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Cognitive Deficits and Neuropsychological Assessment in Multiple Sclerosis

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Abstract

The aim of this chapter was to introduce the contents of neuropsychological assessment in multiple sclerosis, which should include the functional evaluation of cognitive domains, the psychopathology of personality, levels of depression, and the assessment of psychosocial aspects and quality of life with multiple sclerosis. Further, the most commonly used neuropsychological diagnostics are described. The chapter hopes to draw attention to the importance of neuropsychological assessment which should be a part of neurological diagnostics and therapy, including rehabilitation and psychotherapy.

Keywords: neuropsychology, multiple sclerosis, cognitive deficit, neuropsychiatry, neurorehabilitation

1. Introduction

Multiple sclerosis (lat. sclerosis multiplex) is a chronic disease of the central nervous system caused by the damage of the myelin sheath. The symptoms of the disease depend on the location of the damage in the nervous system and can vary: optic neuritis, paresthesia, motor symptoms (spasticity), impairment of cranial nerves, oculomotor disorders, cerebellar disorders, vertigo, urinary disorders, defecation, sexual dysfunctions, fatigue, depression, cognitive disorders, and paroxysmal symptoms. Multiple sclerosis is the most common cause of chronic neurological disabilities in young adults. The onset of the disease is usually between the ages of 20 and 40. Its prevalence is higher among women. The highest susceptibility to the disease is

among Caucasians; the geographic gradient of the incidence increases together with the distance from the equator. Genetic predisposition plays a role.

1.1. Types of the disease

Four types of the disease are recognized according to their clinical course. In the early years of the disease, the most common type is relapsing-remitting MS (RRMS), occurring in 80–85% of patients and characterized by attacks and remissions. If a previous attack left no neurological deficit, remissions may be completely asymptomatic at the beginning of the disease. Half of these patients develop into the stage of secondary progression (SPMS) during the first 10 years of the disease's progression. This stage is characterized by a gradual increase in neurological deficits that are already irreversible, with both the presence and absence of relapses that are not as dramatic as in the remitting stage. The relapsing-progressive (RPMS) form of the disease is characterized by an increased neurological deficit also evident between the relapses; it is thus prognostically the most unfavorable form of the disease. The primary progressive (PPMS) form affects about 10–15% of patients and is characterized by a gradual increase in neurological deficit. This form occurs more frequently among males and with a later onset of the disease [1].

In the relapsing-remitting forms, approximately 20–30% of patients continue working following their first attack. It is uncommon for patients in the early stages of this form of MS to be physically disabled or to have noticeable alternations in terms of dementia. It is primarily the progressive form of MS, developing at a later age that tends to pose more difficulty in the cognitive domains, compared to the remitting one. Patients with the spinal form of the disease have trouble mostly with motor skills and mobility. This form often occurs in the primary progressive form. Cognitive deficits include impaired attention. The typical cognitive domains impaired in the cerebral forms of MS are described below. Psychosocial and maladaptive problems are described in the case report.

1.1.1. Case report 1

A woman of 47 years reported the first symptoms of MS (optic neuritis and paresthesia) at the age of 17; later, the attacks recurred about once a year; the problems worsened after two child deliveries. Therefore, she did not breastfeed her children, for which she blames herself for until today. She underwent an abortion 2 years after the second birth due to the above-mentioned difficulties, then was psychiatrically treated, and still has feelings of guilt. The diagnosis of MS was definitely confirmed about 4 years ago. The patient has since been considerably anxious, unreconciled with the diagnosis, dominated by hostility and distrust of the medical staff (the disease was not diagnosed correctly). MRI scans of the brain and spinal cord showed multiple demyelinating lesions or plaques in the white matter. Nobody in the family had MS. She was entitled to disability pension and has been taking antidepressants for 4 years, based on the psychiatrist's indication of anxiety and depressive problems. Formerly, she worked as a teacher. She feels very tired after only about a 3–4 km walk. She is married, has two adult sons, and lives with her family. When she learned about MS, she was overtaken by fear of dying and felt mentally ill, and thus stopped working. She did not observe any difficulties with cognition. Gradually, a panic anxiety developed; when she wakes up, she feels scared, but this

panic is also present while traveling; family members take her everywhere by car. The patient is recommended to systematic cognitive-behavioral psychotherapy.

