Validating the Draw-A-Man Test as a Personal Neglect Test

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Key Words: activities of daily living • cerebrovascular disorders

Objectives. The purpose of this study was to determine the reliability and validity of a Draw-A-Man Test in measuring personal neglect in patients with right brain stroke.

Method. Draw-A-Man Test was administered to 51 persons with right cerebrovascular accident (CVA) and 110 age-matched persons without brain insult. A categorical classification was developed based on the man drawn in the test. Participants who showed homogeneous bilateral representation of body parts were considered to not have personal neglect, whereas those who showed unilateral body parts were considered to have personal neglect. The completed tests were used to blindly categorize the persons with and without personal neglect according to the above definition by two raters for calculating interrater reliability. The Klein-Bell ADL (Activities of Daily Living) Scale was also administered to the participants with right CVA to validate the Draw-A-Man Test.

Results. This dichotomy—bilateral representation versus unilateral representation—showed a high percentage of agreement between two raters. Rater A classified all 110 “normal” participants as being without personal neglect and classified 13 of the 51 participants with stroke as having personal neglect. Participants demonstrating personal neglect showed significantly poorer ADL performance than did those without personal neglect. ADL performance was also found to be significantly related to somatosensation, motor status of the impaired limbs, and muscle strength of the sound limbs. However, even after controlling the effect of these variables by partial correlation, personal neglect was still highly related to ADL performance.

Conclusion. The Draw-A-Man Test is a reliable and valid tool for discriminating clients with personal neglect from those without.


Personal neglect—which is also referred to as hemisomatognosia (Heilman, Watson, & Valenstein, 1985), asomatognosia (Feinberg, Haber, & Leeds, 1990), or unilateral asomatognosia (Hecaen & Albert, 1986)—is a disorder of body schema. It occurs more frequently in persons with right cerebrovascular accident (CVA) than in persons with left CVA (Hecaen & Albert, 1986). Studies on neuroanatomic substrates revealed that persons with personal neglect and extrapersonal neglect had more anterior lesions involving more of the supramarginal gyrus of the brain. Those with extrapersonal neglect and without personal neglect had lesions primarily in the inferior parietal region, suggesting that lesions of the right supramarginal gyrus produced personal neglect (Feinberg...
Persons with severe personal neglect may be unaware of the left side of their body (hemiasomatognosia), may deny left side disabilities (anosognosia), or may be unable to recognize that their paralyzed left extremities belong to them. Alloesthesia is also a frequent feature of personal neglect. This phenomenon, which refers to displacement of sensation, occurs when a stimulus applied to one side of the body is felt on the other side of body, usually in a homologous region (Frederiks, 1985; Hecaen & Albert, 1986; Hier, Mondlock, & Caplan, 1983; McGlynn & Schacter, 1989). Persons with mild personal neglect may be conscious of their impaired left extremities but still may refer to them as objects and may rarely use them even if they are not motor impaired (Guariglia & Antonucci, 1992; Heilman et al., 1985; Lezak, 1995). In functional terms, individuals with personal neglect may have problems in activities of daily living (ADL) performance. They may fail to comb their hair on the left side or to shave the left cheek (Arnadottir, 1990, Guariglia & Antonucci, 1992; Van Deuen, 1993).

The Draw-A-Man Test (Goodenough, 1926) has been widely used by clinical psychologists to measure intellectual maturation in children (Franzen, 1989; Frederiksen, 1986; Harris, 1963; Scott, 1981); to elicit personality type and unconscious material (Buck, 1948; Lubin, Wallis, & Paine, 1971; Machover, 1948; Piotrowski & Keller, 1989); and as part of neuropsychologic test batteries (Andrews, Brocklehurst, Richards, & Laycock, 1980; Cohn, 1953; Colombo, De Renzi, & Faglioni, 1976; Gasparrini, Shealy, & Walters, 1980; Reznikoff & Tombre, 1956; Riklan, Zahn, & Diller, 1962; Schulman, Kaspar, & Throne, 1965; Ska & Nespoulous, 1987). However, in the literature, the Draw-A-Man test has rarely been used with right CVA patients to determine personal neglect. The purpose of this study was to examine the usefulness of this test in identifying personal neglect.

