




BMJ Open Occupational outcomes of people with multiple sclerosis: a scoping review

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ABSTRACT

Objectives To update the knowledge on the occupational outcomes associated with multiple sclerosis (MS), systematically examine the extent, scope and nature of the pre-existing literature and identify research gaps in the existing literature.

Design Scoping review.

Data sources A comprehensive database search of PubMed/MEDLINE, Scopus, SciVerse ScienceDirect and Web of Science was performed. There were no time limits.

Eligibility criteria We included any peer-reviewed original article reporting the occupational outcomes of people with MS between the ages of 18 and 65 years. We excluded those off-topic and with insufficient information.

Methods This review was conducted following the Joanna Briggs Institute recommendations and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses for scoping review checklist. Screening, reading of full-texts and data extraction was performed in a standardised way by expert reviewers from 14 July 2021 to 31 October 2021. We provided a narrative synthesis and an overview of findings.

Results The initial systematic search yielded 104 228 results. After removing duplicates and applying the exclusion criteria, 403 articles were included in the review. In total, the studies evaluated 492 062 subjects with MS. One hundred fifty-four (38.2%) articles were published in the last 5 years, mostly from Europe and North America (50.9% and 33.0%, respectively). Concerning the occupational outcomes, studies mostly addressed unemployment (311, 77.2%), early retirement (120, 29.8%), disability pension (117, 29.0%), sick leave (77, 19.1%), the indirect cost of MS (74, 18.4%) and work characteristics (57, 14.1%). The results were categorised into seven subtopics: 'Changes in work and occupational status due to MS', 'work-related socio-economic consequences of MS', 'risk factors for unfavourable occupational outcomes', 'reported barriers to employment', 'reported job accommodations and vocational rehabilitation strategies', 'job satisfaction, stigma, and disclosing the diagnosis in the workplace' and 'rating clinical scales'.

Conclusions There are several issues that deserve further in-depth study by the scientific community in order to improve the occupational outcomes of people with MS.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ The scoping design allowed a summary of the diverse/heterogeneous range of terms and conceptualisations or even the multidimensional relationship of work and multiple sclerosis.
- ⇒ All original peer-reviewed articles included were reviewed by our research group.
- ⇒ As we respected the scoping review approach, we did not formally assess the quality of included studies.
- ⇒ We could have missed some data for not including results from the grey literature.

INTRODUCTION

Multiple sclerosis (MS) is a chronic autoimmune disease that causes demyelination and neurodegeneration in the central nervous system. It mainly affects young people between 20 and 40 years of age and it is the main cause of non-traumatic disability among young adults in the Western world.¹ MS is a global disease, affects 2.5 million people worldwide, the incidence and prevalence are known to be increasing in both developed and developing countries.² The symptoms are extremely varied and the clinical course is within a spectrum that extends from relapsing-remitting to progressive.¹⁻³

In addition to the inherent clinical complexity of MS, the age of onset of the disease brings inevitable repercussions to work activity, as it often coincides with the moment in which patients find themselves managing the already expected difficulties of the job market and the beginning of the professional career.⁴ As long as MS symptoms remain 'invisible', people with MS (PwMS) are reluctant to inform their employer about their disease out of fear of losing their job.⁴ Concerns about disclosing the diagnosis in the workplace stem from a range of issues involving the fear of appearing vulnerable, suffering discrimination and losing their jobs.⁵ PwMS often require essential



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accommodations in the work environment to continue providing satisfactory work. Often limiting and disabling, symptoms such as fatigue, neuropsychiatric impairment and motor disturbances constantly threaten the full performance at work and the search for new professional skills. PwMS are more vulnerable to unemployment and early retirement and the influence of MS on professional life is known to be directly associated with quality of life (QoL).⁶

The impact of MS on work activities has already been evaluated in many studies carried out in different parts of the world.^{7–10} Calabrese *et al* demonstrated that workforce participation can decline from 82% to 8% and employment rates vary between 31% and 65%,⁷ being influenced by factors such as the degree of disability, the duration of disease, the level of education and the type of work activity. Another study outlined the complexity of the association between employment and MS and revealed that 56.2% of PwMS are unemployed and face great difficulty in returning to the workforce.⁸

Besides the potential consequences of MS for people's working life, it is also important to recognise the impact of the disease at the community level. Long-term absence, invalidity and early retirement may demand an annual expense of 17 945€ per patient in the late stages of MS.¹¹ Loss of productivity at work and occupation change due to MS account for an annual cost of \$2691 and \$2982 for each patient, respectively.¹² Indeed, the impact of MS on occupational outcomes is responsible for a significant economic burden and represents a matter of public health all around the world.