2. Cognitive functions and MS

The most characteristic feature of cognitive dysfunction in MS is the slowing down of processing speed [2]. Another often affected domain is long-term episodic memory and attention (alternating and maintained). Less frequent but significant cognitive disorders include disorders of executive functions (especially abstract and conceptual reasoning and problem-solving) [3].

2.1. Outline of basic neuropsychological techniques

Due to the high incidence of cognitive disorders in patients with MS, the adequate evaluation and diagnosis of such deficits is of great importance. Their existence is often under diagnosed during an ordinary neurological examination. Various tests are used to identify these.

One of the most significant neuropsychological studies of MS patients was carried out by Rao [4]. The Brief Repeatable Battery (BRB) for neuropsychological impairment in MS [5] was created based on a set of highly sensitive tests, with a few modifications. The BRB tests were chosen with regard to time restrictions, and so the administration of the entire battery lasts only about 40–45 min. It contains the following subtests: The Paced Auditory Serial Addition Test (PASAT); The Symbol Digit Modalities Test (SDMT) measuring attention, visual accuracy, and executive functions; The Selective Reminding Test (SRT) measuring verbal memory and delayed recall periods; The Spatial Recall Test (SPART) measuring visuospatial memory and delayed recall; and The Word List Generation (WLG) measuring verbal fluency. The battery has 15 versions and is thus, despite its longer duration, the most commonly used battery for the longitudinal monitoring of patients with MS. Clinical research supports the high sensitivity of the battery. Its abbreviated version with 3 subtests has been under verification recently.

For cognitive screenings, Beatty [6] developed the Screening Examination for Cognitive Impairment (SEFCI) neuropsychological battery, which proved to confirm cognitive deficits typical of MS in a comparative study (duration 22 min) with other time-consuming neuropsychological batteries. It does not have variants and is thus not suitable for longitudinal observations. The study compared the battery with the Neuropsychological Screening Battery for Multiple Sclerosis (NPSBMS) for which the administration period lasted 31 min. Both batteries identified significantly more patients with cognitive impairment in MS than the Mini-Mental State Exam (MMSE) [7]. The Multiple Sclerosis Functional Composite (MSFC) is a score used in clinical studies, measuring the function of the lower limb—timed walk, upper limb function (nine-hole peg test), and cognitive function (PASAT) [8, 9].

In 2001, the battery Minimal Assessment of Cognitive Function in MS (MACFIMS) [10] was created with respect to neglected domains (higher cognitive functions and spatial processing), and its reliability and validity has been verified in several studies. The MACFIMS battery

includes the following tests: Controlled Oral Word Association Test (COWAT); Judgement of Line Orientation Test (JLO); California Verbal Learning Test, Second edition (CVLT-II); Brief Visuospatial Memory Test-Revised (BVMT-R); Paced Auditory Serial Addition Test (PASAT); Symbol Digit Modalities Test (SDMT); and the Sorting Test from the Delis-Kaplan Executive Function System (D-KEFS). However, the MACFIMS battery is limited by time constraints and for its need to be carried out by an experienced neuropsychologist. For this reason, a shorter battery of cognitive tests has recently been designed. This consists of three subtests from the MACFIMS battery and may be administered by neuropsychological workers without training – International Brief Cognitive Assessment for Multiple Sclerosis – BICAMS [11]. It is suitable for use in routine clinical practices in centers with no neuropsychologist to administrate the MACFIMS. The BICAMS screening battery consists of three tests that are included in the MACFIMS battery: SDMT, CVLT-II (the first five experiments), BVMT-R (the first three trials).

2.2. Cognitive domains and their examination

Cognitive deficits observed within MS can have almost any composition [12]; a typical profile shows impairment of processing speed, memory, and often of executive skills as well [2].