The Draw-A-Man Test can be used to measure somatognosia (Zoltan, Siev, & Freishtat, 1986). Using a blank piece of paper and a pencil, the person is asked to draw an entire man in a sitting position. The rendering is scored by giving one point to the presentation of each of the following body parts—head, trunk, right arm, left arm, right hand, left hand, right leg, left leg, right foot, and left foot—for a total score of 10 (see Figure 1).

When the Draw-A-Man Test was administered to 19 persons with stroke in a pilot study, the test showed significant test–retest reliability ($r = .50$, $p = .0286$), and inter-rater reliability ($r = .96$, $p = .0001$) (Chen-Sea, 1995a). When the test was administered to a larger group—51 persons with right CVA and 110 age-matched persons without brain insult—no significant difference was found between the two groups ($t = –.2817$, $p = .7786$) (Chen-Sea, 1995b) indicating that the scoring system was not valid for measuring personal neglect. The scoring system did not indicate where the points were taken off. For example, a score of 6 may have resulted from not drawing hands and feet, which could have been drawn by a “normal” person (see Figure 2); or because parts of the arm, hand, leg, and foot of the left side were missing, which is a sign of personal neglect (see Figures 3 and 4). The inability of the scoring system to discriminate between persons with or without personal neglect indicated the need to develop a more sensitive scoring system.

According to Frederiks (1963), free drawings tend to elicit evidence of inattention more readily than does copying from a model. The Draw-A-Man Test is a kind of free drawing, and this could easily elicit the mental representation of a perceived body schema. I hypothesized that persons with intact body schema would draw a man with homogeneous bilateral body parts and that persons with personal neglect, inattention to, or unawareness of body parts contralateral to the brain lesion would draw a man with homogeneous unilateral body parts. Furthermore, given the association between personal neglect and poor functional performance of ADL, I hypothesized that the type of man drawn could reflect the level of functional performance and that persons with personal neglect would be
less independent in ADL performance than those without personal neglect. Therefore, the purposes of the current study were to develop a scoring method for the Draw-A-Man Test that would

1. test the interrater reliability of the method;
2. differentiate persons with personal neglect from those without; and
3. validate its functional significance.

Method

Participants

Persons with right CVA who met the following criteria were recruited for the study from seven different hospitals in Taiwan: (a) post onset 2 to 6 months, (b) participated in a rehabilitation program (to exclude cases with poor physical strength resulting from being bed ridden), (c) independent in self-care activities before stroke, (d) vision corrected, if indicated, (e) able to follow verbal directions, (f) adjusted to medication, and (g) right hand dominant. Fifty-one persons completed consent forms, of which 38 (75%) were men. Mean age was 59.41 ± 8.66 years. The mean duration post onset was 109.31 ± 62.26 days. Twenty-five participants had had hemorrhage CVAs, and 26 had had infarction. All the lesions were verified by computed tomography.

Normal participants without CVA and brain insult were recruited from hospital employees, patients’ families and friends, and community recreation service centers. Inclusion criteria were right-handed and no history of neurological or psychiatric problems. Of the 110 participants recruited, 77 (70%) were men. Mean age was 56.79 ± 10.98 years.

Instrumentation

Draw-A-Man Test

Draw-A-Man Test (Zoltan, Siev, & Freishtat, 1986) was used to categorize participants as being with or without personal neglect. Participants were given both a blank piece of paper entitled “Draw an Entire Man” and a pencil, and were asked to draw an entire man.

