NOTE

IMPROVING THE CLINICAL DIAGNOSIS OF PERSONAL NEGLECT: A REFORMULATED COMB AND RAZOR TEST

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ABSTRACT

Beschin and Robertson (1997) devised a simple clinical test of left personal neglect, which characterises personal grooming behaviour according to the proportion of the total activity that is directed to the left side of the body. Although this test proved highly reliable, and more sensitive than prior diagnostic techniques, its formulation may yet be improved. The present paper reports a reanalysis of Beschin and Robertson’s (1997) data, using additional control subjects, and a formula which characterises personal neglect as a lateral bias of behaviour rather than as a lateralised deficit. It is shown that this formula greatly enhances the test’s sensitivity to the behavioural abnormalities of brain damaged patients, and it is recommended that this modification be adopted for the future diagnosis of personal neglect.

Key words: personal neglect, visual neglect, diagnosis, dissociation

INTRODUCTION

Personal neglect refers to a lack of exploration of the side of the body contralateral to a brain lesion. Clinically, it may be observed as a reluctance or inability to locate contralesional body parts (Bisiach, Perani, Vallar et al., 1986) or to attend to them in daily activities. For instance, Zoccolotti and Judica (1991) used observer ratings of patients’ personal grooming to assess personal neglect. This method, however, was somewhat subjective and offered only a coarse estimate of severity.

Beschin and Robertson (1997) modified Zoccolotti and Judica’s (1991) procedure to provide a more differentiated quantitative index of personal neglect. In their “comb and razor” test, each subject was asked to comb his or her hair and, during a thirty-second period, an observer categorised each stroke according to whether it was applied to the left or the right side of the head, or was ambiguous; similar records were taken for simulated shaving (men) or facial compact use (women). For each subject, a “left over total” percent score was calculated for each of the activities performed, according to the formula:

\[
\%\text{left} = \frac{\text{left strokes}}{\text{left strokes} + \text{ambiguous strokes} + \text{right strokes}}
\]

The test was administered to 61 subjects including right brain damaged patients with and without extrapersonal neglect, left brain damaged patients and controls (Beschin and Robertson, 1997). Left personal neglect was diagnosed, in individual patients, by a mean %left score below the lowest score of any control (0.35). By this criterion, 59% of right brain damaged patients with extrapersonal neglect, and 36% of those with no extrapersonal neglect, were diagnosed with personal neglect. Given that the highest incidence of personal
neglect previously estimated for extrapersonal neglect patients was around 25% (Zoccolotti and Judica, 1991), it was concluded that the comb and razor test was more sensitive than prior diagnostic techniques. Additionally, it proved highly reliable across assessments.

Whilst the comb and razor test has obvious merits, the optimality of the %left formula may be questioned on theoretical and on practical grounds. The formula anticipates left neglect as a left-sided deficit of behaviour, rather than as a rightward bias (cf. Kinsbourne, 1993). Moreover, it counts ambiguous strokes as being actively “not left”, combining them with right-sided strokes in the denominator, and depressing the score of any subject producing them. Consequently, control subjects who make many ambiguous strokes may receive lower %left scores than patients with a stronger lateral bias but fewer ambiguous strokes. Such patients will fall within the normal range of performance and their lateral bias may go undetected. Conversely, a patient performing with normal symmetry, but producing a high proportion of ambiguous strokes, could be classified as having left personal neglect.