There is an eminent need for further scientific research on the occupational outcomes of PwMS. Furthermore, research in this area is highly encouraged as it contributes to address the eighth Sustainable Development Goal set up by the United Nations. Although it is relatively easy to find information on MS and work in the literature, being diagnosed with MS still increases the risk of unemployment, early retirement, loss of working capacity, reduced monthly income, job dissatisfaction and impaired QoL. Recent advances in the treatment of MS and the emergence of new types and modalities of work also call for new studies investigating the role of MS on work. Moreover, previous reviews were focused on specific occupational outcomes that do not reflect the totality of possible outcomes, contributing only partially to the holistic understanding of the relationship between MS and work.^{13–17} Due to the large number and heterogeneity of articles already published, there is a significant difficulty in detecting gaps in the pre-existing literature and consolidating evidence on the subject. This scenario favours unnecessary investments in redundant studies that could be reallocated to research with potential to truly influence patients' lives. In this context, we decided to conduct the first scoping review related to the occupational outcomes of PwMS, as it can provide a broad map of the existing evidence and identify gaps for potential future studies.

OBJECTIVES

The objectives of the present scoping review are related to occupational outcomes associated with MS: the primary objective is to update the knowledge on the occupational outcomes of PwMS compared with people without MS, and among PwMS by clinical characteristics. Our secondary objectives were to systematically examine the extent, scope and nature of the pre-existent literature, to summarise and disseminate the research results deriving from the already published articles, to identify research gaps in the existing literature and to provide an accurate rationale to develop further relevant research in the area.

METHODS

We performed this scoping review following the guidelines outlined by Arksey and O'Malley, the Joanna Briggs Institute recommendations and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses for scoping review (PRISMA-ScR) guidelines.^{18–20} As this was a literature review, it analysed data from already published original articles and did not involve the recruitment of subjects and, therefore, the ethical approval was not necessary.

Study selection/search strategy

From 14 July 2021 to 31 July 2021, we systematically searched on PubMed/MEDLINE, Scopus, SciVerse ScienceDirect and Web of Science the following keywords (employ* OR unemploy* OR occupation* OR 'work' OR vocation* OR 'work resumption' OR workplace* OR 'return to work' OR 'work force' OR 'workforce' OR 'labour force' OR 'labour force' OR career* OR job* OR 'job retention' OR retire* OR 'disability pension' OR 'worker' OR 'fitness for work') AND ('multiple sclerosis' OR 'disseminated sclerosis' OR 'demyelinating autoimmune diseases' OR 'demyelinating autoimmune disorders' OR 'clinically isolated syndrome' OR 'demyelinating'). The details of the search strategy used are reported in [table 1](#). We decided not to include specific terms due to the expected diversity in concepts and terms related to the central argument of the study. Furthermore, this choice is supported by the traditional scoping review methodology. After the preliminary identification, the articles were exported and managed in Mendeley 1.19.8 (Elsevier, New York, USA).

Inclusion and exclusion criteria

A priori, we chose a broad search methodology to be able to form an accurate and comprehensive picture of the relationship between the occupational outcomes and MS. The PCC (Population/Concept/Context) framework was used to define inclusion criteria. We included any peer-reviewed original article reporting the occupational outcomes of PwMS between the ages of 18 and 65 years (population). MS must have been diagnosed according to accepted international criteria at the time of the study. No time limits were set for the search. The context was

Table 1 Detailed search strategy in PubMed, Scopus, SciVerse science direct and web of science

