`Original Article

Lexical access in Persian normal speakers: Picture naming, Verbal fluency and Spontaneous speech[1]

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Objectives: Lexical access is the process by which the basic conceptual, syntactical and morpho-phonological information of words are activated. Most studies of lexical access have focused on picture naming. There is hardly any previous research on other parameters of lexical access such as verbal fluency and analysis of connected speech in Persian normal participants. This study investigates the lexical access performance in normal speakers in different issues such as age, sex and education.

Methods: The performance of 120 adult Persian speakers in three tasks including picture naming, verbal fluency and connected speech, was examined using "Persian Lexical Access Assessment Package". The performance of participants between two gender groups (male / female), three education groups (below 5 years / above 12 years / between 5 and 12 years) and three age groups (18 - 35 years / 36 - 55 years / 56 - 75 years) were compared.

Results: According to findings, picture naming increased with increasing education and decreased with increasing age. The performance of participants in phonological and semantic verbal fluency showed improvement with age and education. No significant difference was seen between males and females in verbal fluency task. In the analysis of connected speech there were no significant differences between different age and education groups and just mean length of utterance in males was significantly higher than females.

Discussion: The findings could be a primitive scale for comparison between normal subjects and patients in lexical access tasks, furthermore it could be a horizon for planning of treatment goals in patients with word finding problem according to age, gender and education .

Keywords: lexical access, word-finding, picture naming, verbal fluency, analysis of connected speech

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Introduction

The human ability to communicate, exchange ideas and feelings via words is a unique feature of human beings that can distinguish him from other creatures. Verbal communication needs the ability to find the words properly and quickly, this capability called lexical access. Lexical access is a process by which lexical entry of words are retrieved from mental lexicon (1). Levelt (2) indicated these entries contain two types of information, form and meaning. Phonological and morphological information of words are related to form component. In addition, syntactic and semantic information of words are related to meaning component of lexicon. Lexical access may be damaged in various diseases such as all types of aphasia (3) and Alzheimer's disease (4). The deficit in lexical access define as inability to remember words for things, called anomia (5) .

There are many methods to assess anomia such as picture naming, word reading, naming in reply to oral or written question, matching picture to written word, verbal fluency, picture description, sentence

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completion, verb generation, story (re)telling ,analysis of connected speech and conversation (6). The most application of lexical access tests is assessment of anomia in aphasia and dementia. For patient assessment, there is no norm for normal Persian subjects. Therefore, clinicians intuitionally assess patients and design the treatment plan based on his/her personal experiences. This study provides primitive scores for lexical access in picture naming, verbal fluency and connected speech measures in normal subjects. Few studies have been conducted to evaluate lexical access in normal subject. Most studies determine the picture naming in visual confrontation in aphasia (6-8) and some of them do report the mean of normal subject in verbal fluency (9). There is rarely any report on normal Persian speakers in spontaneous speech.

Since the effect of age, gender and education on lexical access has great role and has been studied in languages (10, 11), the purpose of this study is to assess lexical access performance of Persian normal subjects in different age, gender and education groups.

Methods

The current cross sectional study examined the lexical access performance of 120 adult Persian speakers in three tasks including picture naming, verbal fluency and connected speech, using "Persian lexical Access Assessment Package"(12). The reliability and validity of this test was 0.78 and 0.78 respectively. All of participants in this study were volunteer native Persian speakers (18-75 years old) with no history of neurologic or psychiatric disorders on the base of personal information questionnaire. Data gathering was done in Tehran, during 9 months in year 2013. Equal sample size gathered in both genders. The performance of participants between two gender groups (male / female), three education groups (below 5 years / above 12 years / between 5 and 12 years) and three age groups (18 - 35 years / 36 - 55 years / 56 - 75 years) were compared.

In picture naming, subjects required to name 50 pictures which each picture for 2 second presented on computer. The percentage of correct answers in picture naming was calculated for each person. In verbal fluency section, subjects should recall as many words as they could from a semantic or phonological category in 30 seconds. The semantic category consisted of animal and fruit and the phonological category included the words that begin with letter /پ/ / /p/ and /م/ / /m/ in 30 seconds. The subjects' performance on both animal and fruit naming was calculated as semantic fluency, the same procedure was followed in phonological fluency. For spontaneous speech, Nest's bird story pictures (depicted from(13)) were used, all participants were instructed to see the serial pictures and describe them . The voice of subjects were recorded and analyzed afterwards. Analysis of connected speech was including calculation of speech rate and mean length of utterances (MLU).