Participants whose drawings showed only homogenous unilateral body parts were categorized as with personal neglect. Participants whose drawings showed homogenous bilateral body parts were categorized as without personal neglect. To establish interrater reliability, the tests were categorized separately by two raters, first by rater A, then by rater B, who was “blind” to the ratings of rater A.

The Klein-Bell ADL Scale

The Klein-Bell ADL Scale (Klein & Bell, 1979) was used to test performance in basic self-care. The six ADL areas represented on the test are dressing, elimination, mobility, bathing and hygiene, eating, and emergency telephone communication. The test yields 6 raw scores, one for each ADL area, and a total score that is the sum of the 6 raw scores. The scores range from 0–103 for dressing, 0–46 for elimination, 0–68 for mobility, 0–56 for bathing, 0–30 for eating, and 0–10 for emergency telephone communication. The scale provides no partial scores. The test has a high interrater reliability (92% agreement) for all items, good validity (correlated with Barthel Index, $r = 0.83$, $p < 0.01$), and sensitivity to small changes in function.

Physical Status Measures

Motor status assessment. Motor status was evaluated by Brunnstrom’s motor status assessment (Brunnstrom, 1970). There are six stages in sequence. The higher the stage, the better the motor status retained or recovered. The score is the stage of motor status and ranges from 1 to 6 for each of three body parts—proximal part of upper extremi-

Figure 3. Drawings made by normal subjects. Drawing at left is by a woman, 62 years of age, 6 years of education. Drawing at right is by a woman, 52 years of age, 16 years of education.

Figure 4. Drawings made by clients with right-brain stroke. Drawing at left is by a client, 62 years of age, with 9 years of education, post onset 60 days. Drawing at right is by a female, 65 years of age, with 6 years of education, post onset 175 days.
Eleven physical status variables were evaluated: four muscle strength variables, four sensory variables (touch and position sense of upper and lower extremity), three motor variables (motor status of upper extremity, of hand, and of lower extremity), and four muscle strength variables (grip power elbow extended, grip power elbow flexed, muscle power of upper extremity, and muscle power of lower extremity). A principal components analysis was performed to reduce these 11 variables to composite variables. To determine the number of factors to extract, an unrotated principal-components analysis was conducted. It demonstrated that three factors had eigenvalues of greater than one. Therefore, a varimax rotation analysis was performed retaining the following three factors in the solution: factor 1 included all somatosensory variables, factor 2 included all motor variables, and factor 3 included all muscle strength variables. These three factors explained 85.43% of total variation (Table 1).

Results

Interrater Reliabilities of the Draw-A-Man Test

The scoring system of this study has a high interrater reliability. Agreement between the two raters was 95.45% (105/110) for the participants without brain insult and 100% for the participants with CVA.

The five drawings produced by the “normal” group that elicited lack of complete agreement were of men in right or left profile. Of 51 participants in the group with CVA, 38 were identified as without personal neglect and 13 as with personal neglect, according to the drawings they produced. In other words, the Draw-A-Man Test could discriminate CVA participants with personal neglect from those without personal neglect.

The mean and standard deviation of age, education, and duration post onset for the two groups is shown in Table 2. The results of a t test showed no significant difference between the groups. The proportion of males was 61.54% (N = 8) for the group with personal neglect, 78.95% (N = 30) for the group without personal neglect. A Pearson chi-square test showed no significant difference in gender distribution between the group with personal neglect and the group without personal neglect (X2 [2, N = 51] = 1.55, p = .214). The group with personal neglect was significantly worse than the group without personal neglect.

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in somatosensory, motor, and muscle strength (see Table 3).

### Functional Significance With Personal Neglect

**Between-group analysis on ADL performance.** To examine the hypotheses that participants with personal neglect would have less independence in self-care activities than those without personal neglect, the total ADL scores and six Klein-Bell subscores were analyzed via $t$-tests. The $t$ values are summarized in Table 4. The group with personal neglect showed lower scores than the group without personal neglect in five areas of ADL.