2.2.1. Intellectual skills

Over the past two decades, numerous studies using neuropsychological assessment showed that approximately half the patients exhibit some degree of cognitive impairment. We also know that cognitive disorders may occur at any time during the illness and are not bound to the presence of physical disorders [13]. Generally, a substantial variability of cognitive impairments in MS in terms of their gravity and types has been described. Although approximately 10% of MS patients have severe problems that display extensive impairment even when measuring overall intelligence, the vast majority (90%) of patients is affected only mildly to moderately [14]. It should be emphasized that patients with MS as a group display a relatively small decline on intelligence measures, and overall dementia is rare in MS [13]. Cognitive deficits in MS are usually more focal than generalized. Verbal IQ, therefore, often remains intact during the first signs of MS [4].

2.2.2. Visuomotor skills, visuospatial skills, and attention

Visual disorders including diplopia, reduced color discrimination, blurred vision, and transient blindness, and motor symptoms such as limb weakness, spasticity, incoordination, or a combination of all the problems, as well as sensory disorders including numbness or paresthesia, contribute to the alteration of visuomotor skills in neuropsychological examinations. Deficits of visual attention in MS patients significantly influence their level of visuomotor skills. When evaluating visual attention, it is thus necessary to take into account the visual disorders. For example, test results in automatic attention (reaction time) and focused attention may be in norm in terms of errors, but the patient completes them in a longer period of time. In contrast, controlled attention and divided attention are often deficient [15].

2.2.3. Memory and learning

Long-term memory is related to the learning and retrieval of new information. Patients with MS often have difficulties with memory—the prevalence is reported between 40 and 65%. The most common verbal memory tests are tasks in which the patient learns a wordlist [16]. Visuospatial memory, too, is affected in patients with MS [13]. Patients with MS have significant abnormalities of the hippocampal functional connectivity, even before spatial memory impairment is apparent [17]. Patients with MS in the initial stages of the disease display a relatively intact short-term memory and learning ability, measured by tests of memory skills. More patients experience problems in recalling new material, while recognition is rarely altered.

2.2.4. Verbal ability and executive functions

Executive functions are related to planning and goal-directed behavior. Drew and colleagues [18] reported a series of executive dysfunctions—including disinhibition, poor fluency, and an inability to shift sets. Overall, 17% of their sample of MS patients displayed this kind of deficit. Language functions typically remain intact in MS; however, some minor deficits in understanding were demonstrated. Weakened sentence comprehension has been associated with slower information processing. Deficits in semantic memory and visual processing were also observed [19].

Overall verbal skills in patients with MS are usually preserved for a long time, depending on premorbid mental performance, flexibility, and vocabulary; a low level of verbal fluency is observed. Dysarthria or problems with articulation are more prevalent in speech. The best and longest preserved of all verbal skills is naming. Recalling information from long-term memory, vocabulary, and conceptual reasoning are often normal. If these abilities are altered, it is usually the result of a generalized deterioration, or of the patient having low levels of premorbid education and of cognitive reserve. Some studies have found lower levels of conceptual reasoning in patients with chronic progressive MS. A more detailed examination of verbal and oral skills is possible with a complex speech assessment.

Cognitive impairment in MS, however, does not correlate with the degree of physical disability (Expanded Disability Status Scale EDSS Kurtzke [20]); some studies showed a correlation with disease duration, yet other studies did not prove this. The impairment of cognitive functions correlates positively with some MRI abnormalities—mostly concerning atrophy, ventricular dilatation, and the total volume of impaired white matter on W T2 lesion load. The sites of predilection are areas of the corpus callosum, and extensive demyelination further affects circuits linking the prefrontal and subcortical areas. Large confluent periventricular lesions are also typical. As a whole, the huge variability in cognitive impairment may depend on many factors, such as the patient's age, sex, age at disease onset, level of education, and cognitive reserve [3]. Dysexecutive and prefrontal behavioral syndromes in a patient with a cerebral, relapsing–remitting form are illustrated in the following case report.