PubMed	(employ* OR unemploy* OR occupation* OR 'work' OR vocation* OR 'workplace' OR 'workforce' OR 'labour force' OR 'labor force' OR career* OR job* OR retire* OR 'disability pension' OR 'worker' OR 'fitness for work') AND ('multiple sclerosis' OR 'demyelinating autoimmune diseases' OR 'demyelinating autoimmune disorders' OR 'clinically isolated syndrome' OR 'demyelinating')
Scopus	TITLE-ABS KEY [(employ* OR unemploy* OR occupation* OR 'work' OR vocation* OR 'workplace' OR 'workforce' OR 'labour force' OR 'labor force' OR career* OR job* OR 'job retention' OR retire* OR 'disability pension' OR 'worker' OR 'fitness for work') AND ('multiple sclerosis' OR 'demyelinating autoimmune Diseases' OR 'demyelinating autoimmune disorders' OR 'clinically isolated syndrome' OR 'demyelinating')]
SciVerse Science Direct	('employ' OR 'occupation' OR 'work' OR 'vocation' OR 'labour' OR 'Job' OR 'retire' OR 'disability pension') AND 'multiple sclerosis'
Web of Science	(employ* OR unemploy* OR occupation* OR 'work' OR vocation* OR 'workplace' OR 'workforce' OR 'labour force' OR 'labor force' OR career* OR job* OR retire* OR 'disability pension' OR 'worker' OR 'fitness for work') AND ('multiple sclerosis' OR 'demyelinating autoimmune diseases' OR 'demyelinating autoimmune disorders' OR 'clinically isolated syndrome' OR 'demyelinating')

broad and we accepted articles published in English, Italian, Spanish, French and Portuguese, as these are the languages spoken in our research group (context). The term 'occupational outcomes' was defined as direct and indirect work-related characteristics/consequences potentially associated with MS (concept).

After removing duplicate entries, we performed an initial screening of titles and abstracts to assess potential relevance and excluded those not directly or indirectly focused on the topic of interest. Screening of titles, abstracts and full texts for each article was conducted by two experienced and trained investigators (BKV and AR), each blinded to the other's ratings. In case of discrepancy, a final decision was made by a consensus after a debate with a senior researcher (GD). Afterwards, we obtained relevant full-text articles, read all of them, evaluated their eligibility and determined their final inclusion or exclusion.

Studies written in languages other than the five pre-specified above and studies designed as reviews, letters to the editor, conference abstracts, expert opinions, commentaries, case reports, case series and editorials were excluded. Studies that did not address any aspect of an occupational outcome or that eventually only mentioned it as part of the arguments presented in the introduction or discussion (off-topic articles) were excluded. In case of lack of essential information or full-text not being available, we tried to contact the corresponding author twice to obtain the information by email. Whenever our contact attempt failed, the study was excluded. We did not accept studies where MS was not the primary condition or the subjects had other chronic diseases that could potentially influence the occupational outcomes (eg, a study that included patients with MS and migraine). Some authors published more than one article with the same study population and reporting the same occupational outcomes. In these cases, we included the most recent one and excluded the others. [Figure 1](#) provides the

PRISMA flowchart overview of the search and screening strategy performed.

Data extraction

Data were extracted in a standardised way by an expert reviewer (BKV) and they were double-checked after 2 months in order to minimise the intrapersonal variability. We determined the information to extract a priori. Among the basic characteristics, we gathered information about the authors' names, the title of the study, the year of publication, the country of origin of the study, the study design, the number of subjects with and without MS, the subtype of the disease, the prevalence of each clinical symptom, the duration of the disease, the distribution by age and sex, the level of education, the marital status, the description of any neuroradiological finding, treatment data, assessment of the QoL and disability, prevalence of fatigue, psychiatric symptoms and cognitive symptoms. Regarding the occupational outcomes, the following data were collected: the description of the profession, the prevalence of unemployment and early retirement, the influence of the disease on monthly income, the need for disability pension, the indirect cost of MS, the stigma and prejudice faced in the workplace, job characteristics, strategies of vocational rehabilitation and job accommodations, patient opinion on work and working life in general, barriers to employment, degree of job satisfaction, need for a change of employment due to MS, the prevalence of work handicap and information on the disclosure of the diagnosis in the workplace. Job accommodations were defined as any reasonable adjustment to a job or work environment that enables PwMS to perform their job duties. Barriers to employment were defined as any challenge or difficulty that may prevent PwMS from getting or keeping a job or advancing in their career. The definitions of sick leave and absenteeism vary in the literature. We considered sick leave when the absence is granted because of illness. Usually, it takes