**Analysis of physical status variables on ADL performance.** As shown in Table 5, both the presence or absence of personal neglect and the somatosensory, motor, and muscle strength composite scores show a strong association with ADL performance, suggesting that the relationship between personal neglect and ADL performance was confounded by the three variables of somatosensory, motor, and muscle strength. When a multiple regression (see Table 6) was run to calculate a partial correlation between personal neglect and ADL performance—partialling out the effects of the somatosensory, motor, and muscle strength composites—the resulting $r$ was $-0.50$. According to Cohen (1977), this is a large effect size. Thus, the association of personal neglect and ADL performance, even after controlling for the composite physical status variables, is large and negative as hypothesized.

### Discussion

The finding of perfect interrater reliability on the Draw-A-Man Test for the group with CVA suggests that the test easily differentiates a homogeneous bilateral from an homogeneous unilateral body presentation on a drawn man.

That rater A rated all participants in the group without brain insult as having an intact body schema (homogeneous bilateral presentation) indicates that the Draw-A-Man Test can discriminate participants with personal neglect from those without neglect in terms of a drawn man rather than in terms of the test's quantitative 10-point

### Table 3
**Mean and Standard Deviation of Sensory, Motor, and Muscle Strength**

<table>
<thead>
<tr>
<th>Variables</th>
<th>With Neglect (n = 13)</th>
<th>Without Neglect (n = 38)</th>
<th>$t$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensory $M$</td>
<td>10.54</td>
<td>5.95</td>
<td>4.90***</td>
</tr>
<tr>
<td>Sensory $SD$</td>
<td>2.47</td>
<td>3.04</td>
<td></td>
</tr>
<tr>
<td>Sensory Range</td>
<td>4–12</td>
<td>4–12</td>
<td></td>
</tr>
<tr>
<td>Motor $M$</td>
<td>8.00</td>
<td>12.08</td>
<td>3.03**</td>
</tr>
<tr>
<td>Motor $SD$</td>
<td>3.00</td>
<td>4.52</td>
<td></td>
</tr>
<tr>
<td>Motor Range</td>
<td>3–13</td>
<td>5–18</td>
<td></td>
</tr>
<tr>
<td>Muscle Strength $M$</td>
<td>47.75</td>
<td>64.67</td>
<td>3.17***</td>
</tr>
<tr>
<td>Muscle Strength $SD$</td>
<td>12.43</td>
<td>22.68</td>
<td></td>
</tr>
<tr>
<td>Muscle Strength Range</td>
<td>32–72</td>
<td>16–108</td>
<td></td>
</tr>
</tbody>
</table>

$^aN = 12$ in neglect group; $N = 33$ in group without neglect.

