2020-03

Linguistic Deficiencies in Primary Progressive Multiple Sclerosis

Sofologi, Maria

Research Article

iMedPub Journals
www.imedpub.com

Dual Diagnosis :Open Access
ISSN 2472-5048

2020
Vol.5 No.1:3

DOI: 10.36648/2472-5043.5.1.3

Linguistic Deficiencies in Primary Progressive Multiple Sclerosis

Maria Sofologi[1*], Euaggelia Markou[2], Georgios Kougioumtzis[3], Afroditi Kamari[4], Anastasia Tsanidou[5], Georgia-Nektaria Porfyri[6], Sofia Vavetsi[6] , Sofia Giannoglou[6], Maria Efstratopoulou[7], Eleni Tsiviki[8], Eleni Bonti[6] and Dimitrios Tachmatzidis[9]

[1]Department of Psychiatry, University of Thessaloniki, Thessaloniki, Greece

[2]Department of Special Education, European University of Cyprus, Cyprus, Greece

[3]Department of Turkish Studies, Kopodistrian University of Athens, Athens, Greece

[4]Department of Bioethincs, Democritus University of Thrake, Komotini, Greece

[5]Department of Neuroscience in Education, University of Macedonia, Thessaloniki, Greece

[6]Medical School, 1st Psychiatry Clinic, Aristotle University of Thessaloniki, Thessaloniki, Greece

[7]Bishop Grosseteste University, School of Social Sciences, Lincolnshire, United Kingdom

[8]Depatment of Criminology, University of Nicosia, Cyprus, Greece

[9]Neapolis University of Pafos, Cyprus, Greece

[*]**Corresponding author:** Maria Sofologi**,** Department of Psychiatry, University General Hospital of Thessaloniki AHEPA, Thessaloniki, Greece, E-mail: msofolo@yahoo.gr

Received date: February 27, 2020; **Accepted date:** March 12, 2020; **Published date:** March 19, 2020

Citation: Sofologi M, Markou E, Kougioumtzis G, Kamari A, Tsanidous A, et al. (2020) Linguistic Deficiencies in Primary Progressive Multiple Sclerosis. Dual Diagn Open Acc Vol.5 No.1:3.

Abstract

The aim of the present study is to investigate the linguistic profile of patients with Primary Progressive Multiple Sclerosis (PPMS) in relation to linguistic deficits associated with specific brain areas. Ten adults with PPMS were tested for the needs of the study and compared with healthy participants. The Boston Aphasia Naming Test, namely the tasks of listening comprehension, repetition, and reading comprehension, were administered. Results showed that the group of participants with PPMS had significantly lower performance in the above-mentioned tasks of comprehension compared to the control group. The findings are discussed.

Keywords: Multiple sclerosis; Relapsing-remitting MS; Primary progressive multiple sclerosis; Secondary progressive multiple sclerosis; Linguistic deficits; Response time; Cerebrospinal fluid

Introduction

Multiple Sclerosis (MS) is a chronic multifactorial neurological disease that appears to affect mainly young adults. It is the most common neurological disease [1]. MS behaves as an autoimmune disease. This term is used when the organism does not recognize some tissues for its own and attacks them causing damage. MS is characterized by acute and chronic damage to the white matter, inflammation of the white matter in which there are residues of mononuclear filtration, which consist mainly of T-cells and macrophages. As a result of this inflammatory process, demyelinating neurons occur. Re-myelination is possible from cells derived from progenitor forms of oligodendrocytes. MS is actually a demyelinating disease that has as a predominant element the recurrent focal and multifocal attacks of the central nervous system (CNS) in an unchanging and unpredictable manner [2]. MS is characterized by acute and chronic lesions of the CNS white matter. The name derives from the multiple plaque regions that characterize the disease process [3].

Literature reveals that several pathophysiological processes, such as inflammation, demyelinating, neuronal axial damage-degeneration, gliosis, and cell repairing mechanisms contribute to the complex manifestation of disease [4]. Over time, these processes do not occur in a strict linear order in all patients and may selectively dominate at different stages of the disease and in specific patients. This finding results in the observed heterogeneity and individualization in the phenotypic expression of the disease, in the prognosis and finally in the proper response and implementation to protocol treatments. It is worth noting that personalized recognition and treatment of MS could be conducted using biological markers that would help identify the dominant mechanisms that will eventually lead to the selection of the appropriate therapeutic regimens in selected patient populations. Taking into consideration the above, it is highly important the detection, assessment and treatment of

neuronal axonal damage, as a turning point of the disease, associated with the onset of increased disability. It is precisely this neuro-axial degeneration that is associated with patients' cognitive deficits