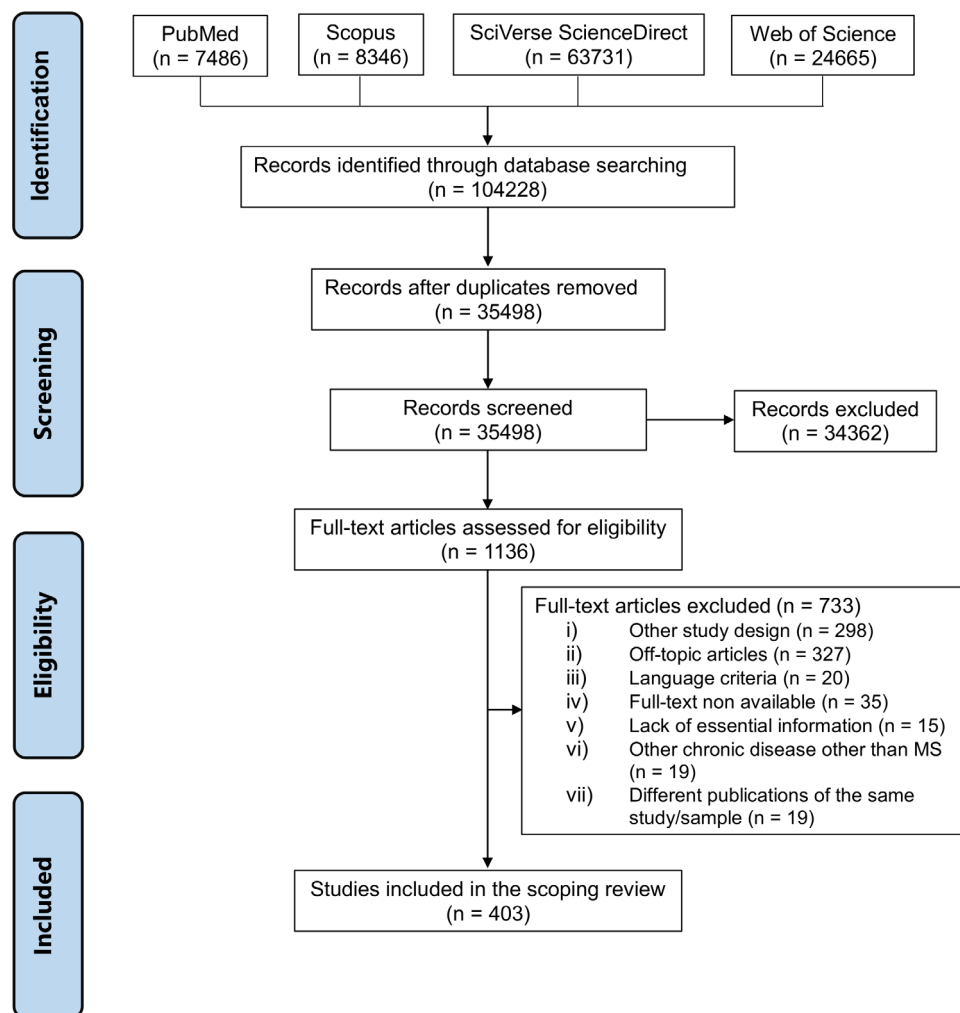


Figure 1 PRISMA flowchart. PRISMA, Preferred Reporting Items for Systematic reviews and Meta-Analyses.

many days and are due to a specific necessity provoked by the illness. In contrast, we considered absenteeism the habitual non-presence of an employee at their job that is not formally justified to the employer or linked to the illness. Usually, it takes just a couple of days but may be more frequent.^{21 22}

Data synthesis

Following data extraction, due to the range of outcomes assessed and different study designs included in the review, we used a narrative synthesis to report data. This process was carried out after reading the full-text of all the articles included in the review in order to summarise the results as clearly and accurately as possible and cover all the outcomes found. One expert reviewer (BKV) performed a thematic categorisation of the findings, which was verified by two other reviewers (AR and AM). The results were categorised into seven subtopics: ‘changes in work and occupational status due to MS’, ‘work-related socio-economic consequences of MS’, ‘risk factors for unfavourable occupational outcomes’, ‘reported barriers to employment’, ‘reported job accommodations and vocational rehabilitation strategies’, ‘job satisfaction, stigma, and disclosing the diagnosis in the workplace’ and ‘rating

clinical scales’. These subgroups were created to guide the synthesis of the main results reported in the pre-existing literature. We generated a set of statements to adequately represent each subtopic, based on their relevance and degree of evidence.

Patient and public involvement

No patients or public were involved in the study.

