Continuous Construct Validation of the St. Marys CVA Evaluation: Bilateral Awareness Scale

Julia Van Deusen, Diane Harlowe

Key Words: perceptual disorders, assessment • tests, by title, sensorimotor

Previous research suggested that scores on the Schenkenberg Line Bisection Test of unilateral neglect should correlate significantly with bilateral awareness ratings on the St. Marys CVA Evaluation, but that scores on both of these instruments should not correlate with St. Marys perceptual scores. To test this hypothesis, occupational therapists at St. Marys Hospital Medical Center administered the Schenkenberg test and St. Marys CVA Evaluation to 26 cerebral vascular accident (CVA) patients. Spearman rho coefficients were computed.

As hypothesized, the correlation between the Schenkenberg test scores and St. Marys bilateral awareness ratings reached statistical significance, and no significant relationship was found between Schenkenberg scores and St. Marys perceptual scores. However, there was a significant relationship between the St. Marys bilateral awareness ratings and perceptual scores. This result may indicate that clinical observations are not adequate to discriminate between unilateral neglect and perceptual impairments.

The results further the construct validation process of the St. Marys CVA Evaluation. The data also support the position that unilateral neglect is not primarily a perceptual phenomenon.

The development of new occupational therapy evaluation instruments is a well-recognized need in the profession (Yerxa, 1983), and validity and reliability data are essential if such tools are to be truly useful to occupational therapists. One method of demonstrating whether an evaluation instrument is measuring what it purports to measure is the process of construct validation, involving examination of hypotheses relevant to test performances (Isaac & Michael, 1971). The St. Marys CVA Evaluation is undergoing this validation process, and the work discussed in this article is the fifth in a series of studies to refine the battery.

In the first study of this instrument, analysis led to the definition of five factors (Fox & Harlowe, 1984). The factors of Self-Care (Factor I), Left Function (Factor II), and Strength (Factor V) were so named because of the nature of variables with high loadings. Factor III was termed Recovery Stage because of high loadings on the Brunnstrom arm and hand stage ratings and on a bilateral awareness scale. Factor IV was called Perception because measures of body scheme, figure-ground, position in space, spatial relations, and left-hand stereognosis had high loadings on this factor. Although sensation was not included in this original factor analysis, a later study lent support to the consistency of sensory testing methods used in the St. Marys CVA Evaluation (Harlowe & Van Deusen, 1985).

The other two studies completed in this construct validation series tested and supported hypotheses relevant to Factors III and IV. A significant relationship was found between perceptual test scores and patient discharge disposition (Harlowe & Van Deusen, 1984). Moreover, Van Deusen & Harlowe (1986) showed that Brunnstrom's recovery stage ratings were related to scores on the Schenkenberg Line Bisection Test, which has data available on its reliability and validity as a measure for unilateral neglect (Schenkenberg, Bradford, & Ajax, 1980; Van Deusen, 1983).

Historically, unilateral neglect (UN) has been considered a form of perceptual dysfunction (Heilman, Valenstein, & Watson, 1985). Much recent neurological research, however, supports the view that UN is an attentional-intentional deficit that can occur with lesions anywhere in the cortico-limbic-reticular loop (Heilman et al., 1985; Mesulam, 1981).

Heilman and colleagues (Bowers & Heilman, 1980; Heilman, Bowers, & Watson, 1983; Heilman & Valenstein, 1979; Heilman & Van Den Abell, 1980; Heilman & Watson, 1978; Watson, Valenstein, & Heilman, 1981) have extensively investigated the neglect syndrome, studying both healthy people and those with brain lesions. The results suggest that asymmetries of orientational tendencies resulting from decreased stimulation of a lesioned hemisphere lead to
the inability to respond to body stimulation and neglect of space contralateral to the lesion site. These researchers considered failure to respond to sensory stimuli an attentional problem (hemi-inattention), whereas hemispatial neglect may be more a failure of directional intention.