Neuro-axial degeneration is not, of course, solely associated with MS. Many diseases, such as Alzheimer's disease, Lewy body dementia, musculoskeletal sclerosis, and multiple system atrophy are characterized by the release of several constituents of the cytoskeleton into the extracellular space. Some of these constituents are nervios .From the extracellular space, these nervios are channeled to the cerebrospinal fluid (CSF) and gradually into the blood stream. Thus, CSF analysis can identify this biomarker, which in turn reflects the extent and rate of pathological changes that are associated with these neurodegenerative disorders [5-7].

Many research studies reveal that patients with MS show that apart from other physical manifestations there are also various cognitive disorders associated with MS. It is noted that cognitive deficits appear from the early stages of the disease and are reported to be considered as one of the primary manifestations of the disease. The relation between cognitive deficits, namely between executive functions, memory and attention, and MS was confirmed in a recent study by Baysal et al. In addition, it is found that the percentage of patients with cognitive impairment in MS is estimated at 40%-70% and depends on the population under study, the tasks and the cut-off values that were used. The cognitive domains that are most affected by MS are memory capacity, mainly in the retention of new information, the speed of processing information with a subjective sense of slow thinking, difficulty in receiving information from multiple sources at the same time, and in the execution of a dual task. Also, there are slow implementation difficulties, with the inability to organize, design and prioritize. Finally, visual processing is affected: it is difficult to distinguish between right and left, difficulty navigating and reading charts [8-10].

Similar studies reveal similar relational patterns between cognitive disorders and MS. In particular, studies reveal association of cognitive deficits, and language deficits in patients with RRMS. There are also studies that explore the comparison of patients' performance in cognitive tasks in the early stages of MS with patients in a more advanced stage (RRMS vs. SPMS). Finally there are also studies that compare cognitive task performance in patients in four different stages of MS [11-18].

While exploring the field of cognitive deficits in patients with MS, it should be noted that it has been found that, although there are several studies investigating the neuropsychological profile of patients at different stages of the disease, research into language deficits appears to be limited, to the best of our knowledge [19]. Therefore, present research attempts to explore speech disorders in patients with PPMS, that is, to investigate possible speech and verbal production disorders in patients with this diagnosis (EDSS rating>4). In particular, this study investigates linguistic deficits and their relation to discourse centers. Our hypothesis is that patients with primary onset diagnosis would be less likely to perform in linguistic tasks compared to participants in the control group. In MS the infestation is subcortical and the arcuate fasciculus, which connects Broca and Wernicke regions, acts subcortically. Possibly, subcutaneous activation of the two areas of speech may affect participants' performance with MS. In addition, we assumed that the performance of the participants in the experimental group would not be affected by the participants' educational level [20].

Method

Ten patients diagnosed with MS (6 males, 4 females) (M=47 years, STD=10.27) and ten participants (5 males, 5 females) were included in the study (M=30 years and STD=5.57). All patients with MS came from the urban main canter of Thessaloniki, GR and were monitored by a private neurologist **(Table 1).** The first diagnosis of the disease was made ten years ago, before the research was conducted. By that time, all patients received proper prescribed medication. The examination of the participants of the two groups took place in a private place, in a predetermined meeting, after personal communication with them. All participants signed a statement of consent/ participation in the research. Prior to the start of the main examination, participants were informed that the research was anonymous and they could stop the examination or withdraw/ cancel at any time without any charge.

Table1: Demographic characteristics of healthy participants and PPMS patients.

	Age		Education	
	Mean	S.D	**Mean**	S.D
Healthy participants	30	5.57	12.3	0.9
Primary progressive MS Patients	47	10.27	12.1	0.7

Assessment Instruments

The Boston Aphasia Naming Test was addressed for the purpose of the study, in order to assess the linguistic competence of the participants [21]. In particular, auditory comprehension, repetition skill, and reading comprehension were assessed. These tasks presuppose the intact arcuate fasciculus, due to its connection to the Broca and Wernicke's regions while running through white matter. This is the reason that makes the arched fasciculus more susceptible and vulnerable to MS. The battery of auditory comprehension consists of three tasks. The first task is called "Touching A with B". The examiner asks the participant to point in which image (out of four) a person touches the pencil with the comb. This activity is divided into three subcategories. The first subcategory includes sentences containing "and", such as "People touch the spoon and scissors". The second subcategory refers to sentences with the code "with +", such as "Comb with pencil". The third subcategory includes non-coded sentences, such as "Touches the fork with the spoon". During the next sub-test of auditory comprehension, the participant, while viewing a picture (i.e. a child with his father), is asked to first identify who the father and