RESULTS

Overview of the literature search

The initial systematic search yielded 104 228 results, of which 7486 were from PubMed, 8346 were from Scopus, 63 731 were from SciVerse Science Direct 24 665 were from Web of Science. Removing duplicates and applying the eligibility criteria resulted in a total of 1136 articles. At the end of the study selection, 403 articles were included in the review, and information about the baseline clinical–epidemiological characteristics and the occupational outcomes was properly extracted (online supplemental table S1). [Figure 1](#) describes the entire PRISMA-ScR flowchart.

Table 2 Clinical, epidemiological and occupational variables reported in the 403 studies

Clinical and demographic characteristics			Occupational outcomes		
	n	%	n	%	
Age	394	97.8	Job description	55	13.6
Sex	389	96.5	Work performance	57	14.1
Educational level	288	71.5	Vocational rehabilitation	19	4.7
Civil status	180	44.7	Unemployment	311	77.2
Socioeconomic conditions	47	11.7	Early retirement	120	29.8
EDSS	212	52.6	Disability pension	117	29.3
Disease duration	274	68.0	Sick leave	77	19.1
Type of MS	258	64.0	Impact on monthly income	52	12.9
Neuroimaging findings	10	2.4	Indirect cost of MS	85	21.1
Description of symptoms	59	14.6	Work characteristics	57	14.1
Quality of life	139	34.4	Barriers to employment	65	16.1
Disability assessment	234	58.1	Job accommodations	45	11.2
Fatigue	169	41.9	Stigma and prejudice	23	5.7
Psychiatric symptoms	209	51.9	Job satisfaction	19	4.7
Cognitive symptoms	160	39.7	Disclosure of the diagnosis in the workplace	17	4.2
Motor symptoms	84	20.8	Professional absenteeism	74	18.4
Treatment (DMDs)	117	29.0	Patients' opinion about work	85	21.9
			Occupational change	78	19.3
			Work disability	38	9.4

DMDs, disease-modifying drugs; EDSS, Expanded Disability Status Scale; MS, multiple sclerosis.

Characteristics of the included literature

The number of studies published on the topic has increased over time, as 154 (38.2%) of the included studies were published in the last 5 years. Most of the studies were conducted in Europe and North America (50.9% and 33.0%, respectively). Asia and Oceania produced 32 (7.9%) and 24 (6.0%) of the studies on the subject, respectively. There were no published data on the association between MS and work from the African continent. Italy, with less than 1% of the world population, promoted the publication of 29 (7.2%) articles on the subject of our study. Regarding the study design, 314 (77.9%) were cross-sectional, 12 (3.0%) were interventional and 77 (19.1%) were longitudinal. Only 63 (15.6%) studies included a control group in their analysis. In total, the 403 studies evaluated 492062 subjects with MS. Among the explored characteristics of MS, the assessment of disability and QoL, the type of MS and the prevalence of fatigue, psychiatric and cognitive symptoms were the most mentioned variables (table 2). Neuroimaging data and the use of disease-modifying drugs (DMDs) were explored in 10 (2.5%) and 117 (29.0%) studies, respectively.

Work was considered as a dependent variable in 285 (70.7%) articles. Eighty-two (28.8%) studies dealt with the description of employment outcomes, 85 (29.8%) aimed to assess the economic impact of MS, 14 (4.9%)

described any strategy of vocational rehabilitation, 17 (6.0%) evaluated the QoL in MS in general, 81 (28.4%) determined possible risk factors associated with occupational outcomes and 6 (2.1%) aimed to develop a possible assessment scale of occupational outcomes. The prevalence of unemployment was the most explored variable (311, 77.2%). Other addressed issues were early retirement (120, 29.8%), disability pension (117, 29.0%), sick leave (77, 19.1%), the influence of MS on monthly income (52, 12.9%), the indirect cost of MS (74, 18.4%) and work characteristics (57, 14.1%). Barriers to employment were reported in 65 (16.1%) studies and job accommodations in 45 (11.2%) studies. Perceived stigma in the workplace, job satisfaction and knowledge of colleagues about MS were less commonly explored aspects in the studies (5.7%, 4.7% and 4.2%, respectively). Finally, 59 (14.6%) articles examined occupational absenteeism, 85 (21.1%) aimed to understand the patient's opinion on aspects of his professional life, and 19 (4.7%) evaluated strategies of occupational rehabilitation. The definition of each outcome is extremely diverse across studies in order to suit the particularities of the study design and the research context.