The %left formula, then, makes the proportion of ambiguous strokes a prime determinant of the differential diagnosis of personal neglect; but perhaps ambiguous strokes should not be granted such weight when the significance of variation on this measure is unclear. It is unrelated to neglect (as this paper will show) and is more likely to reflect the decision criteria of the observer, or even the sex of the subject (since elderly men may have little “ambiguous” hair to comb). One relevant aspect of performance which ambiguous strokes do inform, however, is the total activity level of the individual, and any lateral bias must be characterised with respect to this. We now suggest an alternative formula, which indexes the magnitude and direction of lateral bias as a proportion of the total activity:

\[
%\text{bias} = \frac{\text{left} - \text{right strokes}}{\text{left} + \text{ambiguous} + \text{right strokes}}
\]

The %bias formula yields a score between -1 (total left neglect) and +1 (total right neglect), with symmetrical performance at 0. Its rationale is that personal neglect should manifest as a lateral bias of behaviour, but it makes no further assumptions about the direction of bias. To assess the utility of this approach we have reanalysed Beschin and Robertson’s (1997) data and compared the findings made using the %left and %bias formulae. In order to ensure reliability of the estimated cut-offs for pathological performance, the original control sample (n = 17) has been expanded (n = 44).

**Materials and Methods**

Eighty-eight subjects took part in this study: 17 were right brain damaged CVA patients with extrapersonal neglect (RBDN+), 14 were right brain damaged CVA patients without extrapersonal neglect (RBDN–), 13 were left brain damaged CVA patients (LBD) and 44 were age-matched controls. Demographic and clinical details for these groups are shown in Table I. Forty patients were re-tested: 15 RBDN +, 13 RBDN – and 12 LBD.

Extrapersonal neglect was diagnosed if patients showed neglect impairment on any of six standardised tests, and the comb and razor test was conducted as described in the Introduction. Full procedural details are given by Beschin and Robertson (1997).

**Table I**

<table>
<thead>
<tr>
<th>Group</th>
<th>Number Male/Female</th>
<th>Age Mean (SD)</th>
<th>Months post-stroke</th>
<th>FIM Self-care Mean (SD)</th>
<th>Mean left omissions on BIT star cancellation Mean (SD)</th>
<th>Mean left omissions on Albert’s test Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBDN +</td>
<td>11/6</td>
<td>65.1 (10.9)</td>
<td>3.1 (1.7)</td>
<td>46.3 (12.8)</td>
<td>12.4 (10.6)</td>
<td>6.9 (9.6)</td>
</tr>
<tr>
<td>RBDN –</td>
<td>11/3</td>
<td>64.4 (9.8)</td>
<td>2.7 (1.4)</td>
<td>52.8 (6.8)</td>
<td>0.5 (0.9)</td>
<td>0</td>
</tr>
<tr>
<td>LBD</td>
<td>10/3</td>
<td>63.2 (16.4)</td>
<td>2.8 (1.5)</td>
<td>61.3 (3.3)</td>
<td>1.5 (2.1)</td>
<td>0</td>
</tr>
<tr>
<td>Control</td>
<td>23/21</td>
<td>66.2 (10.2)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>
RESULTS

For each subject, for both the comb and the razor/compact components, alternative scores were calculated according to the % left and % bias formulae (see Introduction). The correlations between scores on the comb and the razor/compact components were 0.63 and 0.70 for the % left and % bias indices respectively. These were sufficient to allow mean scores across the two components to be employed, for each index, in all further analyses. For both indices, the test-retest reliability for the 40 patients tested twice was very high at 0.94 (%left) and 0.95 (%bias).

The mean scores and standard deviations of each experimental group, for each index, are shown in Table II. An ANOVA by group performed upon the %left scores was highly significant \[F (3, 84) = 27.54; p < 0.0001\] and Fisher’s post-hoc exact tests found significant differences between all pairs of groups bar the LBD and control groups. An identical analysis of the %bias scores yielded equivalent findings \[F (3, 84) = 35.54; p < 0.0001\].

