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VERBAL FLUENCY FUNCTIONS IN PATIENTS WITH SCHIZOPHRENIA, THEIR UNAFFECTED SIBLINGS AND HEALTHY CONTROLS

Psychology

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ABSTRACT

Verbal fluency is a cognitive function that allows retrieval of information from memory and can be measured by semantic and phonological fluency tasks. Verbal fluency is a core feature of schizophrenia and is considered as endophenotypes of schizophrenia. This research is an attempt to investigate the verbal fluency functions in patients with schizophrenia, unaffected siblings and healthy controls. The sample comprises of 30 patients with schizophrenia, 30 unaffected siblings and 30 healthy controls from Government Rajaji Hospital, Madurai-20, by purposive sampling method. They were assessed with category fluency and phonemic fluency test. The results showed that when compared with healthy controls, the patients with schizophrenia and unaffected siblings showed statistically significant difference on Category Fluency and Phonemic Fluency test. Our findings suggest that, this poor verbal fluency performance might be caused by familial predisposition to schizophrenia and could be an endophenotype for schizophrenia.

KEYWORDS

Schziophrenia, Cognitive functions, Verbal Fluency.

One of the most common neuropsychological deficits in schizophrenia is the ability to generate a series of words under conceptual or phonological demands, referred to as verbal fluency. Poor performance on verbal fluency tasks is a common sign in multiple neuropsychiatric conditions, including frontal lobe dysfunction, dementia, and depression (Lezak, 1995, p. 546). Impaired performance on fluency tasks may implicate a dysfunctional semantic system, which has also been suggested as a possible origin of formal thought disorder in schizophrenia (Goldberg et al., 1998). Impaired verbal fluency has been reported to be a correlate of reductions in the level of functioning of patients with schizophrenia (Green, Kern, Braff, & Mintz, 2000).

In neuropsychological assessment, verbal fluency is commonly assessed with phonological fluency and semantic (category) fluency tasks. The Controlled Oral Word Association Test (COWAT; Spreen & Strauss, 1998) is the most commonly employed measure of phonological fluency. In a typical version of this examination, the examinee is asked to name, in three consecutive trials lasting 1 minute, as many words as he/she can that begin with a certain letter of the alphabet (e.g., F, A, and S). Animal naming is the most common measure of semantic fluency. In this version of the test, the examinee names as many different animals as he/she can in 60 seconds. Other versions may include other super ordinate category relationships, such as supermarket items, tools, or articles of clothing. Good performance on these tasks depends on intact lexical storage and the ability to retrieve information from semantic memory. Lesions in the temporal and frontal regions (Crowe, 1992) of the brain and lesions in the left hemisphere (Benton, 1968) have been found to predict reductions in verbal fluency. Errors on fluency tasks include repetitions (also referred to as perseverations), which result from repeating the same word or word stem, and intrusions, which occur when the subject provides an inappropriate response (e.g., "car" in the animal naming task). Semantic fluency function could reveal potential endophenotype for the early diagnosis of schizophrenia in the Chinese population (Chen, Y.L, et al. 2000). Verbal Fluency deficits remain stable across the clinical course of schizophrenia (Szoke et al. 2008). 20% of first degree relatives of patients with schizophrenia has showed impaired performance (below the 15th percentile) on Animal Naming Test (SureshKumar,N et. al 2012). Hughes. C., et al. (2005) patients with schizophrenia and unaffected shared a neuropsychological deficit in verbal fluency. Nam HJ, et al. (2009) found that there was a significant difference between the sibling and control groups was observed only in the Category Fluency Test.

METHODOLOGY

Aim:- The present research is aim to examine the verbal fluency functions of the patients with schizophrenia, unaffected siblings, and healthy controls.

Sample:- 30 patients with schizophrenia, and their 30 unaffected siblings, attending inpatients and out patients department of Psychiatry, Madurai Medical College, Madurai and 30 healthy controls (age, gender and education matched) were selected from the same community by purposive sampling method to serve as the sample for the research. Entire subjects were right handed and were selected based on specific inclusion and Exclusion Criteria.