Changes in work and occupational status due to MS

MS is a disease that directly influences the patient's professional life.^{23–26} PwMS are vulnerable to a spectrum

of several negative consequences at work, ranging from reduction of working hours to unemployment. In a Swedish cohort, only 28% and 23% of PwMS were working full-time and part-time after a follow-up of 10 years, respectively.²⁷ A Norwegian study demonstrated that after 19 years of disease, only 45% of patients were still employed.¹⁰ Even for those who remain employed, more than a quarter show some deterioration in employment status and 56% observe a work performance loss in the short term after the diagnosis.^{28 29} Moreover, once unemployed, it is difficult for workers with MS to return to the workforce.⁸ Pflieger *et al* found that the probability of remaining without early pension at 20 years was 22% for patients and 86% for controls.³⁰

Work-related socioeconomic consequences of MS

MS is a debilitating disease that poses a substantial burden in terms of absenteeism, presenteeism, disability pension and sick leave costs.^{31–34} Both employees and employers bear the socioeconomic consequences of MS. Employees with MS are significantly more likely to have disability days compared with employees without MS (21.4% vs 5.2%).³⁵ Overall, employees with MS had lost over four times more workdays compared with their controls (37.7 vs 8.8 days).³⁶ In a cohort of 8350 PwMS, two-thirds received a form of benefit.³⁷ Increased disability as measured on the Expanded Disability Status Scale (EDSS) is strongly associated with reduced earnings and increased benefits,^{23 37 38} but it is noteworthy that even mild disability can pose a significant economic burden at the expense of premature retirement, premature work disability and time lost from work.^{23 31 38 39} Interestingly, Jennun *et al* demonstrated that negative effects on employment and health costs have been shown up to 8 years prior to MS diagnosis.⁴⁰ Neusser *et al* reported an estimated total expenditure of 4.3 billion euros annually when considering all interventions enabling work-life integration.⁴¹ Studies on the economic impact of MS come from different countries and continents,^{7 9 42–44} so the interpretation of their findings must necessarily take into account the specific social security systems of different countries.

Risk factors for unfavourable occupational outcomes

Multiple studies have addressed the risk factors associated with worse professional outcomes. The progressive phenotype of the disease is certainly a negative predictor of occupational outcomes in PwMS compared with the relapsing–remitting form.^{10 39 45} Older age, longer disease duration and high EDSS are also associated with a higher risk of unemployment.^{46–49} Recently, the link between neuroimaging findings and occupational status has been demonstrated. Tauhid *et al* showed that the T1 lesion load, the ratio between the T1 and T2 burden, and the overall brain volume are significantly different between employed and non-employed PwMS.⁵⁰ In a cohort of 145 patients followed up to 12 years, severe brain atrophy, T1 and T2 injury load were the best predictors of deterioration of the occupational status.⁵¹ Cognitive impairment,

neuropsychiatric symptoms and fatigue are also well-described risk factors for labour force withdrawal and work productivity loss.^{28 52 53} The main reasons reported by PwMS for their loss of employment involved the ineffective management of symptoms of MS in the workplace, rather than workplace-related factors including insufficient flexibility of employment conditions or being dismissed.

Reported barriers to employment

Some studies described the main barriers to employment for PwMS, which may result from the disease itself or circumstances related to the workplace. Cognitive symptoms, pain, fatigue, psychiatric disorders, disease severity and mobility/gait impairment are illness-related factors considered as major barriers to employment.^{54–57} In addition, jobs requiring long-distance travel, overly stressful work, limited feedback on performance, hostile supervisors, high-temperature level and inflexible work schedules are some working conditions considered difficult for PwMS.^{57–59} Moreover, negative work events have been reported as an important barrier. Workers with MS may be particularly vulnerable to verbal reprimands, decrease in scheduled work hours, reduction of job responsibilities and mandatory additional retraining.^{29 60–62} Kordovski *et al* and Frindak *et al* both demonstrated that negative work events may act as an indicator of an increased risk of unemployment in the short and medium term.^{61 63}

Reported job accommodations and vocational rehabilitation strategies

Job accommodations are associated with greater chances of retaining occupation. The studies considered work accommodations as reasonable adjustments in the workplace or strategies related to professional retraining and vocational rehabilitation. In a study with 746 workers with MS, participants with a progressive course of the disease, cognitive impairment, a higher number of MS symptoms and greater symptom severity were more likely to use job accommodations.⁶⁴ More than 60% of PwMS who kept their jobs described any type of accommodation and adopting flexible hours as the most frequently reported accommodation.^{29 65 66} Other common accommodations are the possibility of working from home and availability of memory aids, additional time to complete tasks, preferential parking, written job instructions and air conditioning.^{29 60} Rumrill *et al* listed the use of equipment/assistive technological resources as being of great importance.⁶⁶