$^{**}p = or < .0059.$

$^{***}p = or < .0001.$

### Table 4
**Activities of Daily Living Performance in Klein-Bell Scores**

<table>
<thead>
<tr>
<th>Items</th>
<th>With Personal Neglect (n = 13)</th>
<th>Without Personal Neglect (n = 38)</th>
<th>$t$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dressing (0–103)</td>
<td>58.15</td>
<td>93.21</td>
<td>5.21***</td>
</tr>
<tr>
<td>$M$</td>
<td></td>
<td>23.12</td>
<td></td>
</tr>
<tr>
<td>$SD$</td>
<td>20–103</td>
<td>12–45</td>
<td></td>
</tr>
<tr>
<td>Elimination (0–46)</td>
<td>25.38</td>
<td>40.03</td>
<td>4.35***</td>
</tr>
<tr>
<td>$M$</td>
<td></td>
<td>13.13</td>
<td></td>
</tr>
<tr>
<td>$SD$</td>
<td>8–46</td>
<td>16–46</td>
<td></td>
</tr>
<tr>
<td>Mobility (0–68)</td>
<td>19.54</td>
<td>52.32</td>
<td>5.48***</td>
</tr>
<tr>
<td>$M$</td>
<td></td>
<td>18.47</td>
<td></td>
</tr>
<tr>
<td>$SD$</td>
<td>0–56</td>
<td>12–68</td>
<td></td>
</tr>
<tr>
<td>Bathing (0–56)</td>
<td>37.62</td>
<td>49.00</td>
<td>5.25***</td>
</tr>
<tr>
<td>$M$</td>
<td></td>
<td>8.88</td>
<td></td>
</tr>
<tr>
<td>$SD$</td>
<td>21–56</td>
<td>39–56</td>
<td></td>
</tr>
<tr>
<td>Eating (0–30)</td>
<td>28.77</td>
<td>29.34</td>
<td>0.75</td>
</tr>
<tr>
<td>$M$</td>
<td></td>
<td>2.52</td>
<td></td>
</tr>
<tr>
<td>$SD$</td>
<td>22–30</td>
<td>2.31</td>
<td></td>
</tr>
<tr>
<td>Communication (0–10)</td>
<td>9.00</td>
<td>9.95</td>
<td>2.39**</td>
</tr>
<tr>
<td>$M$</td>
<td></td>
<td>1.41</td>
<td></td>
</tr>
<tr>
<td>$SD$</td>
<td>6–10</td>
<td>0.32</td>
<td></td>
</tr>
<tr>
<td>Total (0–313)</td>
<td>178.46</td>
<td>271.21</td>
<td>5.93***</td>
</tr>
<tr>
<td>$M$</td>
<td></td>
<td>59.95</td>
<td></td>
</tr>
<tr>
<td>$SD$</td>
<td>97–298</td>
<td>44.45</td>
<td></td>
</tr>
</tbody>
</table>

$^{***}p = or < .0001.$

$^{**}p = or < .05.$

### Table 5
**The Correlation of Total Activities of Daily Living (TADL) Scores**

<table>
<thead>
<tr>
<th>TADL</th>
<th>Sensory</th>
<th>Motor</th>
<th>Muscle</th>
<th>Subgroup</th>
</tr>
</thead>
<tbody>
<tr>
<td>TADL</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Sensory</td>
<td>$-0.61^{***}$</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Motor</td>
<td>$0.60^{***}$</td>
<td>$-0.57^{***}$</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Muscle</td>
<td>$0.53^{***}$</td>
<td>$-0.46^{**}$</td>
<td>0.31*</td>
<td>—</td>
</tr>
<tr>
<td>Subgroup</td>
<td>$-0.65^{***}$</td>
<td>$0.57^{***}$</td>
<td>$-0.40^{***}$</td>
<td>$-0.35^{*}$</td>
</tr>
</tbody>
</table>

$^{***}p = or < .0002.$

$^{**}p = or < .005.$

$^{*}p = or < .05.$

### Table 6
**Total Activities of Daily Living Regression on Physical Variables and Subgroups for the Calculation of a Partial Correlation**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>$df$</th>
<th>Estimate</th>
<th>SE</th>
<th>$t$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>1</td>
<td>87.52</td>
<td>39.57</td>
<td>4.74</td>
<td>0.0001</td>
</tr>
<tr>
<td>Subgroup</td>
<td>1</td>
<td>$-55.16$</td>
<td>14.99</td>
<td>$-3.68$</td>
<td>0.0007</td>
</tr>
<tr>
<td>Sensory</td>
<td>1</td>
<td>0.34</td>
<td>2.20</td>
<td>0.16</td>
<td>0.8767</td>
</tr>
<tr>
<td>Motor</td>
<td>1</td>
<td>6.99</td>
<td>1.51</td>
<td>4.63</td>
<td>0.0001</td>
</tr>
<tr>
<td>Muscle strength</td>
<td>1</td>
<td>0.80</td>
<td>0.29</td>
<td>2.75</td>
<td>0.0090</td>
</tr>
</tbody>
</table>

Note: The formula for the partial correlation calculated from the regression is:

$$r_{pa} = \sqrt{1 - \frac{r^2}{1 + df \cdot \text{error}}}$$

$Pr = \text{partial correlation}; pn = \text{personal neglect}$. Where $t$ is the test of the significance of the slope of personal neglect and $df$ error is 40 in this model.
score. Thus, the questionnaire’s measure (a drawn man) should be used in determining personal neglect.

