



## Word and nonword repetition in patients with Schizophrenia

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### Abstract

**Introduction:** The assessment of the verbal repetition is important in the study of acquired language disorders and neuropsychology. It is helpful in differential diagnosis of aphasia subtypes, auditory breakdowns, and working memory (WM) performance. Though different linguistic disorders have been identified in patients with schizophrenia, very little is known about their verbal repetition ability.

**Methods:** The present study was conducted in the inpatient ward of Razi Psychiatric Hospital, Tabriz University of Medical Sciences, Iran, during the year 2013. Participants were: 30 patients diagnosed with schizophrenia during the maintenance phase of treatment and 30 healthy people as control group. They were asked to repeat 15 words and 15 nonwords immediately. The stimuli were 1, 2, and 3 syllabic in Turkish language. Any incorrect repetition scored 1 and correct repetitions scored 0. Lexicalization errors were compared between groups too.

**Results:** Both groups repeated words better than nonwords. Patients showed lower ability to repeat nonwords than controls, especially in 3 syllabics. There was no significant difference in the repetition of words between groups though it was better in controls. Patients with schizophrenia made more errors in both words and nonwords and lexicalization errors were twice more.

**Conclusion:** Lower ability to repeat nonwords (than words) in patients with schizophrenia may show the involvement of phonological loop of WM. More lexicalization errors may take place because of dis-inhibition.

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### Introduction

Different linguistic disorders have been identified in patients with schizophrenia including semantic, syntactic, and pragmatic aspects.<sup>1</sup> The deficit in verbal working memory (WM) is considered as underlying mechanism for linguistic disorders.<sup>2</sup> Moreover, Goldman-Rakic states that deficit in WM may be the main cause of "thought disorder" in schizophrenia.<sup>3</sup> WM plays an important role in language acquisition and literacy skills. Abnormalities in WM have been reported in dyslexia, specific language impairment, and

aphasia.<sup>4,5</sup> There are several studies showing WM dysfunction in schizophrenia.<sup>6</sup>

According to Jarrold and Baddeley, nonword repetition can reveal dysfunction in phonological loop of WM.<sup>7</sup> Phonological loop is specialized in processing and manipulating limited amounts of speech-based information.<sup>8</sup> The quality of temporary storage of phonological representations, sensory, cognitive, and motor processes are important for nonword repetition.<sup>5</sup>

It is known that permanent memory representations are used to repair incomplete

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or fuzzy temporary memory traces, which is called the “redintegration process.”<sup>9</sup> But the redintegration process cannot be helpful in nonword repetition, because nonwords do not activate lexical representations in long-term memory.<sup>5</sup> Therefore, phonological demand will be greater in nonword repetition. On the other hand, word and sentence repetition ability is important in clinical aphasia assessment.<sup>10</sup> Nonword repetition along with word repetition are also used in detecting breakdown at the level of auditory analysis and phonological processing in aphasia<sup>11</sup> and is important in differential diagnosis between classical and extrasylvian aphasias.<sup>12</sup>

A recent study has shown the involvement of both phonological and semantic routes in word repetition.<sup>13</sup> We hypothesize that if patients with schizophrenia have deficit in phonological loop of WM, they would show different repetition performance for words and nonwords.

Although there is a rather rich literature on speech and language disorders in schizophrenia, we did not find much about verbal repetition ability in schizophrenia except for Jahan and Javan’s report which has methodological limitations.<sup>14</sup> In this work, we compared the ability of word and nonword repetition between healthy people and patients with schizophrenic.

## Methods

The present study was conducted in the inpatient ward of Razi Psychiatric Hospital, Tabriz University of Medical Sciences, Iran, during the year 2013. The procedure was approved by the Regional Ethical Committee. The study was described for subjects, and they were participated after giving written consent by their caregivers.

As there is no available data about the topic of study in our population, a sample size of at least 30 patients was defined for this pilot study. Patients were selected randomly from in patients with schizophrenia in maintenance phase of their treatment including 15 males and 15 females. All of them were Turkish speaking individuals

(with Azeri ethnic background) who satisfied diagnostic and statistical manual for mental disorders-4<sup>th</sup> edition (DSM-IV) diagnostic criteria for schizophrenia based on the structural clinical interview for DSM-IV.<sup>15</sup> Patients with hearing, speech, or serious neurologic disorders were excluded.

30 healthy subjects were recruited through announcements within the medical center. They were selected to be matched to the patients regarding their sex, age, native language, and educational level. Exclusion criteria were the same for controls.