Dorstyn *et al* verified that sending a standardised, mail-delivered, resource-based package to job seekers with MS improved their vocational self-efficacy, optimism and identity.⁶⁷ Chiu *et al* examined the effect of rehabilitation technology interventions on job retention and concluded that this kind of technological tool may ensure better occupational outcomes.⁶⁸ Vocational rehabilitation is a topic that interests PwMS, a group of people receptive to this type of initiative.⁶⁹ According to these subjects, a programme of

vocational rehabilitation must address two main points: managing work performance and expectations.⁷⁰

Job satisfaction, stigma and disclosing the diagnosis in the workplace

Almost one-third of patients who remain employed are dissatisfied at work⁵⁴ and 20%–30% of workers do not feel comfortable disclosing their diagnosis in the work environment.^{29 59 63 71} Approximately 40% of these patients did not inform the occupational physician about their diagnosis.⁷² More often, patients with increased disease severity and longer work experience disclosed their diagnosis.⁶³ In parallel, PwMS with ‘invisible’ symptoms tend not to disclose. A quarter of PwMS report feelings of stigmatisation at work. Stigma is directly associated with poorer QoL, work handicap and depression.^{45 55 73}

Rating clinical scales

The EDSS and the Multiple Sclerosis Functional Composite (MSFC) scale have both been associated with employability.⁷⁴ Andries *et al* designed the Work and Handicap Questionnaire (WHQ) aiming to estimate the degree of work handicap in PwMS, neuromuscular diseases and asthma based on the association of daily life disabilities and job demands.⁷⁵ Although it was not specifically created for PwMS, it showed good reliability. Honan *et al* developed a shortened version of the Multiple Sclerosis Work Difficulties Questionnaire (MSWDQ) that consists of a 23-item measure of self-reported perceived

workplace difficulties in PwMS.⁷⁶ Schiavolin *et al* designed and validated the Multiple Sclerosis Questionnaire for Job Difficulties (MSQ-Job), which demonstrated to be a useful tool for measuring the work-related difficulties in PwMS.⁷⁷ Both MSWDQ and MSQ-Job proved to be comprehensive tools for tracking subjective work-related problems, but they could not be compared with objective occupational outcomes in a longitudinal perspective and were not validated as a predictive tool of unemployment. McFadden *et al* created a 22-item, self-administered scale that indicates if PwMS are at low, medium or high risk of work instability.⁷⁸ It was further used in a 3-year longitudinal study aimed at assessing the psychological determinants of job retention.⁷⁹ Table 3 summarises all scales associated with occupational outcomes.

DISCUSSION

The scientific literature on occupational outcomes and MS is vast. Nevertheless, it is possible to identify some important gaps on this subject. The quality of the scientific evidence in this field is still limited due to a significant lack of longitudinal and interventional studies. Few studies have analysed the evolution of occupational outcomes of PwMS over time, much less the factors that led to an eventual change: there is no scientific evidence that any improvement has occurred in the prevalence of unfavourable occupational outcomes. Indeed, there is no

Table 3 Identified scales described in the literature associated with occupational outcomes

Study	Name	Specific for MS	Specific for work	Longitudinally validated	Usefulness
Andries <i>et al</i> ⁷⁵	Work and Handicap Questionnaire (WHQ)	No	Yes	No	The WHQ makes an inventory of possibly harmful working conditions and of possible strategies to counter health-related work problems by means of the work adjustments.
Gulick <i>et al</i> ⁸²	Work Assessment Scale (WAS)	No	Yes	Yes	The WAS evaluates work-impeding and work-enhancing situations and conditions.
Honan <i>et al</i> ⁷⁶	The Multiple Sclerosis Work Difficulties Questionnaire (MSWDQ)	Yes	Yes	No	The MSWDQ measures the workplace difficulties that can predict the necessity of reducing working hours, work withdrawal and expectations in PwMS.
McFadden <i>et al</i> ⁷⁸	MS-specific Work Instability Scale (MS-WIS)	Yes	Yes	No	The MS-WIS indicates low, medium and high risk of work instability (job retention).
Raggi <i>et al</i> ⁷⁷	Multiple Sclerosis Questionnaire for Job Difficulties (MSQ-Job)	Yes	Yes	No	The MSQ-Job measures difficulties in work-related tasks.
Honarmand <i>et al</i> ⁷⁴	Multiple Sclerosis Functional Composite (MSFC)	Yes	No	No	The MSFC predicts unemployment.
Busche <i>et al</i> ⁴⁸	EDSS	Yes	No	Yes	The EDSS predicts unemployment.