<table>
<thead>
<tr>
<th>Mean Score on Comb and Razor Test by Group, for Each Index of Personal Neglect</th>
<th>% left (SD)</th>
<th>% bias (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBDN+</td>
<td>0.25 (0.14)</td>
<td>– 0.36 (0.25)</td>
</tr>
<tr>
<td>RBDN-</td>
<td>0.37 (0.06)</td>
<td>– 0.14 (0.13)</td>
</tr>
<tr>
<td>LBD</td>
<td>0.46 (0.05)</td>
<td>0.00 (0.06)</td>
</tr>
<tr>
<td>CONTROL</td>
<td>0.43 (0.04)</td>
<td>– 0.01 (0.05)</td>
</tr>
</tbody>
</table>

At the group level, then, differences between the alternative indices were negligible. This is unsurprising since the formulae differ primarily in their treatment of ambiguous strokes, and an ANOVA by group of the proportion of ambiguous strokes was not significant \[F (3, 84) = 1.47; p > 0.1\]. However, individuals varied widely in the proportion of ambiguous strokes produced (range = 0-38%) and the use of alternative indices had a considerable impact at this level. For each index, the lowest control score was used to define the inferential cut-off for the diagnosis of left personal neglect, and the groupwise distributions of patients above and below these cut-offs are shown in Table III.

As Table III indicates, the double dissociation between personal and extrapersonal neglect reported by Beschin and Robertson (1997) was upheld using both indices. However, whilst 11 patients performed below cut-off on the % left index, 20 patients performed below the % bias cut-off. No case of left personal neglect was diagnosed by the former method that was not also identified by the latter. It should also be noted that, whilst the % left formula specifically targets left personal neglect, the %bias index is symmetrical about zero, and is equally sensitive to right neglect. In fact, two LBD patients produced % bias scores (0.08, 0.09) exceeding the highest control score (0.06), implying mild right personal neglect.

| Number of Patients below and above Cut-off for Left Personal Neglect (LPN), for Each Index |
|-----------------------------------------------|------------------|------------------|-----------------|-----------------|
| % left < 0.30 LPN + | % left > 0.30 LPN – | % bias < – 0.11 LPN + | % bias > – 0.11 LPN – |
| RBDN+ | 9 | 8 | 14 | 3 |
| RBDN– | 2 | 12 | 6 | 8 |
| LBD | 0 | 13 | 0 | 13 |

DISCUSSION

The application of an alternative index to the data of Beschin and Robertson (1997) did not distort their overall findings. The comb and razor test remained highly reliable and
clearly separated the RBDN+ group from the RBDN– group, and both of these groups from LBD patients and controls. A double dissociation between personal and extrapersonal symptoms was also replicated, concordant with earlier indications of a functional distinction between personal and extrapersonal space (Bisiach et al., 1986.; Guariglia and Antonucci, 1992; Zoccolotti and Judica, 1991). Thus, at the group level, the % left and % bias indices provided closely equivalent characterisations of performance.

At the individual level, however, the % bias index, by being robust to the confounding effects of ambiguous strokes, proved far more sensitive to the behavioural abnormalities of brain damaged patients. By this index, 82% of RBDN+, 43% of RBDN–, and 15% of LBD patients showed some degree of personal neglect. These figures further elevate the incidence estimates provided by Beschin and Robertson (1997) and thus strengthen their proposal that rehabilitative techniques targeting personal neglect (e.g. Robertson, North and Geggie, 1992) may be of wide clinical relevance.

In conclusion, it is recommended that the %bias index be used in conjunction with the comb and razor test of personal neglect. Not only does it increase the sensitivity of the test, but it is equally suited to the diagnosis of right and left neglect. Our final point concerns the precise formulation of the %bias index. The stated formula was chosen to maximise comparability with the %left index (Beschin and Robertson, 1997). However, it is inaptly named since it yields a decimal, not a percentage score. Moreover, in assigning a negative value to rightward bias, it runs counter to the convention prevailing for other tests of neglect (e.g. line bisection). Our preferred formula is:

$$\%\text{bias} = \frac{\text{right strokes} - \text{left strokes}}{\text{left + ambiguous + right strokes}} \times 100$$

Thus, rightward bias yields a positive, and leftward bias a negative percentage score.

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REFERENCES


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