Participants were first screened for obvious hearing ability by the Ling-6 sounds test.<sup>16</sup> Participants were asked to repeat a list of 15 words and 15 nonwords composed of 1, 2, and 3 syllables. Words and nonwords were recorded in as an audio file and played back through headphone to participants. Participants were asked to repeat immediately after hearing the stimulus while their responses were recorded. It was clearly explained them that some of stimuli are nonsense and made up words.

Data are presented as mean [standard deviation (SD)]. Multivariate analysis of covariance (MANCOVA) and Wilcoxon Signed-Ranks test was performed to compare the ability of repetition between the two groups as well as between males and females in terms of the 1, 2, and 3 syllabic words and nonwords. Repetition performance was cored as follows: 0 was assigned for correct repetition and 1 for erroneous repetition. Number of erred phonemes in incorrect repetitions recorded for each stimulus as well. A  $P < 0.050$  was considered as statistically significant.

## Results

Mean age  $\pm$  SD of the patient was  $40.1 \pm 10.2$  years, and the mean duration of the disorder was  $6.5 \pm 4.5$ , ranging from 2 to 20 years. Mean age  $\pm$  SD of healthy controls was  $39.3 \pm 10.7$  years.

### *Repetition between groups*

A MANCOVA was performed to compare the ability of repetition in terms of the 1, 2, and 3 syllabic words and nonwords.

Education was considered as covariate. Mean  $\pm$  SD of repetition errors are presented in terms of stimuli type (word and nonword) and syllable length (Table 1). There were significant main effect of group [Pillai's trace = 0.32,  $F = 3.63$ ; degree of freedom (df) = 6] ( $P < 0.050$ ). There were no significant interactions between group and sex or education. Pairwise comparisons showed significant difference in repetition of 3-syllabic nonwords in controls and patients [Mean difference = -1.04, Standard error (SE) = 0.30] ( $P = 0.001$ ).

**Lexicalization errors**

Incorrect repetitions resulted in new words (lexicalization errors), and nonword productions. Lexicalization errors were greater in patients (Mean Rank = 37.08) than controls (Mean Rank = 22.67) ( $U = 222.50$ ,  $z = -3.56$ ) ( $P > 0.001$ ).

**General repetition ability**

A Wilcoxon Signed Ranks test showed better ability to repeat words rather nonwords both in controls ( $z = -4.37$ ,  $P < 0.001$ ) and patients with schizophrenia ( $z = -4.56$ ,  $P < 0.001$ )

(Figure 1).

Total repetition in both words and nonwords was compared in terms of total erred phonemes. Patients produced incorrect phonemes about two times greater than controls in their repetitions (Figure 2).

**Discussion**

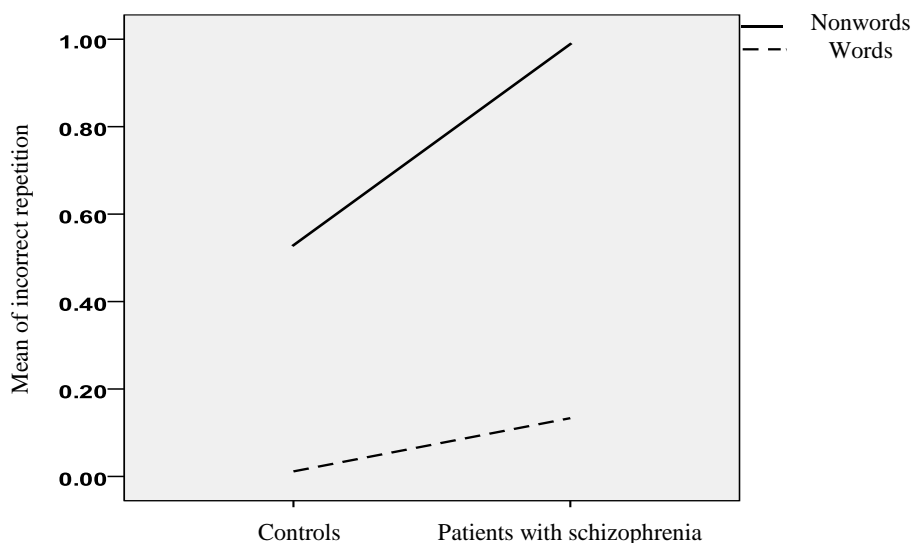
This study showed different ability in repetition of words and nonwords in patients with schizophrenia compared to healthy controls. Their performance was significantly different from controls in 3 syllabic words. They also showed decreased performance in repeating 1-and 2-syllabic nonwords but this decrease did not reach the significance. Repetition was better for words than nonwords in both groups.