Chedru (1976) studied UN through controlled studies of computer keyboard taps. He concluded that his results were compatible with the position of cortico-thalamic-limbic-reticular involvement.

The basic notion of Heilman's group is, for the most part, consistent with the position of Kinsbourne (1977). According to Kinsbourne, who has long proposed asymmetries in attention, UN is a symptom induced by imbalance in lateral orienting tendencies. Increased arousal of the nonlesioned hemisphere promotes imbalance. Thus, left-hemisphere activation through verbal input enhances the imbalance created by right-hemisphere lesions.

Levy (1977), on the basis of split-brain research results, also strongly concurred with the position that deficient arousal in one hemisphere relative to the other is the cause of hemi-inattention. It is the degree of this imbalance, rather than the amount of arousal potential of the lesioned hemisphere per se, that relates to UN.

Two studies by the authors also supported the view that UN is not primarily a perceptual deficit (Fox & Harlowe, 1984; Van Deusen & Harlowe, 1986).

On the basis of this interpretation of UN, the following hypotheses were derived to further test the construct validity of the St. Marys CVA Evaluation:

1. If the Bilateral Awareness Scale of the St. Marys CVA Evaluation evaluates UN, scores on this scale will be significantly related to scores on the Schenkenberg Line Bisection Test.
2. If UN is essentially an attentional deficit, there will be no significant relationship between performance on the Schenkenberg test and the bilateral awareness scale on the St. Marys CVA Evaluation.

The purpose of this study was to test these hypotheses and thereby examine the bilateral awareness component of Factor III from the original analysis of the St. Marys CVA Evaluation.

Methods

Subjects

All 26 subjects had had a cerebral vascular accident (CVA) with right-hemisphere brain lesions. Although many researchers (e.g., Kinsella & Ford, 1980, and Schenkenberg et al., 1980), have linked severe UN with right-hemisphere damage, this body of research does not typically deal with specific brain localization, hence no attempt was made in the present study to define lesion sites more specifically.

Most of the subjects were in the acute stage of stroke, the median days since onset being 3. However, range of time since CVA onset was from 1 to 108 days. All but one subject had the CVA within 19 days of test administration.

All subjects had received physicians' referrals to occupational therapy, and three occupational therapists administered the St. Marys CVA Evaluation according to routine clinical procedures. The St. Marys perceptual tests and Bilateral Awareness Scale are included in this battery. Although it was not possible to collect interrater reliability data on these specific tests, the occupational therapists involved demonstrated consistency in their clinical evaluations in a previous study (Van Deusen & Harlowe, in press). Therapists also administered, but did not score, the Schenkenberg test, and were not aware of individual results or the study design.

Instrumentation

The St. Marys Bilateral Awareness Scale provides therapists with a format for noting clinical observations on the presence or absence of unilateral neglect. The patient's awareness or neglect of the impaired side is assessed during performance of self-care tasks and other tests in the battery. For example, the test for body scheme includes construction of a number of body puzzles. Puzzle pieces are scattered randomly on a tabletop across the patient's full field of vision. Unilateral neglect is suspected if a patient with an intact visual field does not attend to some or all pieces on the left. This observation may be corroborated by the patient's performance on the draw-a-person or left-right discrimination tests. For the purposes of the present study, subjects showing no unilateral neglect scored 3, mildly impaired subjects scored 2, and impaired subjects scored 1.

Perceptual measures from the St. Marys CVA Evaluation included in the present study were body scheme (described above), figure-ground, position in space, and spatial relations. These measures have been described elsewhere (Harlowe & Van Deusen, 1984). Perceptual items for figure-ground and position in space were derived from the children's tests of Ayres (1972) and Frostig (1966). Spatial relations items (1 practice item and 11 test items) were developed by the St. Marys Occupational Therapy Department using spatial relations picture cards purchased from Developmental Learning Materials. Each card pictures an object in relation to another, and the subject must orally identify the relationship. Stereognosis test results were not included because manual identification impairments could not be distinguished from sensory deficits for purposes of this research. The St. Marys therapists rated perceptual performance as intact or impaired, and subjects received 1 point.
for each intact perceptual function. The maximum possible score was therefore 4.