2.3. Case report 2

A woman of 54 years was treated for MS and migraine for 15 years. A cognition and personality assessment was recommended by a neurologist for her memory problems. MRI of the brain showed unique plaque lesions in the white matter, predominantly in the right frontal lobe; the spinal cord was not affected. There has been improvement when comparing MRI scans, the lesions were less apparent. The patient was entitled to a full disability pension 10 years ago. She was a skilled saleswoman. She has been married for 35 years; her sons are adults. There is no report of MS in the family. She commutes to a psychiatric clinic where antidepressants are prescribed. She is oriented in contact, talkative, often gets lost, and exhibits signs of the prefrontal syndrome. Memory problems have occurred for a longer period, approximately 10 or even more years. She misplaces things and then cannot find them, someone talks about something and she does not know about it, and she does not remember old information. She also experiences sudden interruptions of activities when she goes off to do another one, although she had not planned it; it is impulsive. She experiences confusions in her mind; she wanted something and suddenly does not know what she was thinking about. It troubles her. She “masks” these difficulties in front of her family and friends. Headaches occur daily. Neuropsychologically, it is mainly attention that is impaired, and the generalized deterioration of intellect is also striking, considering her education. It is possible to explain the problems behaviorally, mainly through the prefrontal behavioral and dysexecutive syndromes, which might be related to the largest findings of plaques in the frontal lobes. Cognitive behavioral therapy and training of cognitive functions was advised.

3. The course of cognitive deficit

Studies on large MS patient samples have shown that the range of cognitive impairment prevalence in MS is between 40 and 70% and appears in all stages and types of the disease (which also includes the clinically isolated syndrome—CIS) [21]. It seems that observations carried out for long enough are able to show cognitive impairment in progressive stages [22]. Several studies have confirmed the relationship between the dysexecutive syndrome and frontal lesions, and others have focused on deficits in interhemispheric transfer (i.e., disconnection syndrome) in the atrophy of the corpus callosum.

The course of a cognitive deficit without progression but with behavioral disorders is illustrated in the following case report.

3.1. Case report 3

A 43-year-old man with the relapsing-remitting form, treated for MS for 18 years, was initially assessed due to problems with memory, concentration, exhaustion, and no sexual appetite. An MRI scan of the brain showed small plaque lesions subcortically, compared with no progression found on MRI scans 4 years ago. The patient had been treated with interferons for 3 years. He is left-handed, a skilled auto-mechanic, has his own workshop at home, and works

17 h a day. He has been married for 22 years, has two children and “does not get on well” with his wife, and he admits to extramarital relations. They are currently in a divorce proceeding. The main problem is with his erection. Neuropsychologically, no striking impairment of cognitive domains was found, and only anxiety and a conflictive family environment were found. Marriage counseling, a sexologist, and conflict solving were recommended. The patient refused the proposed recommendations and increasingly adopted strange and promiscuous behaviors; he forced his wife and their children to move out of the house. He was incapable of rational thinking; he explained the promiscuity as a verification of his sexual functions. A 1-year follow-up neuropsychological assessment showed no impairment of cognitive domains and intellect, but a psychiatric examination was recommended due to paranoid thinking and aggressiveness.

On the contrary, a rapid development of cognitive deficits into dementia can be seen in the following case report.

3.2. Case report 4

A 42-year-old woman diagnosed with chronic progressive MS for 10 years was treated by interferons for 6 years. At the time of her visit, eye problems are dominant for the first time; she uses a white cane. She also experiences hearing difficulties, but does not complain about memory at all. A former governess, now entitled to full disability pension, divorced, with two children, both studying, not in contact with her ex-husband. Her mother and brother help her mostly, but the patient feels dependent and helpless. According to an MRI scan of the brain, periventricular plaque lesions are apparent in the white matter of both hemispheres. There has been a slight progression of plaque and atrophy when compared to an MRI from 4 years ago. The initial psychological examination suggested a multi-domain impairment, a decrease of more than 2 SDs (verbal mnestic and visual skills, construction, executive functioning), with severe anosognosia. The performance may have been influenced by her impaired visual and auditory perception. Two years later, she comes fundamentally oriented, and the right eye is blind. The outcome of the examination is a multi-domain cognitive disorder; cognitive abilities are significantly impaired across the whole profile.

