents severely impaired language function) for aphasic patients. Average Boston Naming Test (BNT) score, a measure of expressive language function, was 29.26 (out of 60 total items). LOFT and WTAR performance for the aphasic group were compared to a medically comparable group of patients with one or more cardiovascular (CV) risk factor (i.e., hypertension, CV disease); CV-risk group. Aphasic and CV-risk patients were also compared to a group of healthy control (HC) participants who had no neurologic or CV history. Overall, groups did not differ significantly with regard to age or education (see Table 1). For all three groups, raw LOFT scores were converted to standard scores (estimated IQ) based on existing WTAR normative data. Estimated premorbid IQ scores from the WTAR were similar to LOFT scores and were in the average or high average range for both the HC and CV-risk groups. In contrast, the mean WTAR score for the aphasia group was in the severely impaired range while the mean LOFT score was within normal limits (Table 1).

Table 1. Demographic data and WTAR/LOFT scores

	Aphasic <i>N</i> = 25	CV-risk <i>N</i> = 78	Healthy control <i>N</i> = 47
Age	62.88	64.06	64.72
Education	15.29	13.55	15.38
WTAR (raw score)	15.48	31.45	44.06
WTAR (scaled score)	70.56	98.26	117.04
LOFT (raw score)	43.04	41.28	47.53
LOFT (scaled score)	115.64	113.03	122.15

A multivariate analysis of variance conducted on LOFT and WTAR data revealed a significant interaction across groups. Post hoc comparisons revealed significant differences between the aphasic and HC groups, as well as between the CV-risk and HC groups. However, the aphasic and CV-risk groups did not differ significantly. Within the aphasic group, partial correlations (controlling for BNT performance) demonstrated that the LOFT, but not the WTAR, correlated

significantly with education. In addition, LOFT scores did not correlate with severity rating. Further analyses were then conducted by sub-grouping the aphasic patients according to severity rating (mild, moderate, or severe). A multivariate analysis of covariance (controlling for BNT score) revealed a significant interaction across WTAR and LOFT scores, with no significant differences between LOFT scores across aphasic sub-groups.

Conclusions

Overall, these results demonstrate preserved lexical retrieval in a group with significant language impairments. In addition, results of the current study indicate that in contrast to a standardized premorbid intelligence screen (the WTAR), LOFT performance is not related to the degree or severity of aphasia, and thus may be useful even in patients with mild expressive or receptive language problems. Importantly, our findings suggest that the LOFT may provide a better estimate of premorbid intelligence in patients with aphasia. We also suggest that the LOFT may be a more sensitive premorbid screening measure particularly when there is concern that verbal production may not accurately reflect word knowledge.

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