On the Schenkenberg test, the subject is told, by standard directions, to mark the exact center of each of 18 horizontal lines, 6 of which are placed to the left, 6 to the center, and 6 to the right on the paper. There are 2 practice lines. Any skipped lines are pointed out to the subject. Only the 6 left-placed lines were scored for this study, because they discriminate validly for left-side neglect. Standard scores are presented in terms of the subject's deviations from the true midpoints of the lines, and the 6 scores are averaged for each subject. A research assistant trained by the principal investigator scored all tests. Details of administration, scoring, and method of obtaining mean deviation scores have been reported (Schenkenberg et al., 1980; Van Deusen, 1983; Van Deusen & Harlowe, 1986).

Analyses

Spearman rank correlation coefficients were calculated between the St. Marys bilateral awareness ratings and Schenkenberg test scores \((n = 26)\), between the St. Marys bilateral awareness ratings and perceptual scores \((n = 24)\), and between the Schenkenberg test scores and St. Marys perceptual scores \((n = 24)\).

Results

As anticipated on a test of unilateral neglect administered only to right-hemisphere brain-damaged subjects, data were skewed. On the Schenkenberg test, mean deviation scores for the six left-placed lines ranged from -48.36 to 85.88 with a median of 12.25. Eleven subjects each scored 1 or 3 on the St. Marys Bilateral Awareness Scale, and four subjects scored 2. Perceptual scores ranged from 0 to 4 with a median of 3.

The Spearman rho coefficient for the correlation between bilateral awareness ratings and Schenkenberg test scores was \(r = .59, p < .01\). The coefficient for the association between Schenkenberg test scores and perceptual scores was \(r = .37\), which was not significant, \(p > .05\). The coefficient for the relationship between St. Marys bilateral awareness ratings and perceptual scores was \(r = .59, p < .01\).

Discussion

The lack of a statistically significant relationship between scores on the Schenkenberg tests of unilateral neglect and the St. Marys perceptual measures appears to support the point of view that unilateral neglect is essentially a nonperceptual phenomenon.

Also as hypothesized, there was a significant relationship between the Schenkenberg test scores and the St. Marys bilateral awareness ratings. Because the correlation coefficient is of moderate size, this finding could offer support for the validity of the St. Marys evaluation for identifying unilateral neglect. However, this interpretation is clouded by the unexpected significant relationship between bilateral awareness ratings and perceptual scores, when, consistent with theory, the more rigorous Schenkenberg test did not correlate with perceptual scores.

Bilateral awareness is assessed by observation of performance during other test procedures and during functional activities, and it does seem reasonable that it would be difficult to separate perceptual deficits and unilateral neglect under these circumstances. However, the St. Marys Bilateral Awareness Scale could be useful to assess unilateral neglect in CVA patients with no apparent perceptual deficits.

Although replication of this study with a larger number of subjects would be desirable, the limited data suggest that adding the Schenkenberg test or substituting it for the Bilateral Awareness Scale would enhance the St. Marys CVA Evaluation. The implication from the present data is that clinical observations of CVA patients are not so valid as formal testing results when it is desirable to separate unilateral neglect from perceptual dysfunction. In settings where CVA patients are referred to occupational therapy for only a few days, the only practical evaluations may be those that do not discriminate between perceptual and attentional deficits. But when occupational therapy is of at least moderate duration, it would be feasible to discriminate between perceptual and attentional dysfunction to enhance treatment planning.

Acknowledgments

We thank Becky Black, Mary PaJahokke-Hansen, and Nancy Walker, occupational therapists at St. Marys Hospital Medical Center, Madison, Wisconsin, for the collection of data, and Tanya Rodgers, a student at the University of Florida, Gainesville, for research assistance.

References