4. Cognitive abilities and imaging methods

Magnetic resonance imaging (MRI) is used as one of the basic methods for diagnostics, visualization, and monitoring of the inflammatory lesion dynamics in the brain and spinal cord. The first MRI studies in patients with MS were published in 1981. It was found that inflammatory lesions occur 5–10 times more than MS clinical attacks. Commonly used images for the diagnosis of MS are those in which lesions of hyperintense signal of size from 1 mm to several cm are apparent, located in the white matter of both hemispheres, mostly in the cerebral ventricles, as well as in the brain stem, medulla, cerebellum, and upper cervical spinal cord. If the radiologist wants to depict the active lesions, he/she applies gadolinium. The range of

lesions visible in this way does not correlate with clinical disability as it is not known whether the lesion is currently in the stage of reparation or destruction.

The only areas described as hypodensities (“black holes”) are areas where a loss of axons, thus the definitive loss of tissue, has occurred. The typical brain damage in the white matter in MS patients is clearly associated with a loss of axons [23]. Loss of axons is also a natural sign of brain aging, and its verification is only possible postmortem.

Recent neuropsychological studies especially use functional magnetic resonance imaging (fMRI) to assess the plasticity of functional cognitive deficits in patients with MS. The method consists of recording the activation of brain areas during the presentation of various simple neuropsychological tests. Compensatory mechanisms of cognitive functions already in the early stages of chronic MS are described. The results of fMRI scans in a group of MS patients with mild cognitive impairment and a healthy control group were compared. The functional activation areas of the brain were completely distinct during the presentation of the verbal naming test in each group (in MS patients in the frontal part of the right cortex and in the left Brodmann's area, and in the right cingulate gyrus in the healthy group). The functional reorganizations of motor functions are also described in fMRI assessments of MS patients, when compared to healthy subjects. MS patients with mild cognitive deficits assessed by neuropsychological tests were presented with auditory memory tests during an fMRI and were found to display heightened activity in different areas. Patients with greater neuropsychological deficits were found to exhibit lower activation of brain areas during the fMRI assessment, which probably supports the theory of adaptive mechanisms resulting from neural disorganization or inhibition associated with MS [24]. It is therefore also possible to explain the unproven relationship between the extent of morphological findings of gliosis and plaques in the white matter, and the severity and location of neuropsychological deficits in terms of this plasticity of neuropsychological functions. The range of specific cognitive deficits, such as memory disorders, reduced processing speed, and attention disorders, can be better explained by the cortical gray matter lesions (lesions and atrophy) than subcortical white matter lesions [25]. It has been shown that neocortical atrophy is associated with impaired verbal memory, visual episodic and working memory, verbal fluency, attention/concentration, and processing speed [26]. It is also possible that the neocortical atrophy is further responsible for slight personality changes, such as euphoria, that are seen in MS patients [27]. The left frontal atrophy occurs in patients with impaired verbal/auditory memory, while the right frontal atrophy is associated with impaired visual episodic and working memories. The medial temporal cortex atrophy is associated with a decrease in processing speed and impaired episodic and verbal memories. The most important within the subcortical gray matter are atrophy, structural changes, and an altered metabolism of the thalamus, which are associated with the impairment of many cognitive domains [28]. Generally, it can be concluded that the cognitive impairment observed in MS patients is caused by inflammatory lesions and a widespread loss of gray matter. Although it is not possible to define the neuropsychological profile of MS patients as strictly “cortical” or “subcortical”, it seems that it is the disruption of the cortical gray matter which determines the degree and nature of cognitive dysfunction. Instead of the term sub-

cortical dementia, often associated with a severe multi-domain cognitive impairment, the term multiple disconnection syndrome is also used for cognitive deficits in MS [29].

