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Short communication

A Validation Study of Appropriate Phonological Verbal Fluency Stimulus Letters for Use with Croatian Speaking Individuals

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A B S T R A C T

The aim of this study is to determine the word frequency for all thirty letters of the Croatian alphabet and to collect normative data for the letter fluency task in Croatian speakers. Ninety two healthy participants were given each of the Croatian letters, and asked to generate as many words as possible in 60 seconds for each letter. Results suggested that participants generated most frequently words starting with the letters as follows: »K«, »P«, »S« and »M«.

Key words: *verbal fluency, healthy participants, Croatian, clinical neuropsychology, test, COWAT, cognitive*

Introduction

Almost any test format that provides the opportunity for unrestricted speech will test verbal fluency. Fluency of speech (»verbal fluency«) is typically measured by the quantity of words produced usually to a stimulus or within a restricted category, and within a specific time limit. Fluency tests with the task of generating words according to an initial letter require subjects to seek appropriate strategy for guiding their search for words. These tasks are most difficult for subjects who cannot develop strategies of their own[1]. Examples of effective strategies involve use of words with the same initial consonant, variations on a word, or variations on a theme[1]. Category fluency tests, calling for items in a category, provide structure, and, from that point of view are not as demanding. However, in spite of existence of different well defined categories, subjects with good searching strategies will often develop subcategories for organizing their recall. Frequently, verbal fluency is measured by word--naming test originated by Stanford-Binet. An alternative method for measuring verbal fluency is to employ the Controlled Oral Word Association Test (COWAT). The COWAT is widely used in clinical neuropsychology, primarily as a measure of verbal fluency, but also as a measure of executive skills such as working memory, planning and strategy. COWAT has also been widely used as a measure of verbal fluency and executive skills in a number of clinical drug trials, including studies of an amyloid lowering treatment for use in patients with Alzheimer's disease[2], and in the EXPRESS trial of rivastigmine in patients with Parkinson's disease[3]. Variations of the COWAT are also included in the various neuropsychological batteries like NCCEA[4], or Multilingual Aphasia examination[5]. The purpose of the test is to evaluate the spontaneous production of words beginning with a given letter or of a given class under restricted search conditions, i.e. a given letter of the alphabet, and within a limited amount of time[6]. Many authors pointed out that successful performance on these tests depends in part on the subject's ability to organize output of information in terms of clusters of meaningfully related words[7]. Verbal fluency performance is also known to be correlated with word knowledge, auditory attention and long-term verbal memory[8–10]. Participants must be able to develop a strategy for retrieving words from memory as well as keeping track of what words have already been said in a working memory system Generally, optimal fluency per-

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formance involves generating words within a subcategory and, when a subcategory is exhausted, switching to a new subcategory. These behavioural components were identified[11] and than operationalised as »clustering« and »switching«[12,13]. Clustering is the ability to producewords within phonetic and semantic subcategories, and switching isthe ability to shift between clusters. Research has determined that clustering and switching are both correlated with the number of words generated in semantic fluency tasks. However, switching is better correlated with the number of words generated on phonemic fluency.. Clustering is related to temporal lobe functioning as indicated by impaired performance among patients with temporal lobectomy[14]. Switching is related to frontal functioning, and it is specifically impaired among patients with left dorsolateral and superior medial frontal-lobe lesions[15]. Many patients experience changes in »speed« and »ease« of verbal production. Impaired verbal production in »speed« (e.g. speed of verbal retrieval or speed of formulating effective recall strategies) and »ease«, is according to previous coincidence with term »switching«, associated with frontal lobe damage, particularly the left frontal lobe anterior to Broca's area[16,17]. A reduction in word fluency has also been reported with diffuse, multifocal and non-frontal lobe damage[8]. Switching is also decreased under conditions of divided attention[12]. Reduced capacity to generate words has also been associated with Alzheimer's- type dementia[15,18–20]. Age, sex, and education have also been found to influence performance[21–25] and so the performance of individuals with less than a high school education must be interpreted with caution. With regard sex differences, it seems that the performance of females is better preserved after age 55. As many authors suggested, word fluency tests provide an excellent measures from which we can find out how the subject organized his thinking strategies.

Controlled Oral Word Association Test[5,21] first called Verbal Associative Fluency test consists of three word-naming trials. The set of letters that were first employed, »F«, »A«, »S«, has been used so extensively, that this test is sometimes called »FAS«. The 1976 version provides norms for two sets of letters, »CFL« and »PRW«[1,26]. This affects the results to some extent because of differences in vocabulary size for each letter[27]. These letters were selected on the basis of the frequency of English words beginning with these letters. In the »FAS« set, »F« has the lowest while »S« has the highest dictionary frequency. Overall, it seems that »FAS« version allows more vocabulary choices than »CFL« or »PRW« versions, but the last two sets are approximately equivalent in the amount of choices offered. Keeping with the goal of developing a multilingual battery for the examination of aphasia, Benton and Hamsher (1976), give the frequency rank for letters in French, German, Italian and Spanish. Although the COWAT is increasingly employed in international trials, very little is known about the utility of the English version of the test in non-English speaking populations[28]. English versions of the test employ letter stimuli for which native English speakers are most fluent, and these letters may be inappropriate for use with Croatian speakers[29,30]. Many investigators also note high importance of adequate interpretation of these tests[3]. They point out that lack of normative data makes judgments regarding impairment in individual study participants very difficult. Remedying this lack of information is thus of key importance if we are to employ verbal fluency tasks as a routine measure of verbal memory, attention, and the ability to initiate systematic search and retrieval[31].