the child. Finally, the third activity in this field is called 'Embedded Suggestions'[1]. There are four pictures on each card. The examiner explains the visualization of the images and asks the examiner to show one image that describes, i.e. "The boy hits the sitting girl" and then "The girl who hits the boy is sitting". The repetition task consists out of three activities and assesses oral expression. The first activity calls for repetition of simple words, such as 'chair', the second requires repetition of pseudonyms, such as 'punch', and the third requires repetition of sentences such as 'Father comes home'. The reading comprehension tasks[2] are assessing the understanding of sentences and paragraphs. Two examples (sentences/ paragraphs with missing–deliberately omitted words) are given to the participant, in which the examiner reads each sentence and each choice and then selects the correct completion of the sentence. The participant is then asked to read (mentally, not aloud) the sentences/paragraphs given to him and to indicate their correct completion (through four possible answers). Response time was noted in these tasks (time was measured from the point where the questioning was over until the patient provided the answer). Subsequently, repetition tasks were followed and finally reading comprehension was assessed.

Results

For the purpose of the present study a T-test was conducted in order to investigate the comparison of the mean performance of the two groups. In particular, statistical test showed that in terms of acoustic comprehension it appears that the mean performance scores of the two groups differ significantly. Specifically, the t-test showed statistically significant differences in the performance of the two groups in the auditory comprehension test in the first sub-test (p=0.01), in the third test (p=0.005), while no statistically significant difference was found between the mean scores of the two groups in the second sub-test of auditory comprehension. There was a statistically significant difference between the two groups (p=0.01) regarding the mean difference in the repeated test. Finally, a statistically significant difference in the means of the two groups showed a statistical difference (p=0.05). **Table 2** presents the results of comparing the mean scores of the two groups of participants.

Table 2: Mean and standard deviation between the two groups.

	Control group		Test group (MS)		
	Mean	Std	Mean	Std	P
Auditory comprehension	29.7	1.59	26.37	4.68	0.05
Repetition	24.3	3.12	23.68	2.19	0.01
Reading comprehension	8.9	0.91	7.94	1.78	0.05

Discussion

Current literature presenting cognitive deficiencies in patients with MS is limited and typically refers to cases of patients with an acute aphasic syndrome during the progression course of the disease. At the same time, MS is found to be associated with mild or moderate impairment of higher cognitive functions, whereas dementia or impairment of specific cortical functions, such as speech disorders, is less common [22]. Mental disorders in patients with MS account for 43%-59% and mainly affect the thinking and ability of reasonable conclusions. Cognitive disorders are usually present in patients who have been ill for many years, but can also occur in the early stages of the disease, even as a first symptom. Furthermore, the extent of demyelination is related to the severity of mental disorders.

In addition, one of the most common problems that patients present is finding the right word. A reasonable number of patients (20%-42%) have impaired spontaneous recall of verbal and visual information. Significant amount has been observed in tasks that control immediate recall from long-term memory, whereas recent memory appears to be unaffected. There are a large number of patients with attention disorders, especially on complex issues, as well as slower processing of the information given to them. Studies have shown reduced ability to problem-solving, to classify elements or prioritize tasks. In addition, studies have shown that severe visual agnosia and aphasia can occur in MS. These patients have slower response time in speech tasks and they perform more errors than the control group in naming and reading tests. Similar findings show difficulty in understanding sentences and delay in response time [23].

Conclusion

While, as stated before, current literature is very limited regarding mainly linguistic deficiencies in patients with MS, this study attempts to illustrate specific language deficits in patients with MS. Our findings show a deficiency in sentence comprehension as well as auditory comprehension. One of the main limitations of this research was the inability to accurately record the response time of the participants in order to measure the processing time of the information. The speed of information processing seems to be related to the function of the frontal lobes. Finally, it would be interesting to study the different types of multiple sclerosis in order to illuminate the field of linguistic deficits and to record the linguistic deficits present in different manifestations of the disease.

References

1. Benedict RH, Weinstock GB, Fishman I, Sharma J, Tjoa C , et al. (2004) Prediction of neuropsychological impairment in multiple sclerosis: Comparison of conventional magnetic resonance

imaging measures of atrophy and lesion burden. Arch Neurol 61(2): 226-230.