5. Neuropsychiatric aspects of MS

Cognitive and affective disorders in MS have largely been ignored for many years, yet they occur in 5% of the patients early in the disease, while in its advanced stages, this can be up to 70% of cases. MS is associated with a variety of behavioral changes. These may be associated with emotional disorders and cognitive distortions and may often overlap. The prevalence of depression is at least 50%; it is often manifested in parallel with the MS attack, and suicidal tendencies may occur. The causes of depression are probably neuropathological changes associated with the limbic system, neuroendocrinological, and psychoneuroimmunological changes, responses to life change, or a side effect of MS therapy (especially corticosteroids). The prevalence of bipolar disorders in MS is approximately 15%, and the prevalence of anxiety disorders in MS is about 36%. The occurrence of bipolar disorder and psychosis in MS is twice as common as in the general population, and the so-called pseudobulbar affectation (involuntary emotional expression disorder) affects one in ten patients. It is likely that the interruption of frontolimbic and temporolimbic connections plays a role in the pathogenesis of euphoria. Euphoric patients tend to have higher EDSS and a significantly more impaired cognition, including anosognosia. The incidence of euphoria is lower (approximately 2%) than is described in the older literature, thanks to an earlier diagnosis and treatment of MS. Symptoms of depression do not correlate with neurological findings or with disease severity, as measured by the sum of symptoms of physical disability and cognitive dysfunction [30]. However, depression positively correlates with subjective experience of stress, memory deficits, and with age in elderly patients over 65 years of age, in patients with the chronic progressive form and in patients with a predominance of spinal distortion. The neuropsychological assessment should therefore, in addition to cognitive domains, also include assessments of emotional alterations, especially depression and anxiety scales (e.g., methods HAD–Hospital Anxiety and Depression Scale, BDI-II) and their development over time [31].

Other changes in patients with MS, particularly changes in values and attitudes, progress together with the psychosocial adjustment and are mostly associated with the subjective perception of a physical handicap, but do not correlate with the duration of MS or other demographic indicators. Specific quality of life with MS questionnaires is used to measure the quality of life in these patients, such as the MSQOL-54 [32], which measures 12 subscales: physical function, role limitations—physical, role limitations—emotional, pain, emotional well-being, energy, health perceptions, social function, cognitive function, health distress, overall quality of life, and sexual function.

The Multi-domain battery Multiple Sclerosis Quality of Life Inventory (MSQLI) contains 10 scales, both generic and specific to MS [33]; some scales also have a shortened version: Health Status Questionnaire (SF-36), Modified Fatigue Impact Scale (MFIS), MOS Pain Effects Scale (PES), Sexual Satisfaction Scale (SSS), Bladder Control Scale (BLCS), Bowel Control Scale

(BWCS), Impact of Visual Impairment Scale (IVIS), Perceived Deficits Questionnaire (PDQ), Mental Health Inventory (MHI), and MOS Modified Social Support Survey (MSSS). The scales can also be presented individually.

6. Multi-disciplinary MS treatment

6.1. Cognitive disorders therapy in MS

Pharmacotherapy for cognitive impairment in MS is currently the subject of intense research. First and foremost, a preventive effect of early initiation and immunomodulatory therapy, in association with the possible development of cognitive disorders, is assumed. The primary point is to prevent axonal loss and the development of atrophy. Very few randomized trials have been carried out so far. Acetylcholinesterase inhibitors have currently been examined, through only with questionable or entirely negative results. No effective pharmacological treatment for cognitive disorders in MS has yet been found [34]. The pharmacological manipulation of depression is also significant, however, and should always be combined with psychotherapy in MS patients. Moreover, depression can be enhanced by a variety of biopsychosocial factors, such as reduced work performance or increased neurological symptoms.

6.2. Neuropsychological rehabilitation and the cognitive deficit psychotherapy

Kalb and Reitman [35] report the so-called cognitive rehabilitation as the basic therapy for cognitive deficits. They present two approaches: The first is to restore functions, such as through direct training and exercising of skills that are altered in neuropsychological tests (this approach, however, has a limited benefit in improving daily activities in MS patients) and the second approach is more compensatory, and closer to current neuropsychology, with its desire to improve a function through substitution, that is, the individual use of residual cognitive abilities in order to improve the quality of life through behavioral and cognitive therapy. The first approach is based on a more experimental approach, while the second is more clinical. It concerns creating an individual plan, “customized” for each patient.