Inclusion criteria: Patients diagnosed with schizophrenia according to the ICD 10 Diagnostic criteria and their unaffected siblings were included for this research. Healthy controls from the community were also selected as sample for the research. They were in the age range of 20 to 40 years of age with minimum education qualification of 8th standard and above, those who are volunteering to participate to this study.

Exclusion criteria: Patients with schizophrenia, unaffected siblings and healthy controls were excluded from present or past history of any psychiatric illness and substance abuse, History of Head Injury with any documented cognitive sequeale or with loss of consciousness, Neurological diseases or damage (Epilepsy etc), having undergone Brain surgery, clinical evidence of mental retardation and Medical illness that may significantly impair cognitive functions. (Cardiovascular Disorder, Liver Diseases etc.) For healthy controls, General Health Questionnaire (GHQ-12) was administered and a score of above 2 were excluded.

Tools used:
Socio demographic data sheet: A personal data sheet was developed to record all information about patient name, age, education, occupation, income, and marital status.

Clinical data sheet: To gather information about the onset of illness, duration of the illness, type of illness, family history of illness and other relevant information recorded.

Verbal Fluency:
• Controlled oral Word Association Test (COWAT).
• Animal Name Test (ANT), Furniture and Vegetable Naming test.

The GHQ:
The General Health Questionnaire (Goldberg & Williams, 1988) - GHQ, is a self-administered 12- item screening tool which is used to assess the presence of diagnosable psychiatric disorders in community settings and nonpsychiatric clinical settings. This tool was used in the present research to ensure the healthy controls for the absence of psychiatric symptoms. The total score ranged from 0 to 36, with higher scores indicating poor psychological well-being. The internal consistency of the GHQ-12 is reported to be .90 (Hankins,2008) and it

has high validity, and is not influenced by gender, age, or level of education (Goldberg et al., 1997).

VERBAL FLUENCY:
PHONEMIC FLUENCY :

Controlled Oral Word Association Test (COWAT): (Rao et al., 2004, Indian Adaptation). This test is a measure of phonemic fluency. The subject generates words based on the phonetic similarity of the words. The subjects generates words begins with the letters F,A.S. (Benton and Hamsher, 1989). Proper nouns and names of the numbers should be excluded. The same word should not be repeated with a suffix. Subjects who do not know English are asked to generate words in their mother tongue (Tamil), commencing with consonants 'ka', 'pa', ma'. The subject is asked to generate words for 1 minute in case of each consonant starting with 'F', going on to 'A' and 'S' or the subjects is illiterate the word starting with 'ka' going on to 'pa' and 'ma'. In the present research, maximum words generated by the subject in each task were used for statistical analysis.

CATEGORY FLUENCY; ANIMAL / VEGETABLE / FURNITURE NAME TEST: (LEZAK 1995) - Rao et al., 2004, Indian Adaptation

This test is a measure of category fluency which is another form of verbal fluency. In this, it is the content of the words rather than the phonetic similarity of the words that is regulated. The subject generates words which belong to a particular category. For Example in Animal Naming Test, the subject is asked to generate the names of as many animals as possible in one minute. The subject is asked to exclude the names of fishes, birds and snakes. Similarly, the subjects were asked to generate the names of vegetables and furniture's as many as possible in one minute. In this present research maximum numbers of new words generated are scored for used for statistical analysis.

Procedure: The unaffected siblings of patients with Schizophrenia were drawn from inpatient and outpatient Department of Psychiatry, Govt. Rajaji Hospital, Madurai Medical College, Madurai-20, who met the inclusion and exclusion criterion for the present research, were considered for the assessment procedure. The healthy control (age, education and Gender matched group) were drawn from the same community. Informed consent was obtained from the entire sample. The treating team was informed about the results of the tests.

Analysis of Data: The obtained data were analyzed using (SPSS-17) descriptive statistics such as mean, standard deviation, one way ANOVA and Bonferroni's Post Hoc multiple comparison test were used to compare the performance of individual with Schizophrenia, unaffected siblings and healthy control.

RESULTS AND DISCUSSION
Table. 1. Socio demographic characteristic of the selected subjects (– 90).

