

**NINDS CDE Notice of Copyright
Written Verbal Fluency Test**

Availability:	Please email the authors for information about obtaining the instrument: s.abrahams@ed.ac.uk .
Classification:	Core for ALS. Supplemental for HD.
Short Description of Instrument:	<p>Summary/ Overview of Instrument: The test is an adaptation of the Thurstone's Word Fluency Test (Thurstone and Thurstone, 1962) which together with other spoken word fluency tests has been shown to be sensitive to frontal lobe lesions. This test was adapted to control for motor speed for use with patients with upper limb disability with the incorporation of a copy condition. The test has been shown to be independent of physical disability.</p> <p>The participant is required to verbally generate items from a given semantic category. The most frequently used category is animals; however, other categories used include: fruits and vegetables, items of clothing, things found in a supermarket.</p> <p>Construct measured: Generation, executive function, semantic knowledge.</p> <p>Generic vs. disease specific: Generic.</p> <p>Intended use of instrument/ purpose of tool (cross-sectional, longitudinal, diagnostic, etc): The category fluency task is a measure of fluency in verbal generation of semantic category members. It may be used as a longitudinal marker of disease severity in manifest/premanifest HD or as a cross-sectional measure of cognitive impairment across disease stages or between manifest/premanifest HD and healthy controls.</p> <p>Means of administration (paper and pencil, computerized): Verbal (responses recorded on paper verbatim for later scoring if needed).</p> <p>Location of administration (clinic, home, telephone, etc): Clinic.</p> <p>Intended respondent (patient, caregiver, etc.): Patient.</p> <p># of items: N/A.</p> <p># of subscales and names of sub-scales: N/A.</p>

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ALS Rationale:	<p>Strengths: The adaptation to control for motor speed was designed for patients with ALS. The test has also been shown to be sensitive to frontal lobe dysfunction in ALS through functional and structural MRI studies.</p> <p>Weaknesses: Requires further validation of properties and production of normative data. The full test is not suitable for patients with marked writing difficulties.</p> <p>Psychometric Properties:</p> <p>Feasibility: The test requires that the patient can write. Spoken versions of this test can be employed in patients with severe upper limb dysfunction.</p> <p>Reliability: Has not been assessed.</p> <p>Validity: The Written Verbal Fluency Index has been shown to be sensitive to frontal lobe dysfunction in ALS in functional imaging and structural imaging (Abrahams et al. 2004, 2005a.). The index has also be found to correlate with ocular fixation abnormalities in ALS (Donaghy et al. 2009).</p> <p>Sensitivity to Change: No change was reported over a 6 month period (Abrahams et al. 2005b).</p> <p>Relationships to other variables: This measure was shown not to correlate with measures of emotional lability (Palmieri et al. 2009) or measures of disease duration or disability (Abrahams et al. 2000).</p>
Scoring:	<p>The score is the total number of correct items produced in one minute. Error responses (e.g. perseverations, intrusions) are often also recorded.</p> <p>Standardization of scores to a reference population (z scores, T scores, etc): Normative data, stratified by age and education level are available for the general population (Tombaugh et al., 1999).</p> <p>If scores have been standardized to a reference population, indicate frame of reference for scoring (general population, HD subjects, other disease groups, etc). Normative data are available for the general population.</p>

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Psychometric Properties:	<p>Reliability: Test-retest or intra-interview (within rater) reliability (as applicable): Inter-interview (between-rater) reliability (as applicable): Internal consistency: Statistical methods used to assess reliability:</p> <p>Validity: Category fluency scores are moderately correlated with Phonemic Fluency scores ($r=.52$) (Tombaugh et al., 1999), another verbal generation task.</p> <p>Sensitivity to Change/ Ability to Detect Change (over time or in response to an intervention): Meta-analysis of HD observational studies published between 1993-2007 reveals longitudinal change within pre-HD and manifest HD over time.</p> <p>Pre-HD cross sectional: Effect size = -0.11 (95% CI= $-0.34, 0.12$) based on 9 studies including 126 participants.</p> <p>Pre-HD longitudinal: Effect size = -0.40 (95% CI= $-0.99, 0.19$) based on 1 study including 12 participants.</p> <p>Manifest HD cross sectional: Effect size = -1.34 (95% CI= $-1.90, -0.78$) based on 4 studies including 40 participants.</p> <p>Manifest HD longitudinal: Effect size = -0.50 (95% CI= $-1.06, 0.06$) based on 3 studies including 102 participants.</p> <p>Known Relationships to Other Variables (e.g. gender, education, age, etc): Performance improves with years of education and decreases with age, with education accounting for 13.6% of variance and age 23.4% (Tombaugh et al, 1999).</p> <p>Diagnostic Sensitivity and Specificity, if applicable (in general population, HD population- premanifest/ manifest, other disease groups): N/A.</p>
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References:	<p>Key References:</p> <p>Mitrushina, M.M., Boone, K.B., Razani, J., & D’Elia, L.F., (2005). Handbook of normative data for neuropsychological assessment (2nd ed.). New York: Oxford University Press.</p> <p>Abrahams S, Leigh PN, Harvey A, Vythelingum GN, Grise D, Goldstein LH. Verbal fluency and executive dysfunction in amyotrophic lateral sclerosis (ALS). <i>Neuropsychologia</i> 38(2000):734-747.</p> <p>Other References:</p> <p>Tombaugh, T.N., Kozak, J., Rees, L. (1999). Normative data stratified by age and education for two measures of verbal fluency: FAS and animal naming. <i>Archives of Clinical Neuropsychology</i>, 14, 167-177.</p> <p>Abrahams, S., Goldstein, LH., Al-Chalabi, A., Pickering, A., Morris, RG., Passingham, RE., Brooks, DJ. and Leigh PN. (1997). Relation between cognitive dysfunction and pseudobulbar palsy in amyotrophic lateral sclerosis. <i>Journal of Neurology, Neurosurgery and Psychiatry</i>, 62, 464-472.</p> <p>Abrahams, S., Goldstein, L.H., Suckling, J., Ng, V., Simmons, A., Giampietro, V. Atkins, L., Williams, S.C.R. and Leigh, P.N.. (2005a) Fronto-temporal white matter changes in patients with amyotrophic lateral sclerosis. <i>Journal of Neurology</i>. 252, 321-331.</p> <p>Abrahams, S., Goldstein, L.H. and Leigh, P.N. (2005b) Cognitive change in amyotrophic lateral sclerosis: a prospective study. <i>Neurology</i>, 64 1222-1226.</p>
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