Aim

The aim of the study was to find out the word frequency for all thirty letters of the Croatian alphabet in order to identify the most appropriate letters for use with Croatian speaking study participants. This methodology replicates the investigation originally conducted with English speakers and by which the most appropriate letters were selected for use. We also sought to determine whether there are any differences between Croatian and English speakers with respect to fluency.

Subjects and Methods

There were 92 healthy participants, without a history of neurological disorder, learning disability or psychiatric conditions requiring medication, age ranged from 18 to 52 years. For two participants we omitted information about their gender and for one participant about his age. Thus, a total of 92 persons were screened, resulting in a final sample of 90 individuals. Among 90 participants there were 68 females (75.6%) and 22 males (24.4%). Of the total group, 73 were between the ages of 18–30, 9 were between the ages of 31–41, and 9 were between the ages of 42–52. Thus the majority of the participants were between 18–30 years of age. Two participants have received 8 years of education, fifteen had completed between 9 and 12 years of education, and 72 had earned above of 13 years of education. For three participants no information about their education level was available.

Administration and Scoring

Standard instructions were employed in the administration of the test[6] with some exceptions – participants will try to produce as many words longer than three letters as they can for all thirty letters of Croatian alphabet. All participants will be given the initial letters in which the subject had to generate the words in alphabetic order. Instruction for test is as follows: »I will say you a letter of the alphabet. Then I want you to give me as many words as you can that begin with that letter as quickly as you can. For instance, if I say »B« you might give me »bad, battle, bed... «. I do not want you to use words which are proper names such as »Boston, Bosna, Branimir«. Also, do not use the same word again with a different ending such as »jelo« and »jesti«. So, you can't use verbs in your verbal production. »Any questions? Begin when I say the

letter. The first letter is A. Go ahead«. We begin timing immediately, and allow 1 minute for each letter. After 1 minute, the experimenter says: »Fine« or »Good«. If the participants discontinue before the end of the one minute, we encourage them to try to think of more words. If there is a silence of more than 15 seconds, we repeat the basic instruction, and the letter. For scoring purposes, we write down the actual words in the order in which they are produced. If there are some words with possible alternative meaning, at the end of the one minute period, we ask the participant what was meant by this word. The administration takes little bit more than 30 minutes. The scores are the sum of all admissible words for the letters of Croatian alphabet. Slang terms and foreign words that are part of standard Croatian are acceptable. Inadmissible words produced under these instructions are not counted as correct (i.e. verbs, variations, repetitions). Errors are useful in that they can provide clues to certain types of disorders – e.g. repetitions (possible perseverations), paraphrasias, spelling errors. Often the order of words produced suggests clues to search strategy of the participant.

Results and Discussion

The average number of generated words beginning with certain letter ranged from a low of 2.45 for »Ć« to 12.96 for »K«. Participants generated the greatest amount of words beginning with the letters »K« (M-12.96), »P« (M-11.87), »S« (M-11.50) and »M« (M-11.30). Due to the rather small and unrepresentative sample, these are provisional results that do not permit robust estimates of norms and calculation of percentiles. Nevertheless, we have no reason to believe that the ranking of the letters obtained in the study is any different in the Croatian population or in any clinical group. Further research is, however, needed in order to provide and establish more precise estimations of population parameters of means, variances and percentile values.

TABLE 1
AVERAGE FREQUENCY AND OTHER STATISTICAL INDICATORS OF THE GENERATED WORDS WITH THE SAME INITIAL LETTER ON CROATIAN SAMPLE (N=90)

Letter	Minimum	Maximum	X	SD
K	4	20	12.96	3.68
P	4	22	11.87	3.69
S	5	22	11.50	3.70
M	3	19	11.30	3.71
R	3	18	10.98	3.22
T	2	25	10.84	3.78
V	4	20	10.72	3.32
B	2	20	10.25	3.77
L	2	18	9.84	3.20
G	2	20	9.47	3.82
Z	3	20	9.28	3.08
Š	3	19	8.80	3.17
O	3	16	8.49	2.97
D	0	17	8.46	3.65
Ž	4	17	8.30	2.71
N	1	18	8.16	3.15
A	1	16	7.85	3.14
J	1	16	7.75	3.16
U	2	18	7.66	3.12
F	3	16	7.55	2.71
Č	1	13	7.42	2.91
C	0	15	6.70	2.81
H	1	13	6.54	2.51
I	1	15	6.13	2.74
E	0	14	5.51	2.76
LJ	1	15	5.01	1.94
DŽ	0	10	3.59	1.76
NJ	0	7	2.87	1.60
Đ	0	7	2.49	1.61
Ć	0	6	2.45	1.42

Conclusion

Our results suggest that there are differences among most frequent letters in COWAT between Croatian and English speakers. We recommend the use of the letters »K«, »P«, »S« and »M« in studies of verbal fluency (COWAT) performance conducted with Croatian speaking individuals.

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FONOLOŠKA VERBALNA FLUENTNOST NA HRVATSKOM UZORKU: PRIMJENA TESTA, IZBOR PODRAŽAJA I NORME

S A Ž E T A K

Cilj studije jest istražiti učestalost riječi za svih trideset slova hrvatske abecede, odnosno prikupiti normativne podatke za zadatke fonološke verbalne fluentnosti na hrvatskom uzorku. Na 92 zdrava ispitanika primijenili smo test verbalne fluentnosti za svako slovo hrvatske abecede i tražeći od njih da za svako slovo generiraju što je moguće veći broj riječi unutar 60 sekundi. Rezultati pokazuju da su ispitanici generirali najveći broj riječi s početnim slovom »K«, »P«, »S« i »M«.