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R.W. Butler & M.A. Jenkins. Ideational Fluency in Frontal Brain Disease.

Fluency measures involve assessing productivity under timed conditions. Thus far, neuropsychological paradigms for verbal and nonverbal fluency have been developed. We revised several tests of ideational fluency originally developed by Guilford, in order to make them timed measures. The measures require the production of remote and uncommon, but meaningful associations. Both verbal and nonverbal ideational fluency were assessed. These tests, along with several other neuropsychological measures were administered to 23 normal subjects and 17 subjects who had been diagnosed as having a frontal brain tumor. The frontal group obtained significantly fewer correct responses on most of the ideational fluency tests. This pattern appeared to be independent of simple verbal productivity as there were no significant differences in total number of responses to the ideational tests.

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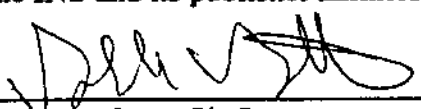
Senior Author's Signature 

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Ideational Fluency in Frontal Brain Disease

A number of neuropsychological tests have been developed that are relatively sensitive to the integrity of the frontal lobes. One neuropsychological paradigm that has been used involves obtaining indexes of productivity under timed conditions. These paradigms have been labeled as measures of fluency. Verbal fluency, as assessed by the FAS test, may be related to left frontal functioning (Borkowski, Benton & Spreen, 1967). A nonverbal measure of productivity, the design fluency test, has also been developed and isolated results suggest that it may be reflective of right frontal functioning (Jones-Gotman & Milner, 1977). Guilford (1967) developed a number of measures of fluency that were used to assess his concept of divergent and convergent intelligence. These ideational fluency measures require the production of information that is relevant to a concept but may be more remote in nature. Thus, theoretically, ideational fluency may require greater information processing on the part of the individual. We revised several of Guilford's measures in order to make them timed tests. The tests were then administered to both normal subjects and patients with frontal lobe brain tumors. We hypothesized that the Guilford ideational fluency measures would also prove to be sensitive to the presence of frontal brain dysfunction.

Subjects.

Data were collected on 23 normal subjects and 17 patients that had been diagnosed as having a frontal brain tumor. The groups were not significantly different in age, education or digit span score from the WAIS-R. The normal subjects were screened for possible substance abuse and psychiatric disturbance by an MMPI derived classification schema (Butler, Jenkins & Braff, 1989).

Measures.

All subjects completed the Wisconsin Card Scoring Test (WCST), the FAS verbal fluency test, the nonverbal fluency test (free condition) and the Guilford measures. The Guilford tests were scored for total number of responses and number of acceptable, correct responses. These ideational fluency tests were administered under timed conditions and are briefly described below.

Possible Jobs - The person is provided an emblem on which an object is represented (e.g. light bulb, safety pin). The subject must name as many jobs as possible that the emblem might identify.
Alternate Uses - Given the name of a common object (e.g. shoe, pencil), the subject must identify uncommon, but possible uses.
Consequences - Given an unusual situation (e.g. People no longer need food to live), the subject must identify possible consequences. Responses are scored for either remote or obvious content.
Sketches - The subject is provided with a series of identical geometric designs and is required to alter them into recognizable drawings.
Making Objects - The subject is provided with different geometric shapes and required to use as many as possible in order to construct different objects.

Results.

The variables were analyzed using student *t* tests. Means, standard deviations and level of statistical significance are listed below. An alpha level of .01 was used as the criterion for statistical significance.

	Normal (n = 23)	Frontal (n = 17)	
Age	33.2 (9.2)	41.6 (13.6)	N.S.
Education	14.7 (1.8)	16.0 (3.8)	N.S.
Digit Span	11.0 (2.3)	9.0 (1.7)	N.S.
WCST (Perseverative Responses)	6.8 (9.7)	31.9 (29.9)	$p < .01$
Verbal Fluency	44.4 (8.8)	24.6 (17.3)	$p < .01$
Nonverbal Fluency	21.9 (12.0)	10.6 (5.7)	
Possible Jobs/Total	29.4 (8.9)	23.3 (11.4)	N.S.
Possible Jobs/Correct	25.4 (8.2)	14.2 (7.4)	$p < .01$
Alternate Uses/Total	27.1 (9.4)	21.0 (10.7)	N.S.
Alternate Uses/Correct	20.8 (9.1)	12.1 (6.1)	$p < .01$
Consequences/Total	21.2 (7.2)	14.5 (6.7)	N.S.
Consequences/Obvious	10.1 (4.0)	6.1 (2.7)	$p < .01$
Consequences/Remote	10.6 (4.5)	4.8 (4.2)	$p < .01$
Sketches/Total	11.7 (4.0)	12.9 (4.4)	N.S.
Sketches/Correct	10.5 (3.5)	8.1 (3.2)	N.S.
Making Objects	33.2 (8.5)	14.6 (13.0)	$p < .01$

Discussion.

Not unexpectedly, the frontal brain tumor group made significantly more perseverative responses on the WCST than the normal subjects. Of interest, however, is the large standard deviation of the frontal WCST scores. Approximately 50% of the frontal subjects performed within the normal range on this test. The frontal patients also scored significantly lower than the normals on the verbal fluency measure. Again, approximately 50% of the patients scored in the normal range on the test. The group difference on the nonverbal fluency test, however, did not reach statistical significance. The groups were not significantly different on overall productivity scores for the ideational fluency measures. This is somewhat curious given the group difference in verbal fluency. Also of note were the more homogeneous variances for the ideational fluency tests. The frontal group did produce significantly fewer scoreable responses to most of the ideational challenges. These results suggest that frontal brain dysfunction may be characterized by deficits in ideational fluency that are relatively independent of simple productivity. The diagnostic significance of these preliminary findings remains unknown. Additional research will be necessary in order to determine if these measures will add unique variance to current neuropsychological test batteries. Preliminary results do suggest that the concept of ideational fluency may be useful in extending our knowledge of frontal brain function.

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