The consent of subjects was taken and they were free to withdraw at any stage of assessment who wanted. Data were analyzed by SPSS-21 using independent t-test for comparing means in two different genders and one-way ANOVA for different age and education groups.

Results

The 120 normal Persian speakers participated in this study, the demographic information of them summarized in table (1). The number of participants was matched in each group according to gender, but we didn't have equal number of participants in different age and education in each group.

Table1. Demographic information of participants

Gender	N(percent)	Age (years old)	N(percent)	Education (years)	N(percent)
male	62(%51.7)	18-35	40(%33.3)	0-5	3(%2.5)
		36-55	12(%10)	6-12	7(%5.8)
		56-75	10(%8.3)	12-22	52(%43.3)
female	58(%48.3)	18-35	34(%28.4)	0-5	6(%5)
		36-55	15(%12.5)	6-12	2(%1.7)
		56-75	9(%7.5)	12-22	50(%41.7)
total	120(%100)	18-75	120(%100)	0-22	120(%100)

Distribution of subjects' age showed that the majority of subjects were between 18 and 35 years old (%61.7), with education above 12 years (%85). The Phonological and semantic verbal fluency, picture naming and speech parameters (MLU and speech rate) in males and females are indicated in table (2).

Table 2. Verbal fluency, picture naming and speech parameters in males and females

gender	N	Phonological verbal fluency M (±SD)	P-value	semantic verbal fluency M (±SD)	P-value	Picture naming M (±SD)	P-value	MLU M (±SD)	P-value	Speech rate M (±SD)	P-value
male	62	9.3 (± 2.87)	0.58	13.31(±2.89)	0.18	%95.5 (±4.08)	0.37	7.03 (±3.18)	0.001	119.38 (±28.32)	0.23
female	58	8.99(±3.23)		14.03(±3.01)		%96.18 (±4.85)		5.44 (±2.07)		113.11 (±29.58)	
total	120	9.16(±3.04)		13.66(±2.97)		%95.83 (±4.46)		6.27 (±2.81)		116.35 (±28.99)	

The best score in phonological verbal fluency was obtained by males (M=9.3), but the difference between male and female, using t-test, was not statistically significant (p= 0.58). In semantic verbal fluency tasks females had better performance (M=14.03) than males (M=13.31), but this difference was not statistically significant. Although we can observe difference between two groups in picture naming and speech rate, but these differences were not statistically significant. The MLU in males (M=7.03) was significantly higher than females (M=5.44).

The values of verbal fluency (semantic and phonology), picture naming and speech parameters (MLU and speech rate) in different age groups was shown in table (3).

Table 3. Verbal fluency, picture naming and speech parameters in different age groups

age group (years)	N	Phonological verbal fluency M (±SD)	P-value	semantic verbal fluency M (±SD)	P-value	Picture naming M(±SD)	P-value	MLU M (±_SD)	P-value	Speech rate M (±SD)	P-value
18-35	74	10.1 (±2.72)	0.001	14.3 (±2.59)	0.001	%96.68(±3.46)	0.001	6.54 (±2.77)	0.07	119.34 (±24.56)	0.31
36-55	27	7.22 (±2.58)		12.04(±2.97)		%96.25 (±3.17)		5.19(±2.01)		109.68 (±38.43)	
56-75	19	8.2 (±3.35)		13.43 (±3.53)		%91.98 (±6.73)		6.71 (±3.58)		114.16 (±29.44)	

The best performance in phonological verbal fluency was achieved by 18-35 year olds (M=10.1) and lowest performance belonged to 36-55 year olds (M=7.22). Observed difference in phonological verbal fluency task was significant in all three age groups (p<0.001). In semantic verbal fluency task, the best performance was for 18-35 year olds (M= 14.3) and lowest mean was for 36-55 year olds (M=12.04). As indicated in table 3, observed difference in semantic verbal fluency task between all three age groups was significant (p<0.001). The difference in picture naming between all age groups was statistically significant (p<0.001). In this regard, best performance in picture naming was seen in age group 18-35 year olds and the lowest average was seen in the age group above 56 years. The performance of different age groups for picture naming was significantly different (p-value <0.001) and there was no significant difference in speech parameters (MLU and speech rate).

