

Therapeutic approaches to language skills in major neurodegenerative disorders: a literature review

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ABSTRACT

Major Neurodegenerative Disorders (MNDs) impact a large number of individuals globally. Individuals with neurodegenerative diseases have a significant problem due to the gradual development of communication difficulties. This is a review article to address the latest ways to manage and help individuals with language problems because of neurological diseases like Alzheimer's disease, mild cognitive impairment (MCI), and primary progressive aphasia (PPA). In the beginning we'll discuss the diseases, and then we'll be discussing how to treat them. The therapies used for Alzheimer's disease and PPA have been subject to extensive research. Therefore, the techniques follow a more structured way. However, there is a limited number of research in MCI and the strategies used in MCI mostly concentrate on enhancing the communication abilities of patients and their caregivers. There is a need for more research to increase approaches for speech and language therapy, as there is limited research on intervention in Turkish patients with MCI, PPA and Alzheimer's disease. It is critical to have evidence-based practice in MNDs, and more research is required to understand the effectiveness of speech and language therapy.

Keywords: Major neurodegenerative disorders, Alzheimer's disease, primary progressive aphasia, dementia, speech and language therapy

Major Neurodegenerative Disorders (MNDs) can be categorized based on their clinical symptoms, with extrapyramidal and pyramidal movement abnormalities, language deficits and cognitive or behavioral problems being the most prevalent [1]. Language difficulties are commonly seen in several neurodegenerative diseases, typically appearing as a prominent symptom in the early stages, as in the case of Primary Progressive Aphasia (PPA) [2]. Language impairments may also be present alongside other cognitive problems, as shown in Alzheimer's disease (AD) [3]. Recent developments

in our comprehension of the neuroscience of language have led to the revision of certain initial concepts about language recovery.

In clinical application, there are limited studies and reviews on people with MND and the speech therapy approaches that are generally used with them. So, it is very important to understand the difficulties that they have and to manage their situations. People with MND need to have speech and language therapy to preserve their speech and language abilities. Speech-language therapy is tailored to address the specific needs of these individuals. When individuals are im-

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pacted by MND, they exhibit a gradual decline in many abilities, with a significant focus on speech and language function.

This review examines the current treatment and intervention strategies for language difficulties caused by MNDs such as AD, MCI, and PPA. Firstly, we will start by explaining the diseases and then the therapy approaches will be outlined.

MILD COGNITIVE IMPAIRMENT (MCI)

MCI is a defined condition characterized by cognitive deterioration that exceeds what is often predicted for an individual's age and level of education, but does not significantly interfere with their everyday activities. Therefore, it is different from dementia, since dementia involves more severe and extensive cognitive deficits that significantly impact everyday functioning [4].

Petersen *et al.* [5] were the first to establish specific criteria for diagnosing MCI. The criteria for diagnosis are as follows: (a) subjective complaint of memory loss, (b) objective impairment of cognitive capacity, (c) preserved general cognitive function, (d) intact activities of daily life, (e) person does not fulfill criteria for dementia. Individuals who fulfill these specific requirements have a higher likelihood of getting Alzheimer's disease compared to the general population [5, 6].

For MCI assessment, the following six areas of cognition were chosen for examination: language, visual-spatial construction ability, learning and memory, complex attention, social cognition, and executive function [7]. As the language is a significant domain in MCI, Speech-language pathologists (SLPs) are very important for assessing and treating patients with MCI. They are responsible for providing cognitive-communication training or rehabilitation to patients with MCI.

The most often reported language performance impairment in patients with MCI is a decline in verbal fluency, which is assessed by asking individuals to list as many objects as they can within a certain category [8-10]. Also, when confrontational naming was assessed, it was evident that they have difficulty in naming objects, famous people and buildings [11]. It is very important to notice and determine the changes in language characteristics of MCI patients and create

specific therapeutic programs for them.

There are limited studies in the Turkish language conducted with Turkish speaking MCI patients [12]. As a result of their study, they found that nonword repetition test and narrative comprehension, and story grammar scores were significantly different between a MCI patient and healthy aging participants.

Traditionally, language intervention has aimed to enhance the communication skills of individuals. Language difficulties are a substantial problem for most individuals with MNDs, especially as the condition progresses. Initial indicators of communication impairment appear as challenges in word retrieval, especially with terms associated with known individuals or items [13].