This plan is based on neuropsychological assessment and interviews with the patient and their family. The evidence for the efficacy of cognitive rehabilitation in MS is, unfortunately, quite limited and contradictory. Memory rehabilitation studies suggest that individualized computer programs focused on patient-specific difficulties could be most effective. The most beneficial in the rehabilitation of executive functions is perhaps a direct instruction by a therapist, that is, paper and pencil method. The main problem of cognitive training in MS remains to be particularly its unavailability for patients and their often low motivation. It is therefore very important to maintain employability of patients for as long as possible and motivate them toward mental activity.

For these purposes, teams of multi-disciplinary experts work with people with MS, where a neurologist, psychologist, psychiatrist, speech therapist, occupational therapist, physiotherapist, and a psychotherapist cooperate in complex, holistic, all-day programs, based on

cognitive as well as emotional, behavioral, and physiological changes. Even though it is impossible to increase one's premorbid IQ and brain volume, we can work on cognitively stimulating leisure activities. It is also very important to motivate the patient to lead an active life that includes adherence to the prescribed pharmacotherapy, but also an active attitude toward physiotherapy, psychotherapy, and cognitive training. It is the combination of physiotherapy and cognitive training that has the correct effect on the neurogenesis and formation of new synapses.

The specific model of psychosocial support for patients with MS at different levels, which has the characteristics of a cognitive-behavioral supportive therapy and family therapy, includes [35]: (1) psychoeducation, that is, education leading to the understanding of the disease, explanation of adaptive coping strategies; (2) diagnostics/treatment of emotional or cognitive problems; (3) family intervention, that is, how to organize family support for members with MS for adaptive coping with the illness; (4) work support for MS patients, that is, to work productively in a field for as long as they are able and interested, and vice versa, to stop working if necessary; (5) individual psychosocial assistance to individuals with MS. In addition to professional psychotherapy, a support group of people with the same disease, but also of family, friends, possibly a cultural-social or religious community, is appropriate.

6.3. Disability, employability, and MS

The organization of care for MS patients is similar around the world. A patient with a benign course of the disease is usually checked by a neurologist twice a year; more complicated patients are consulted in centers for MS that are a part of most university neurological clinics. In the case of a more severe disability, it is advisable to contact social services or long-term care. Neuropsychological approaches, however, show that employability can also be predicted by a short battery of tests that focuses on relevant domains, such as the aforementioned battery BICAMS [36]. The issue of employment restrictions, disability, work, and life disability due to MS is illustrated in the following case report.

6.3.1. Case report 5

A doctor, surgeon specialist, formerly a chief physician, 50 years old, with remitting MS. MRI scans revealed the cerebrospinal form with multiple plaques in the white matter of the brain and spinal cord; the demyelinating plaque findings are unchanged for 3 years. The patient was recommended to a cognition assessment for his memory problems, was dismissed from the surgical specialty, and thus works as a GP, which does not satisfy him. He is divorced and has problems with his second wife, who is a nurse, approximately 25 years younger. The wife is hostile, blames him for the change of social status. Neuropsychologically, only his psychomotor speed and motor dexterity are slightly reduced, which exhibits moderate depression in emotional experience, not suicidal. Couples therapy was recommended to address the changes in his professional situation and partner quality of life, together with a psychiatric consultation.

7. Conclusion

This article summarizes a neuropsychologist's perspective on cognitive skills in MS. When evaluating the cognitive level of patients, the comprehensive or screening assessment should examine specific domains that may not correlate with the length of the illness, neurological objective findings, the amount of plaque on MRI scans, and the MS form or type. Cognitive disorders are a significant predictor of quality of life during all stages of MS; they reduce physical independence and the ability to perform both activities of daily life and of employment, they influence one's coping and compliance to the treatment and their rehabilitation potential. The employability of people with MS can thus be easily predicted by the severity of cognitive disorders and their premorbid cognitive reserves, rather than by physical disability. The neuropsychological assessment of cognitive functions in MS should be a part of care for patients with MS and a part of a multi-disciplinary approach to neurorehabilitation.

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