S. No	Variables		Schizophrenia (30)	Siblings (30)	Controls (30)
1	**Age in years**	Mean	31.10	29.63	28.87
		SD	5.27	5.28	4.61
		Range	21-40 years	19-39 years	20-36 years
2	**Gender**	Male	14	16	16
		Female	16	14	14
3	**Education**	Secondary (up to 10)	12	17	17
		Higher Secondary	10	4	4
		College/ Professional	8	9	9
4	**Socio Economic Status**	Lower	23	23	23
		Middle	7	7	7
		Upper	0	0	0
5	**Residence**	Rural	19	19	19
		Urban	11	11	11
6	**Family Type**	Nuclear	24	24	24
		Joint	6	6	6

The mean age range of patients with schizophrenia was 31.10 with Standard Deviation of 5.27 and their age range was between 21-40

years. The unaffected siblings mean age was 29.63 with the standard deviation of 5.28 and their age range was between 19 – 39 years. The healthy control group mean age was 28.87 with the standard deviation of 4.61 and their age range was between 20-36.

14 (47%) of patients with schizophrenia, 16 (53%) unaffected siblings and 16 (53%) healthy controls belongs to male gender. 16 (53%) patients with schizophrenia, 14 (47%) unaffected siblings and 14 (47%) healthy controls belongs to female gender.

With respect to education, 12 (40%) patients with Schizophrenia and 17 (57%) unaffected siblings and 17 (57%) healthy controls belongs to secondary education. 10 (33 %) Patients with schizophrenia and 4 (13%) unaffected siblings and 4 (13%) healthy controls belongs to Higher Secondary education. 8 (27%) patients with schizophrenia and 9 (30%) of unaffected siblings and 9 (30%) healthy controls belong to Professional education.

In Socio economic status, 23 (77%) patients with schizophrenia, 23 (77%) unaffected siblings and 23 (77%) healthy controls belongs to Lower Socio-Economic Status. 7 (23%) patients with schizophrenia, 7 (23%) unaffected siblings and 7 (23%) healthy controls belongs to Middle Socio-Economic Status. None of the sample belongs to Upper socioeconomic status.

19 (63%) patients with schizophrenia, 19 (63%) unaffected siblings and 19 (63%) healthy controls belong to rural area. Whereas 11 (37%) patients with schizophrenia, 11 (37%) their unaffected siblings and 11 (37%) healthy controls were belongs to urban area.

The results reveal that 24 (80%) patients with schizophrenia, 24 (80%) unaffected siblings and 24 (80%) healthy controls belong to Nuclear family type. Whereas only 6 (20%) patients with schizophrenia, 6 (20%) unaffected siblings and 6 (20%) healthy controls were belongs to Joint family type.

Table - 2 Mean and Standard deviation, one way ANOVA and Bonferroni's multiple comparison Post Hoc test of Patients with Schizophrenia, Unaffected Siblings and Healthy Control groups on Category Fluency Test.

Test Variables	Groups	No, of subjects	Mean	Standard Deviation	ANOVA F -Value	Bonferroni's Post Hoc Test
ANT	Siblings	30	12.93	2.04995	45.025**	Siblings Vs Controls $p < 0.001$**
	Control	30	15.80	1.37465		Controls Vs Schizophrenia $p < 0.001$**
	Schizophrenia	30	10.43	2.88496		Schizophrenia Vs Siblings $p < 0.001$**
Vegetable	Siblings	30	11.13	2.27	6.322**	Siblings Vs Controls $p < 0.001$**
	Control	30	12.67	1.86		Controls Vs Schizophrenia $p < 0.001$**
	Schizophrenia	30	10.73	2.49		Schizophrenia Vs Siblings $p > 0.01$
Furniture	Siblings	30	9.70	2.10	27.911**	Siblings Vs Controls $p < 0.001$**
	Control	30	11.57	1.28		Controls Vs Schizophrenia $p < 0.001$**
	Schizophrenia	30	7.83	2.28		Schizophrenia Vs Siblings $p < 0.001$**

Table-2, In Category Fluency, when compared with healthy controls, patients with schizophrenia and unaffected siblings performed significantly poor on animal naming task (F.value of 45.02 , p<0.001) and Furniture naming task(value of 45.02 , p<0.001). In Vegetable naming task, when compared with healthy controls patients with Schizophrenia showed poor performance (value of 6.32, p<0.001) and intermediate performance on unaffected siblings between healthy controls and patients with schizophrenia were also observed.