Assessment and speech-language therapy for MCI can be varied according to the patients and their daily lives. There are some specific language therapy options, speech-language therapists (SLTs) can offer cognitive-communication training or rehabilitation to individuals with MCI and early-stage dementia caused by AD. Speech and language therapy aims to assist patients in managing their condition, enhancing their functional abilities, improving their quality of life, and preparing them for future decline. [14, 15]. Recent research indicates that cognitive rehabilitation may extend the duration of independence in patients with MCI [16]. Many individuals with dementia reside in their home environment and get aid and supervision from caregivers. Therefore, it is better to educate patients' caregivers and provide counseling activities to patients with MCI or dementia who are residing in the community [17].

Also, engaging in discussions about long-term planning is crucial for all patients, particularly older adults, and especially those who may be dealing with a progressive illness. This ensures that their care aligns with their desired outcomes. The primary responsibility for conducting these discussions will usually fall on the patient's primary care clinician or social worker, while the SLT can provide valuable assistance and support.

SLTs have access to several methods to assist patients in properly expressing their desires. They might also use strategic planning as part of their therapeutic objectives. Given that the patient resides in the community, the objectives should prioritize enhancing safety within their home environment and facilitating

their normal activities. Goals may also prioritize the development of augmentative and alternative communication (AAC) techniques, such as Memory Books. Initiating the creation of mnemonic devices at an early stage can perhaps alleviate the apprehensions of individuals who are apprehensive about their future memory and communication abilities. Formal dementia-based caregiver training programs can be beneficial for caregivers, such as family members and friends, since they provide assistance for readiness and long-term care. SLTs can also assist by offering communication partner training.

While the SLT does not have the responsibility to directly treat psychological conditions, it is suitable and beneficial for the SLT to anticipate and recognize these emotions. The SLT should create a secure environment for the patient to express their feelings, particularly when they are related to their cognitive-communication objectives. Additionally, the SLT should be aware of when and where to refer the patient for assistance. SLTs can assist the patient in addressing grief by working together to establish cognitive-communication objectives that prioritize reducing distress and enhancing resilience, functionality, safety, and purposeful existence.

ALZHEIMER'S DISEASE (AD)

Cognitive-communication impairments are a significant feature of AD, and communication difficulties can arise as early as the first stage of the condition [18]. Impairments in the areas of language comprehension and expression are associated with memory and other forms of cognitive decline [19]. According to Bayles *et al.* [20], the cognitive communication problem that occurs in AD is characterized by severe deficiencies in identifying, describing, writing, and pragmatics. These deficits are dependent on the progression of the disease. The deterioration of this language seems to follow a hierarchical pattern, where the language forms that are learnt last in the order of language development deteriorate first [21].

In the early-stages of dementia caused by AD, language abilities and other cognitive abilities are addressed in order to assist patients in managing their condition, optimizing their functional abilities, enhancing their quality of life, and preparing for future

deterioration [14, 15]. Early stages are distinguished by anomia repetitions, and periphrasis, whereas aphasic-like language develops later in the course of the disease [22]. Semantic mistakes (e.g. trouble choosing the right word, limited vocabulary) are common [23], and semantic [24] and letter fluency [25] issues may be noticed. As the disease progresses, all language modalities are affected.

Morello *et al.* [26] investigated the impacts of non-pharmacological interventions on individuals with AD. Their study results indicated that lexical-semantic approaches and treatments that target multiple cognitive domains, including language, are potentially efficacious. Recent research has shown significant advantages of language rehabilitation on its own, as well as when combined with other cognitive activities. The studies that demonstrated more significant improvements were the ones that employed comprehensive language-cognitive intervention programs [27-30].

The limited amount of data on dedicated language rehabilitation may be attributed to the lack of research that specifically targets language therapy and compares them to broad cognitive interventions. Future research should prioritize the investigation of exclusive language rehabilitation and the comparison of language and cognitive therapy methodologies.

PRIMER PROGRESSIVE APHASIA (PPA)

PPA is a subtype of dementia that is characterized by a decline in language skills while memory remains relatively intact. Over an extended period, the primary indications and manifestations may be limited to the domain of language [31]. PPA refers to a collection of neurological conditions characterized by significant speech and language impairment [32]. The language problem seen in individuals with PPA may present as agrammatic, logopenic, or semantic aphasia, which is determined by the specific anatomical distribution of cortical atrophy [33].

