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SYNTACTIC PRESERVATION IN DEMENTIA

Синтаксичні збереження при деменції

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Abstract

With aging, some cognitive diseases like dementia arise. There are different types of dementia. The most common one is Alzheimer's Disease (AD). AD has two subtypes one of which is early-onset Alzheimer's disease (EAD). EAD affects people younger than age 65, but the starting age can be as early as twenty. In this study, EAD patients and healthy people were compared. According to the results, EAD patients produced similar amount of coordinated and compound sentences. However, in cookie-theft and random speech test use of compound sentence; in story-picture sequencing and random speech use of coordinated sentences were statistically significant.

Key words: *syntactic ability, early-onset Alzheimer's disease, sentence types.*

Introduction

Dementia is an acquired condition which involves multiple cognitive impairments that are sufficient to interfere with activities of daily living (Barkof & Buckem, 2016). There are different types of dementia that are based on pathophysiology and patterns of neurocognitive impairment that are demonstrative of the neural networks involved. The most frequently observed type of dementia is Alzheimer's Disease (AD) (Wischenka, Marquez & Felsted, 2016).

AD has two subtypes: early-onset and late-onset Alzheimer's disease. The term early-onset Alzheimer's disease (EAD) identifies patients who *meet criteria*

for AD, but show onset of symptoms before the age of 65 (Migliaccio Agosta, Possin, Canu, Filippi, Rabinovici, et al., 2016). EAD differs in the areas of the brain which are targeted, rather than only in the rate of progression. EAD patients appear to be hit harder in attention-related areas of memory, while the late onset patients appear to have more damage in areas related to recall and recognition (Kensinger, 1996). There have been conflicting results in literature regarding the patterns of cognitive dysfunction in EAD and LAD, but taken together results of these studies seem to suggest that EAD patients have more prominent difficulties in non-memory domains which include language, visuospatial skills, and executive functions (Joubert, Gour, Guedj, Didic, Guériot, Koric, et al., 2016).

Linguistic problems are one of the most important problems seen in individuals with AD. Word finding difficulties, problems in phonetic and syntactic use, writing disorders etc. are linguistic problems observed in patients with AD. These problems can differentiate in relation to the stages of AD. Patients with AD who have word finding difficulties, verbal fluency problems, comprehension difficulties in written and spoken language in the early stage of the disease, then have severe problems about verbal fluency, comprehension problems and difficulties in repetition especially in the moderate and severe AD. In the last phase of the AD, word repetition problems are observed at a serious level and language problems go as far as mutism (Ferris & Farlow, 2013: 1008). Several kinds of language functions were described as more severely deteriorated in early rather than late-onset patients. However, other studies reported more profound language dysfunctions in late-onset patients (Imamura, Takatsuki, Fujimori, Hirono, Ikejiri, Shimomura, et al., 1998).

In this study, it was aimed to find out if the use of coordinated and compound sentence structures of EAD patients was similar to the people with normal aging and to compare the results within four different language tests.

Methods and Techniques of the Research

In order to decide the number of the patients which was going to include to this study, a power analysis was performed and it was revealed that this study could be done with the number of 23 patients with EAD. These patients were diagnosed as mild or moderate EAD.

In order to evaluate their syntactic ability, four different language tests were implemented: Picnic Picture Description Test (from Western Aphasia Battery, Revised: Kertesz, 2007), Cookie Theft Picture Description Test (from Boston Diagnostic Examination of Aphasia: Kaplan, Goodglass & Weintraub, 2001), Story Picture Sequencing Test and Random Speech Test.

After a ten minute interview, all data was transcribed based on the DuBois' discourse transcription symbols (1993). In their speech just coordinated and compound sentences were analysed (just grammatically acceptable sentences).

In order to reveal the effect of illness on the syntactic ability of EAD patients and to make a comparison within groups (EAD-Control Group(CG)) Qui-square test was used and to check if there was a statistically significant difference between EAD and CG median test was used.

Results

Firstly, the demographic features of the EAD patients and CG were compared and it was revealed that there was no significant difference within groups (Age: $p > 0,292$; Gender ♀: $p > 0,331$; Education: $p > 0,390$). It meant that these participants were suitable for the comparison. Secondly, the number of the sentences that EAD patients and CG produced was calculated. According to the results, the number of the sentences that EAD patients produced was different from test to test. In picnic picture description test they produced 88 sentences, in cookie theft picture description test 177 sentences, in story-picture sequencing test 214 sentences and in random speech test 188 sentences. Compared to EAD patients, CG produced more sentences (Picnic picture: 265 / Cookie theft: 230 / Story-picture sequencing: 293 / Random speech: 245). Comparisons showed that the difference between EAD and CG was statistically significant ($p < 0,005$) and CG produced more sentences compared to EAD patients.

