

Comparison of emotional and non-emotional word repetitions in patients with aphasia

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Abstract

Background: Aphasia is a language disorder caused by left hemisphere damage. For treatment of aphasia, in some of therapeutic approaches, the right hemisphere (RH) abilities, such as, emotional perception, is used for stimulation of the language process in the left hemisphere. The aim of this study is to investigate emotional word repetition in aphasia after a stroke, in Persian language patients.

Materials and Methods: Fifteen aphasic patients (eleven male and four female) between 45 and 65 ($58/4 \pm 7/8$) years of age, participated in this cross-sectional study. A list of 20 emotional words and a list of 20 neutral words as stimuli were prepared and the patients were asked to repeat each word after five seconds; if a patient needed to repeat a word again, it was repeated for him/her again, and the total score for each subject was calculated. The paired *t*-test was used to test group mean differences and the significant level was 0.05.

Results: The mean and standard deviation for emotional word repetitions were 6.93 ± 1.72 and for non-emotional word repetition was 7.10 ± 2.23 , and the *P* value = 0.892, thus, no significant difference between emotional and non-emotional word repetitions was noticed. The mean and standard deviation for the positive emotional word repetitions were 3.53 ± 3.29 and for negative word repetitions were 3.40 ± 3.56 , (*P* = 0.751), with no significant difference between positive and negative emotional word repetitions.

Conclusion: Despite the main hypothesis that the right hemisphere is involved in the processing of emotions, it can be stated that both hemispheres are involved in the processing of emotional words, albeit in a different and probably complementary manner.

Key Words: Aphasia, emotional word, repetition

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INTRODUCTION

Aphasia, a severe impairment of language production and comprehension, arises as a result of focal brain damage and cerebrovascular accidents affecting the left hemisphere, which produce deficits in different aspects of the language. Aphasia is characterized by impairments in speech, auditory comprehension,

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reading, writing, anomia or word retrieval deficit, and repetition disorders.^[1,2] Statistics regarding the incidence of aphasia and the various subtypes of aphasia are variable, due to subject sampling and description methods.^[1] As many as a quarter of the people, following a stroke, are diagnosed with aphasia.^[3-5]

Aphasia rehabilitation has a long history, as well as a use of many methods for rehabilitation of expression and reception of language disorders.^[6] In rehabilitation of aphasia, speech-language pathologists have two major objectives: (1) Using intact skills and capacities, (2) transferring therapeutic materials to the real world setting. In order to reach the first objective, some of the therapeutic methods use functions of the intact right hemisphere to stimulate the impaired left hemisphere (LH) (such as, the use of melodic intonation in therapeutic exercises). Furthermore, to gain the second objective, materials that act as language facilitators are used.^[1,2,6] On the basis of Jackson's hypothesis, some aphasic patients may produce speech under a high emotional condition better than when propositional speech is used.^[7]

Humans always use words to convey emotions in their everyday lives. The choice of emotional words completes communication, as they express the speaker's opinions and feelings, which add to the semantic referent of a given word, making the communication more humane. Emotional words are characterized by two features: 'Valence' and 'Arousal'. Valence (or evaluation) varies from negative to positive and is defined as a measure of how pleasant or unpleasant a stimulus is,^[8] whereas, arousal or activation, ranges from calm to highly arousing and is defined as a measure of how intensely a person would want to approach or flee from a stimulus.^[9] Some researchers have demonstrated differences in the processing of emotional words, as compared with neutral words. Taking into consideration the fact that the left hemisphere (LH) is more efficient at language processing and the right hemisphere (RH) is often reported to be involved in the processing of emotions,^[10] in this study, we use word repetition as a task to assess the effect of emotionality of the stimuli on language production, in aphasic patients.

For the elicitation of language expression, researchers use several methods, such as, picture description, storytelling, and a direct question or conversation. However, the use of these methods involves many linguistic processes and the researcher cannot control these variables. One of best methods for research on speech output is the use of word repetition. This skill, although it has no role in daily conversation, is important in some therapeutic methods, and is the

primary step of various methods, such as, Melodic Intonation Therapy, Helm Elicited Language Program for Syntax Stimulation, Language-Oriented Therapy, and the Schuell's Stimulation Approach.^[1,2]

Ramsberger used emotional and non-emotional word repetition in 20 aphasic patients and demonstrated that patients significantly repeated emotional words better than non-emotional words.^[11] The aim of this study was to investigate the emotional word repetition in aphasia after a stroke, in Persian language patients.

MATERIALS AND METHODS

Fifteen aphasic patients (eleven male and four female), with ages ranging from 45 to 65 ($58/4 \pm 7/8$) years, participated in this cross-sectional study. The inclusion criteria for the subjects were: Right handedness, Persian native language, primary degree education, normal hearing and vision (with or without aid), aphasia, had to be six months post stroke at time of study, and the site of lesion in all patients had to be in the left hemisphere on the basis of the results of neuroimaging (MRI or CT scan) data and interpretation of the neurologist. Patients with severe auditory comprehension deficits and severe verbal apraxia were excluded from study. The Ethical Committee of the Tehran University of Medical Sciences approved this study. All of the patients filled the consent form before conducting the study.

This study was done in two stages: The first phase involved preparation of a list of emotional and neutral words and the second phase involved execution of the test.

