Verbal Fluency: A NART-based equation for the estimation of premorbid performance

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A sample of 142 subjects free of neurological or psychiatric disorder were administered the National Adult Reading Test (NART) and a verbal fluency (VF) test. A highly significant correlation between the NART and VF was obtained indicating that premorbid ability should be taken into account when interpreting VF performance. A regression equation was built to estimate premorbid performance on VF from the NART. A highly significant difference between predicted and obtained VF was obtained in a sample of neurological patients *(N* = 38). For ease of use, a table converting NART errors to predicted VF scores is presented.

Verbal fluency tests are widely used in the assessment of cognitive impairment. A number of such tests have been developed but the most common version requires subjects to produce orally words beginning with designated letters (F, A and S) in a set time period (60 seconds per letter). The FAS test has been proven to be a useful indicator of cerebral dysfunction, particularly where there is involvement of the left frontal lobe (Lezak, 1983). It has also been widely recommended as a screening test for dementia (see Hart, Smith & Swash, 1988).

The present study was partly prompted by the absence of adequate UK normative data for verbal fluency (VF). However, rather than simply collect normative data, the aim was to build a regression equation to estimate an individual's *premorbid* or *expected* VF score from performance on the National Adult Reading Test (NART; Nelson, 1982). The NART has high construct validity as a measure of verbal intelligence and appears to be largely resistant to the effects of psychiatric and neurological disorder (see Crawford, 1989 for a review). Using the NART to obtain an *individualized* standard against which a client's current VF performance can be compared should be preferable to assessing performance by reference to the mean and SD of a normative group. The importance of taking premorbid ability into account is demonstrated by Miller's (1984) report that VF scores were highly correlated with verbal intelligence in a sample *(N* = 36) of healthy subjects. Furthermore, Borkowski, Benton & Spreen (1967) have reported that brain-damaged subjects of above-average IQ obtained higher VF scores than below-average control subjects.

After building the regression equation in a healthy sample, it was proposed to conduct a preliminary assessment of the validity of this approach by comparing predicted and obtained VF scores in a sample of neurological patients. It was hypothesized that NART predicted VF scores would be significantly higher than obtained VF scores.

A sample of 142 subjects (74 males, 68 females) free of neurological, psychiatric or sensory disorder, were administered the NART and VF test. Most received a small honorarium for their participation. Mean age was 41.3 (SD = 16.6), range 16—88 years. Mean years of education were 12.5 (SD = 3.3), range 7-20 years.

A sample of patients *(N* = 38; 29 males, 9 females) with verified neurological disorder were recruited from referrals to a clinical neuropsychology service. Mean age was 37.5 (SD = 13.5) and mean years of education was 11.9 (SD = 2.7). The majority had suffered either a closed head injury (N = 19) or a

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subarachnoid haemorrhage (15). The diagnosis in the remainder was of dementia Alzheimer type (2) and multiple sclerosis (2).

In the healthy sample, mean NART errors was 20.7 (SD = 10.8), range 0-45. Mean VF score was 41.7 (SD = 12.2), range 12-70. Despite the wide age range, age did not correlate significantly with VF score *(r = —.05)*. This is consistent with the results obtained by Miller (1984). Regression of VF scores on NART errors revealed a highly significant correlation between the two measures (r = .67, *p* < .001), thereby confirming that premorbid ability should be taken into account when interpreting VF performance. The regression equation and its standard error of estimate (SE_{est}) is presented below:

$$\text{Predicted VF} = 57.5 - (0.76 \times \text{NART errors}) \quad SE_{est} = 9.09.$$

For ease of use, Table 1 converts NART errors to predicted VF scores. In clinical practice, predicted VF should be compared with obtained VF to assess the likelihood of impairment. Examination of the discrepancies between predicted and obtained VF revealed that a discrepancy of more than 12 points in favour of *predicted* VF was exhibited by less than 10 per cent of the sample. A discrepancy of this size in a client would therefore be significant at the .1 level. A discrepancy of more than 15 points would be required for significance at the .05 level.

Table 1. Table for converting NART *errors* (N) to *predicted* verbal fluency score (VF)

N–VF	N–VF	N–VF	N–VF	N–VF	N–VF	N–VF	N–VF	N–VF
0–57	6–53	12–48	18–44	24–39	30–35	36–30	42–26	48–21
1–57	7–52	13–48	19–43	25–38	31–34	37–29	43–25	49–20
2–56	8–51	14–47	20–42	26–38	32–33	38–29	44–24	50–19
3–55	9–51	15–46	21–42	27–37	33–32	39–28	45–23	
4–54	10–50	16–45	22–41	28–36	34–32	40–27	46–23	
5–54	11–49	17–45	23–40	29–35	35–31	41–26	47–22	

Mean obtained VF score in the neurological sample was 25.5 (SD = 9.8) and mean predicted VF score was 40.6 (SD = 5.9). A repeated measures *t* test revealed a highly significant difference in favour of predicted VF (*t* = 9.57,*p* < .001). In summary, the present study indicates that premorbid ability should be taken into account when interpreting a client's VF performance and has presented an equation and conversion table for use in the individual case. The preliminary investigation of the equation's utility in detecting impairment in a neurological sample supported the rationale underlying its use in that a highly significant difference was observed in favour of NART estimated VF performance over current VF performance.

To our knowledge, despite the widespread use of the NART in clinical practice, this is the first study in which it has been used to provide an estimate of premorbid ability for anything other than the WAIS. In view of the importance of premorbid ability in test interpretation (Lezak, 1983), it is to be hoped that the results from the present study may encourage the development of NART equations for use with other cognitive ability measures.

Finally, comparison of the present sample with the UK census indicated that it was reasonably representative of the adult UK population in terms of age, sex and social class distribution (although there was a slight over-representation of social class 1 subjects). Therefore, the data from the present sample can be used as conventional normative data for VF by UK clinicians who do not use the NART or for clients in whom administration of the NART would be inappropriate.

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