2. Polman C, Reingold S, Banwell B, Clanet M, Cohen J, et al. (2011) Diagnostic criteria for multiple sclerosis: 2010 revisions to the McDonald Criteria. Annals Neurol 69(2): 292-302.
3. Pugliatti M, Rosati G, Carton H, Riise T, Drulovic J, et al. (2006) The epidemiology on multiple sclerosis in Europe. J Neurol 13: 700–722.
4. Gunnarsson M, Malmestrom C, Axelsson M, Sundstrom P, Dahle C, et al. (2011) Axonal damage in relapsing multiple sclerosis is markedly reduced by natalizumab. J Ann Neurol 69(1): 83-89.
5. Abdo WF, Bloem BR, Van Geel WJ, Esselink RA, et al. (2007) CSF neurofilament light chain and tau differentiate multiple system atrophy from Parkinson's disease. Neurobiol. Aging 28(5): 742-747.
6. Perrot R, Eyer J (2009) Neuronal intermediate filaments and neurodegenerative disorders. Brain Res Bull 80(4-5): 282-95.
7. Singh P, Yan J, Hull R, Read S, Sullivan J, et al. (2011) Levels of phosphorylated axonal neurofilament subunit H (pNfH) are increased in acute ischemic stroke. J Neurolo Sci 304(1-2): 117-121.
8. Schulz D, Kopp B, Kunkel A, Faiss JH (2006) Cognition in the early stage of multiple sclerosis. J Neurol 253(8): 1002–1010.
9. Baysal kL, Ekmekçi Ö, Yüceyar N, Sağduyu Kocaman A (2014) Assessment of early cognitive impairment in patients with clinically isolated syndromes and multiple sclerosis. Behavi Neurol 44: 1-5.
10. Chiaravalloti ND, DeLuca J (2008) Cognitive impairment in multiple sclerosis. J Neurol 7(12): 1139-1151
11. Deloire M, Ruet A, Hamel D, Bonnet M, Brochet B (2010) Early cognitive impairment in multiple sclerosis predicts disability outcome several years later. Mult. Scler J 16(5): 581-587.
12. Rogers JM, Panegyres PK (2007) Cognitive impairment in multiple sclerosis: Evidence-based analysis and recommendations. J Clin Neurosc 14(10): 919–927.
13. Smestad C, Sandvik L, Landrø NI, Celius EG (2010) Cognitive impairment after three decades of multiple sclerosis. J Neurol 17(3): 499–505.
14. Amato MP, Portaccio E, Goretti B, Zipoli V, Hakiki, B, et al. (2010) Cognitive impairment in early stages of multiple sclerosis. J Neurol Sci 31(2): 211-214.
15. Kambanarosa M, Messinis V, Nasios G, Nousiac A, Papathanasopoulos P (2017) Verb–noun dissociations in relapsing-remitting multiple sclerosis: Verb eects of semantic complexity and phonological relatedness. Aphasiology 31(1): 49–66.
16. Ntoskou K, Messinis L, Nasios G, Martzoukou M, Makris G, et al. (2018) Cognitive and Language Deficits in Multiple Sclerosis: Comparison of Relapsing Remitting and Secondary Progressive Subtypes. Open Neurol J 12:19-30
17. Renaulda, S, Mohamed-Saïda, L, Macoir (2016) Language disorders in multiple sclerosis: A systematic review. Mult Scl Dis 10: 103–111.
18. Potagas C, Gigkaraki E, Koutsis G, Mandellos D, Tsirempoulou E et al. (2008) Cognitive impairment in different MS subtypes and clinically isolated syndrome. J Neurol Sci 267: 100-106.
19. Kambanaros M (2013) Does verb type aect action naming in specific language impairment (SLI)? Evidence from instrumentality and name relation. J Neurol 26: 160–177.
20. Yorkston KM, Beukelman DR, Strand EA, Bell KR (2006) Therapeutic Intervention of Neurogenic Speech Disorders in Children and Adults. Athens: Hellenic.
21. Goodglass H, Kaplan E. (1972) The assessment of aphasia and related disorders. Lea & Febiger.
22. Koutsouraki E, Balogiannis EI (2006) Mental Disorders in Multiple Sclerosis, Brain, 43 (4).
23. Lacour A, Seze J, Revenco E, Lebrun C, Masmoudi K, et al. (2004) Acute aphasia in multiple sclerosis: A multicenter study of 22 patients. Neurol 62 (6): 974 – 977.