This syndrome is characterized by a language disorder that originates from neurodegeneration and manifests relatively independently of other significant neurological symptoms for the initial one to two years following onset. Furthermore, this disorder maintains its predominance for the majority of the disease trajectory. The onset typically arises prior to the age of

65, and its prevalence is roughly equivalent between the sexes [33].

Three variants of PPA have been identified as (1) agrammatic (PPA-G), (2) semantic (PPA-S), and (3) logopenic according to the nature of the language impairment; each is associated with a clinically consistent distribution of peak cortical atrophy [34, 35]. The subtypes of PPA are as follows [36]:

1. PPA-G: PPA with agrammatism refers to a condition marked by slow and difficult speech, difficulty in producing and/or understanding grammatically correct sentences, and varying levels of difficulty in recalling words, with some ability to understand individual words remaining intact. Comprehension of sentences is hindered when dealing with highly challenging morphosyntactic structures, such as negative passives and clauses with negative objects.

2. PPA-S: In this variety, it is typical to observe semantic paraphasias, which refer to the substitution of a more familiar exemplar within the same category. For example, the word "dog" may be used instead of "hyena". During the early phase, the abilities to articulate, understand and produce sounds, organize sentence structure, and repeat information are preserved. As the condition advances, the ability to produce language may become "vacant", lacking in nouns and mostly consisting of imprecise placeholders like "thing", as well as function words like "this" or "the". The ability to spontaneously name items is significantly decreased, and typically, providing several choices does not lead to improved performance.

3. PPA-L: PPA has also been associated with "logopenic" language output, which is characterized by problems in choosing words and decreased output. This type of language output is syntactically simple yet correct. This variety is characterized by phonemic paraphasias, which refer to the substitution of sounds within single words, such as saying "tamp" instead of "lamp".

Significant advancements have been achieved by speech and language therapists (SLTs) in comprehending the broader ramifications of these communication challenges on the quality of life, interpersonal connections, and daily functioning of individuals with PPA [37]. This has influenced the development of a number of crucial intervention strategies and the speech and language therapy literature, such as lexical retrieval therapies, script therapy, communication partner train-

ing, communication aides, and multimodal communication therapy [38].

Volkmer *et al.* [32] suggested that impairment-based approaches, compensatory-based approaches, group education and support and therapeutic models – heading to a person-centered approach can be used for patients with PPA. Impairment-based methods use particular techniques for word retrieval, including semantic feature analysis and phonemic component analysis. In addition, script training may also be used as a therapeutic strategy to assist individuals with PPA-G. Additionally, individuals with PPA may benefit from the use of alternative and augmentative treatment approaches. These strategies are very effective in facilitating communication in daily life activities and provide patients with a means to express themselves. When it comes to providing opportunities for socialization, group treatments are quite beneficial, and speech therapy techniques that are especially customized to the individual are also highly significant. Individuals who have PPA may benefit from using the Life Participation Approach for Aphasia [39] as a framework to develop therapeutic goals for them.

CONCLUSION

Speech, language, and communication problems are experienced by people with MCI, PPA, and AD, as well as their carepartners. These challenges have a detrimental effect on the individuals' ability to participate in social activities and their mental health. Dementia-related disorders are progressive and require individualized interventions to optimize cognitive and communicative functioning throughout the disease course [40].

Recommendations for speech and language therapy treatments should be made on a regular basis for individuals who have MND. A wide range of therapies may be provided by speech and language therapists in order to adjust the needs of individuals who have MND and the families of those individuals. During speech and language therapies, different approaches can be used such as impairment based approaches, family counseling and partner training and alternative augmentative communication.

Further investigation is necessary in this field to substantiate the clinical practice of SLTs and improve

the quality of life for patients. Also, evidence-based practice manuals are particularly required to be effective in clinical settings.

Authors' Contribution

Study Conception: FSK, ST, NÇ; Study Design: FSK, ST, NÇ; Supervision: FSK, ST, NÇ; Funding: FSK, ST, NÇ; Materials: FSK, ST, NÇ; Data Collection and/or Processing: FSK, ST, NÇ; Statistical Analysis and/or Data Interpretation: FSK, ST, NÇ; Literature Review: FSK, ST, NÇ; Manuscript Preparation: FSK, ST, NÇ and Critical Review: FSK, ST, NÇ.

Conflict of interest

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