Functional Significance with Personal Neglect

Personal neglect and extrapersonal neglect have been reported as different entities. The two syndromes are highly associated, and yet they also can be dissociated (Bisiach, Perani, Vallar, & Berti, 1986; Guariglia & Antonucci, 1992; Pizzamiglio et al., 1989; Vallar, Sterzi, Bottini, Cappa, & Rusconi, 1990). The impact of extrapersonal neglect (visual spatial neglect) on ADL performance has been studied empirically (Anderson, 1971; Arnadottir, 1990; Chen-Sea, Henderson, & Cermak, 1993; Denes, Semenza, Stoppa, & Lis, 1982; Friedman, 1990, 1992; Fullerton, McSherry, & Stout, 1986; Guariglia & Antonucci, 1992; Kinsella, & Ford, 1985; Kotila, Niemi, & Laaksonen, 1986; Marsh & Kersel, 1993). However, the effect of personal neglect on ADL performance has been described only anecdotally. The findings of the current empirical study support the anecdotal descriptions.

The most difficult ADL areas on the Klein-Bell ADL Scale for participants with personal neglect were dressing, elimination, mobility, and bathing. The most difficult task for dressing performance was in dressing the left body parts; for elimination, the difficult tasks were achieving a urinating (defecating) position, pulling pants up to the waist, and resuming the ambulation position; for mobility, ambulation and getting in and out of car were difficult; and for bathing, assuming the bathing position and lathering and drying the back of the body from head to knee and knee to feet were difficult tasks. All these activities can be performed only with awareness of left body parts and adequate dynamic balance in changing position and mobility. Ayres (1985) described body schema as a postural model, on which movements are based. Individuals with personal neglect, because of hemisomatognosia, may be unaware of or deny body parts on the left side, which may cause deficits in movements required for keeping balance. As seen in this study, 12 of the 13 participants with personal neglect were nonambulatory. Only one person could ambulate with an ankle–foot orthosis and quad cane. Some of these participants could not concentrate on functional activities, such as dressing, without losing their balance. Although the behaviors of the individuals with personal neglect were not a study focus, all participants with personal neglect were observed on several occasions to be inactive to the left side of their bodies—two could not find their affected limbs, or stated that someone’s limbs were in bed with him or her. Participants with neglect also were observed to have difficulty carrying movements toward the neglected side. One appeared to have alloesthesia during the touch sensation test. All of these behaviors could interfere with ADL performance. The result could vary from being unable to do an activity to doing it with poor quality on the neglect side. For example, one participant neglected to put on the left sleeve or did not properly adjust it when it was on. The same observation also applied to combing, shaving, and other bilateral activities. Not all participants with personal neglect had poor ADL performance. A few developed compensatory strategies for the deficit of personal neglect.

The finding of this study lead to the conclusion that the Draw-A-Man Test can be a reliable and valid tool for measuring personal neglect. Point to Body Parts on Command, Body Visualization, Ayres’s Right–Left Discrimination, Finger Agnosia, Semistructured Functional Evaluation Scale, and many other tests have been used to assess body schema (Ayres, 1985; Bisiach et al., 1986; Feinberg et al., 1990; Guariglia & Antonucci, 1992; Zoltan et al., 1986; Zoccolotti & Judica, 1991). One of these should be used to determine the level of test sensitivity and validity in order to better identify the degree of personal neglect. Because personal neglect can be dissociated and yet is highly associated with extrapersonal neglect, the differential effect of extrapersonal neglect should be considered in conjunction with personal neglect on ADL performance in future studies.

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References