Table-3 Mean and Standard deviation, one way ANOVA and Bonferroni's multiple comparison Post Hoc test of Patients with Schizophrenia, Unaffected Siblings and Healthy Control groups on Phonemic fluency

Test Variables	Groups	No. of subjects	Mean	Standard Deviation	ANOVA F –Value	Bonferroni's Post Hoc Test
Ka	Siblings	30	9.53	1.94	59.87**	Siblings Vs Controls p < 0.001**
	Control	30	12.47	1.63		Controls Vs Schizophrenia p < 0.001**
	Schizophrenia	30	7.53	1.66		Schizophrenia Vs Siblings p < 0.001**
Pa	Siblings	30	9.93	1.87	79.71**	Siblings Vs Controls p < 0.001**
	Control	30	11.93	1.68		Controls Vs Schizophrenia p < 0.001**
	Schizophrenia	30	5.93	2.05		Schizophrenia Vs Siblings p < 0.001**
Ma	Siblings	30	9.78	2.54	65.88**	Siblings Vs Controls p < 0.001**
	Control	30	11.47	1.57		Controls Vs Schizophrenia p < 0.001**
	Schizophrenia	30	5.50	1.99		Schizophrenia Vs Siblings p < 0.001**

Table-3, In Phonemic Fluency, when compared with healthy controls, patients with schizophrenia and unaffected siblings performed significantly poor on "Ka" word naming task (F.value of 59.87, p<0.001), "Pa" word naming task (F.value of 79.71 , p<0.001) and "Ma" naming task (F.value of 65.88 , p<0.001).

DISCUSSION:

The present research reveals that patients with schizophrenia and unaffected siblings generated fewer words than controls on Category Fluency and Phonemic Fluency. They also made few repetitions and intrusion. This poor performance may be due to limited memory performance and processing speed. Verbal fluency has been shown to be a sensitive indicator of brain dysfunction in general (Lezak 1995) and frontal and temporal brain dysfunction specific to schizophrenia (Henry and Crawford 2004). Impaired fluency performance in schizophrenia patients is caused by disconnection between frontal and temporal lobes (Frith et al 1995). Dysfunction of semantic fluency is one of the core features of schizophrenia and is independent of language system or cultural background (Sumiyoshi, C et al. 2009). The finding of the current research is corroborating with Szoke, A et al. 2008, results from previous longitudinal indicate that semantic verbal fluency could be a promising potential endophenotype in Schizophrenia. In addition, Children who later developed schizophrenia, and their siblings, showed similar cognitive deficits and, compared to siblings of unaffected individuals, the probands exhibited more severe deficits in semantic fluency function (Gilvarry, C. M. et al. 2001 & Niendam, T. A. et al.2003). Verbal fluency differences may be associated with a large effect size between relatives of schizophrenic cases and controls (Szoke, A. et al.2005). The verbal fluency task discriminates between patients and healthy controls irrespective of task duration. (Blessing A et. al. 2009). Siblings of schizophrenic individuals may exhibit significantly less word output in the verbal fluency test, which probably indicated semantic verbal fluency deficit as a familial trait marker in schizophrenia (Chen, Y. L. 2000).

Conclusion:

The current research reveals that, patients with schizophrenia and unaffected siblings generated fewer words than healthy controls on Category Fluency and Phonemic Fluency. It provides more evidence that impaired verbal fluency could represent on end phenotypic marker of vulnerability to develop schizophrenia.

Limitations:

The sample size is too small. The findings of the study should be considered as preliminary and should be replicated in studies with larger sample. The negative and positive symptoms of patients with schizophrenia were not assessed & correlated with fluency performance. This research has not included cognitive strategic implementation according to clustering and switching scores in detail for analysis. Working memory and comprehensive neuropsychological assessment and cognitive retraining for verbal fluency may be included for further research.

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