After analysing the number of sentences, it was aimed to evaluate the sentence types that all groups produced in four different language tests. In general the number of the coordinated and compound sentences were similar which refers that the syntactic ability is a preserved ability in AD. However, in cookie-theft picture description test and in random speech test the difference about the use of compound sentences was statistically significant ($p < 0,011$ / $p < 0,021$). The use of coordinated sentences was also statistically significant in story-picture sequencing test and

random speech test ($p < 0,006$ / $p < 0,035$). To conclude, the syntactic ability of EAD patients was also preserved especially about the use of coordinated and compound sentence types. In these tests, EAD patients produced much less coordinated and compound sentences but in general usage, the amount of these sentence types were similar to CG.

Lastly, these sentence types were compared within tests. Considering these comparisons, it was found out that EAD patients produced more coordinated sentences in picnic picture description test and random speech test (29,8%) and less coordinated sentences in cookie-theft picture description test and story-picture sequencing test (20,2%). Related with the compound sentences, EAD patients produced more compound sentences in story-picture sequencing test (40,0%) and less compound sentences in cookie-theft picture description test. The same analysis was done for the CG. According to the results, CG produced more coordinated sentences in picnic picture description test (32,0%) and less coordinated sentences in cookie-theft picture description test (20,4%). Related with the compound sentences, CG produced more compound sentences in cookie-theft picture description test (27,3%) and less compound sentences in story-picture sequencing test and random speech test (26,3%).

Conclusion

This study investigated the syntactic abilities of early-onset Alzheimer's disease. First of all, the number of sentences used both EAD patients and CG were analysed and it was revealed that the speech amount of EAD patients was not the same as CG in all four language tests. EAD patients produced less sentences compared to the people with normal aging. As the deterioration in EAD is much deeper, the ability of using different sentence types becomes difficult for these patients. Due to this, EAD patients try to use less words while describing something or talking.

The other finding was about coordinated and compound sentences. First, the number of coordinated and compound sentences that EAD patients produced was compared to their aged matched peers. Then, in both groups these sentence types were compared within tests. In the first comparison, by considering the general performance, it was found out that the syntactic ability of EAD patients was preserved. However, in some tests the production of these sentence types differed

from the people with normal aging. It is known that AD patients have working memory problems due to the deficits in neural interconnections between the posterior and frontal brain areas (Altmann & McClung, 2008). Working memory has a role in sentence processing and provides linguistic information for this process (Sung, Kyung & Hyang, 2013). Memory problems can also be the reason of difficulties in sentence comprehension and sentence production (Altmann & McClung, 2008). Some studies related to sentence processing indicate a left-temporal network for syntactic processing and bilateral temporo-frontal networks for semantic processing (Lukic, Bonakdarpour, Ouden, Price & Thompson, 2013).

The last finding was about EAD patients' performance about four language tests which were related with picture description and spontaneous speech. These comparisons showed that EAD patients produced more coordinated sentences in picnic picture description test and random speech test; more compound sentences in story-picture sequencing test. Their performance was bad at cookie-theft picture description test. Cookie theft picture description test is a complex test which makes comprehension difficult for EAD. Brain atrophy can also be the reason of their poor performance on this test.

In literature, there are also some studies which examine the syntactic ability of EAD patients. However, not all of these studies are related with sentence production. They are also related with comprehension of different sentence structures. In one of these studies, it was mentioned that EAD patients were essentially impaired on word production while comprehension was typically affected at more advanced stages of the disease. And also it was stated that not all aspects of language were impaired in AD; phonological processing and syntax were generally preserved, at least in the early stage (Rainville, Caza, Belleville & Gilbert, 2007).

In other studies, different sentence structures were analysed and it was revealed that EAD patients tended to use more nominal sentences compared to verbal sentences (Can & Kuruoglu, 2017; Can & Kuruoglu, 2018). In another study, it was stated that LAD patients preferred to use basic sentences more in their speech compared to the people with normal aging (Can, Kuruoglu & Ozsoy, 2018). About the coordinated and compound sentences, LAD patients were analysed and similar findings were found out. The use of coordinated and compound sentence structures were similar to healthy subjects (Can & Kuruoğlu, 2019).

To conclude, the syntactic ability of EAD patients is mainly similar to the people with normal aging. It is a clear fact EAD patients can still use coordinated and compound sentence structures despite their diagnosis about AD and the stage of their illness. Future studies about other sentence structures may reveal different findings about EAD patients' syntactic ability.

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