In order to prepare a list of emotional words, the emotional and non-emotional words were developed using the following procedure. First, we developed (counseling with linguistics), a 100-word list of monosyllabic and high frequency of words.^[12] To determine the emotionality of the words, the list, with a seven-point score (rating 1-7), was presented to 30 neurologically normal, Persian speaking persons, between 36 and 60 years of age. The score of 1 was for low emotionality and 7 for high emotionality. The words with 5 to up score were considered as emotional words and all of words with fewer than 3 were considered as non-emotional. We prepared a list of 20 emotional words and a list of 20 neutral words as stimulus. All of the emotional words were abstract, while the non-emotional words were composed of concrete and abstract words. Also, the emotional words were divided culturally into positive (a positive emotion was one that involved a positive evaluation of the word or object, a positive type of motivation, and an agreeable feeling,

e.g., happy) and negative (a negative emotion involved a negative evaluation of the word, and an unpleasant feeling, e.g., sad) words.

In the second phase, in order to determine aphasia, the Persian Aphasia Test was used, as well as the informal assessment, to distinguish it from verbal apraxia.

Subsequently, each patient was presented with stimuli, at a comfortable level of listening, and they were asked to repeat each word after five seconds. In case a patient needed to repeat a word again, the word was repeated again. To score the repetition responses, the following format was used, 1 = the target word was repeated correctly, 0 = the target word was not repeated correctly and produced semantic paraphasia or neologism and verbal paraphasia. Finally, we calculated the total score for each subject. The paired *t*-test was used to test the group mean differences and significant level was 0.05 in this study.

RESULTS

The demographic characteristics of the patients are shown in Table 1. The mean and standard deviation for emotional word repetitions was 6.93 ± 1.72 and non-emotional words repetitions was 7.10 ± 2.23 , and the *P* value = 0.892, and there was no significant difference between emotional and non-emotional word repetition [Table 2].

DISCUSSION

The results of this study indicate that there is no significant difference between emotional and neutral word repetition, and also, there is no significant difference between the positive emotional words getting processed in the left hemisphere and negative emotional words getting processed in the right hemisphere. Ramsburger, in his study, has indicated that aphasic patients repeat emotional words better than non-emotional words, but this difference is not significant.^[11] In another study that investigates the effects of emotionality on auditory comprehension in aphasia, the results show a significantly better performance on emotional words rather than non-emotional words.^[13]

In his study, Landis has shown that emotional words process significantly faster than neutral words in oral reading and writing tasks.^[14] The possible reasons for this difference between our study and these studies is that we have investigated the output of language, whereas, the first study deals with the input of language, and in Landis's study, the visual aspects of language are assessed.

Table 1: Demographic characteristics of participants

Subject	Age	Sex	Site of lesion
1	65	M	LH
2	60	M	LH
3	65	M	LH
4	62	M	LH
5	63	M	LH
6	65	F	LH
7	45	M	LH
8	61	F	LH
9	53	M	LH
10	57	M	LH
11	45	M	LH
12	62	F	LH
13	56	M	LH
14	45	F	LH
15	65	M	LH

LH: Left hemisphere

Table 2: Comparison of emotional and non-emotional word repetitions in aphasic patients

Type of words	N	Mean	Standard deviation	P value
Emotional words	15	6.93	1.72	0.892
Non-emotional words	15	7.10	2.33	
Positive emotional words	15	3.53	3.29	0.751
Negative emotional words	15	3.40	3.56	

The first hypothesis of this study was based on a dual-process model for the processing of words, with emotional meaning, in the cerebral hemispheres. The right hemisphere hypothesis suggests that the RH has a greater role in processing emotional information than does the LH; and the valence hypothesis states that LH is more involved in positive emotions and the RH in negative emotions,^[10] but the findings of this study was not in agreement with this hypothesis.

Recent research, on basis of behavioral, electrophysiological, and neuroimaging methodologies, indicates that both hemispheres are involved in the processing of emotional words, albeit in a different and probably complementary manner,^[10] thus our findings are adapted to recent hypothesis.

Another reason for the difference between this study in the Persian language and other studies may be because of the differences between the two structures of language and culture. Studies have shown that western and eastern cultures have distinct differences in emotional expressions with respect to hemifacial asymmetry; the eastern population showed right hemifacial bias for positive emotions, while the western group showed left hemifacial bias to both negative and positive emotions.^[15]

Also, in recent times, the valence and arousal of the 12 most popular keywords on emotional expressed on the microblogging site 'Twitter' were measured using Latent Semantic Clustering in three geographical regions: Europe, Asia and North America. It was demonstrated that the valence and arousal levels of the same emotional keywords differed significantly with respect to these geographical regions — Europeans are (or at least present themselves as) more positive and aroused, North Americans are more negative, and Asians appear to be more positive, but less aroused, when compared to the global valence and arousal levels of the same emotional keywords (Bann and Bryson). This shows that the emotional differences between the western and eastern cultures can, to some extent, be inferred through their language style.^[16,17]

CONCLUSION

Although there is confirmed evidence that emotion is processed in the right hemisphere and language is dominantly processed in the left hemisphere, the present study indicates that in aphasia following left hemisphere damage, emotion processing is involved. Hence, both hemispheres are involved in the processing of emotional words, although in a different manner.

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