Number of errors in nonword repetition was influenced by the length of the stimuli (number of syllables) and the existence of semantic support from long-term memory. Patients with schizophrenia were more sensitive to the absence of meaning and longer stimuli. It is known that error rate increases in repetition of longer words.<sup>6</sup>

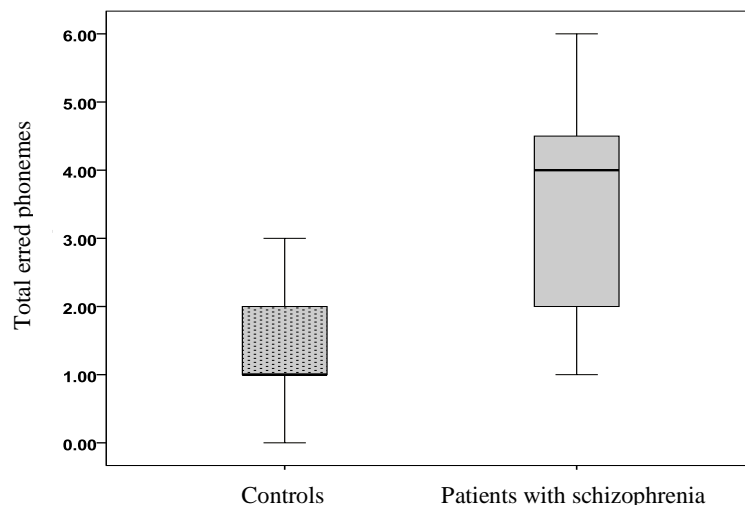
**Table 1.** Error in repetitions of words and nonwords in patients with schizophrenia and controls

Participants (groups)	Words			Nonwords		
	1 Syllabic	2 Syllabic	3 Syllabic	1 Syllabic	2 Syllabic**	3 Syllabic*
	Mean $\pm$ SD			Mean $\pm$ SD		
Controls	0.03 $\pm$ 0.18	0.00 $\pm$ 0.00	0.06 $\pm$ 0.25	0.82 $\pm$ 0.71	0.10 $\pm$ 0.30	0.65 $\pm$ 0.97
Patients with schizophrenia	0.13 $\pm$ 0.34	0.08 $\pm$ 0.28	0.11 $\pm$ 0.32	1.08 $\pm$ 0.79	0.34 $\pm$ 0.57	1.69 $\pm$ 1.22

\* $P < 0.050$  level, \*\* $P < 0.060$ , SD: Standard deviation



**Figure 1.** Mean of incorrect repetitions in patients with schizophrenia and controls



**Figure 2.** Total erred phonemes in patients with schizophrenia and controls

Lack of reintegration process in nonword repetition task might reveal deficit in verbal WM.<sup>9</sup> This process may underlie the deficit of patients with schizophrenia while repeating nonwords. Moreover, these patients show deficits in auditory perception<sup>17</sup> which can cause weaker performance on verbal repetition tasks.<sup>11</sup> Interaction of deficits in verbal WM and auditory perception needs to be studied still.

Lexicalization errors were seen twice more in patients with schizophrenia. This may be attributed to deficit in cognitive control processes.<sup>18</sup> Phonologically similar words may compete with nonwords during a repetition task and should to be inhibited, otherwise lexicalization takes place.

Contrary to people with classical and extrasylvian aphasia, patients with schizophrenia did not show significant difference in word repetition compared controls. It is acknowledged that, in milder cases of classical aphasia and extrasylvian aphasias, word repetition may be preserved. On the other hand, according to Hoffman et al. sentence repetition was significantly more impaired in hallucinating schizophrenic patients than normal subjects and non-hallucinating patients. However, normal subjects and non-hallucinating patients did not significantly differ from each other.<sup>19</sup> Investigating word, sentence, and nonword repetition in subtypes of schizophrenia may

have clinical implications.

There is very little known about verbal repetition ability in patients with schizophrenia. Although this report might not have clinical use, it will add information about cognitive deficits associated with these patients. However, this preliminary study had some limitations; while all patients in this sample received atypical antipsychotics, it is known that atypical improve the cognitive function in these patients.<sup>20</sup> Drug naive patients with schizophrenia may show different performance in verbal repetition. Stratified sampling may be needed to compare subtypes of schizophrenia.

### Conclusion

Patients with schizophrenia showed deficits in repetition task of nonwords which was dominant in longer nonwords. This is attributable to the phonological loop of the WM. They also showed more lexicalization errors than normal people. Investigation of usefulness of verbal repetition in routine clinical assessment, as its usefulness in aphasia assessment is suggested.

### Conflict of Interests

Authors have no conflict of interest.

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