The values of verbal fluency (semantic and phonology), picture naming and speech parameters (MLU and speech rate) in different education groups was shown in table (4).

Table 4. Verbal fluency, picture naming and speech parameters in different education groups

Education group (years)	N	Phonological verbal fluency M (±SD)	P-value	semantic verbal fluency M (±SD)	P-value	Picture naming M(±SD)	P-value	MLU M (±_SD)	P-value	Speech rate M (±SD)	P-value
0-5	9	4.8 (±2.4)	0.001	9.8 (±2.04)	0.001	%88.99 (±9.82)	0.001	5.37 (±1.29)	0.61	103.5 (±30.72)	0.12
6-12	9	6.7 (±2.3)		12.55 (±2.7)		%95.52 (±3.79)		6.36 (±3.88)		103.45 (±38.48)	
12-22	102	9.7(2.7)		14.09 (±2.8)		%96.39 (±3.26)		6.33 (±2.81)		118.62 (±27.63)	

The highest average (M=9.7) in phonological verbal fluency was obtained by education group 12-22 years and lowest performance (M=4.8) belonged to education group 0-5 years .Between all three age groups the observed difference in phonological verbal fluency task was statistically significant ($p<0.001$). In semantic verbal fluency and picture naming, a similar trend was observed.

Discussion

The main purpose of this study was to offer scores for performance of normal subjects in lexical access. In order to assess the processes involved in lexical access such as lemma or lexeme activation (2) in healthy subjects we should check the reaction time or using the functional neuro-imaging techniques, in this study we did not use any of these techniques. We just offered average of the normal Persian speakers in verbal fluency, picture naming and analysis of connected speech especially for research and clinical use, since it was a lack. According to the current results, lexical access in picture naming and verbal fluency tasks are affected by age and education and the only part of lexical access that is not affected significantly by age and education is connected speech. Comparison verbal fluency between different education groups indicate that there can be a relationship between phonological and semantic verbal fluency and educational level, These findings are consistent with Seyedin and colleagues (7) results.

In overall, the findings indicate that the gender have no influence on verbal fluency. A similar study was conducted by Nejati and Rahimzade (9) to evaluate the performance of verbal fluency in older people in Qom, the results of that study was in the same direction with this study.

According to the results, verbal fluency was declined as age increased. Since verbal fluency is a neuropsychological assessment and could be a useful test to assess executive functions, cognitive and linguistic functions (14), this decline can be interpreted based on two phenomena 1) executive function decrease with aging and 2)increasing tip of tongue (TOT) with aging (15). The findings of this study are consistent with Bialystok and colleague work, they assessed working memory, lexical retrieval, and executive control in different age groups. They indicated younger participants performed better than older participants in the majority of linguistic and cognitive tasks, that confirmed the effect of aging on these processes (16).

The results of picture naming in this study were consistent with Cardebat's study (10). This maybe the reason for such a clinical application of this task for assessing lexical access. The results of the present study about insensitivity of analysis of connected speech to age and education is inconsistent with Ardila and Rosselli (11). The speech measure in this study was not the exact copy of Ardila and Rosselli's work. This part is controversial but, the reason for choosing analysis of connected speech as an important part of lexical access processing was the role of word retrieval in context. When a picture is presented in isolation, the only basis for recognition and naming are the sensory features extracted from the stimulus, i.e., bottom-up processing. When we use serial pictures, there is the additional information on the basis of semantic or syntactic features that would help subjects to find exact words (i.e., top-down processing). This task is more like a normal word-finding situation in everyday life (17, 18). On the other hand, the connected speech is informative enough to give us a view about the patient's ability in expressive language and lexical access specially

considering its role in diagnosis of fluent and non-fluent aphasia (18, 19).

One of most important application of these results is clinical utility. Using a fairly comprehensive test of lexical access, on one hand could obtain a clear picture of the performance of normal subjects in different age, sex and education groups and on the other hand could be a first step for future research. To generalize the results of this study larger sample size is needed. For future research adding the other task for lexical access such as repetition, verb generation and sentence completion both in normal subjects and anomic patients could be a good choice.

Conclusion

According to the results, it sounds lexical access in picture naming and verbal fluency tasks are affected by age and education. The only part of lexical access that is not affected significantly by age and education is connected speech. These findings show the importance of speech measure (MLU and speech rate) as a quick, simple and operational index for lexical access that could be used in clinic.

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