EDSS, Expanded Disability Status Scale.

study supporting the hypothesis that a worker with MS in 2022 is not susceptible to the same occupational consequences caused by the disease as 40 years ago. In contrast, over the past 20 years, there have been notable advances in the treatment of MS due to a significant increase in the availability and effectiveness of DMDs that, in theory, may have influenced various occupational outcomes.⁸⁰ In this scenario, a study that assesses the specific role of DMDs on occupational outcomes is highly encouraged. Likewise, there is a lack of studies that compare the variables related to work based on a geographical perspective (eg, countries and continents). Furthermore, there is little evidence on the biopsychosocial context related to work disability, as most articles focus only on the relationship between work trajectories and morbidity.

Data about occupational outcomes come from different contexts and study designs. In most cases, occupational outcomes are part of the primary objectives of the studies. The geographical distribution of the origin of the studies is uneven and creates a bias in the interpretation of the results. No article defined the term 'occupational outcomes' and the definitions of each variable differed substantially. Our scoping review brings an evidence-based description about the several possibilities of occupational outcomes and shows that it comprises of several possible variables, most of them easily evaluated objectively—such as unemployment or salary reduction. The variables described in the literature comprise potentially reversible outcomes present at the beginning of the illness and outcomes that are generally irreversible and are associated with the end of the professional career.

The literature is unanimous regarding the MS burden on the economy and public health; indeed, the economic impact of the influence of MS on work has driven several research projects. However, the cost-effectiveness of the new DMDs has not been thoroughly studied, considering both the occupational items and the feasible strategies of professional integration concerning their potential benefit in promoting better occupational outcomes with consequent decrease of the economic impact of MS.

Moreover, despite the literature provides a wide description of possible risk factors and work accommodations for PwMS, little evidence exists concerning the possible protective factors associated with occupational outcomes. Most studies are focused on the aspects related to the disease, and few are dedicated to work-related risk factors. Furthermore, the real role of each type of accommodation in promoting favourable occupational outcomes is still unclear due to a lack of studies providing strong evidence (longitudinal and interventional studies).

Our scoping review identified gaps between the patient's interest in receiving technical guidance on how to improve the occupational outcomes and the degree of evidence on this topic. Few studies were dedicated to identifying strategies capable of promoting job retention, work performance and even return to work. Moreover, most of the strategies of vocational rehabilitation were studied in small samples of subjects and did not consider

the particular characteristics of PwMS. Given the still unsatisfactory unemployment rates among PwMS, vocational rehabilitation may be a valuable complementary resource that deserves further research.

There is also extremely limited evidence related to job satisfaction, stigma and prejudice in the workplace; in this view, it is important to study these outcomes to gauge an individual's overall level of work adjustment. More studies are needed to understand the reasons for not communicating the diagnosis of MS, including to the occupational physician, since the disclosure may be the first step to promote the worker's full integration.

Only few studies tried to develop a scale associated with the occupational outcomes of PwMS. All the proposed scales described the work handicap or job difficulties in restricted samples and mostly in a cross-sectional design. Most of them revealed to be excessively extensive and complex, which represents a limitation for their wide use in clinical practice. The EDSS is the only scale that has already been associated with occupational outcomes as it generally reflects the severity and progression of the disease. However, this evidence comes from secondary analysis of studies and, despite being simple, the EDSS does not include several other factors already proven to specifically influence the professional outcomes, which can also raise concerns about its sensitivity. The development of a simple and validated scale should be the subject of future studies, as it may represent an easy-to-use tool capable of supporting a more objective and uniform assessment of PwMS by physicians with different backgrounds.

Finally, no study addressed how the new ways of working in the 21st century interfered with the occupational outcomes of PwMS. The nature and the pattern of work have undoubtedly changed in the last 20 years⁸¹ and it is reasonable to imagine that PwMS may find more alternatives and resources to ensure a fruitful professional life. Possibly, technological advances in the workplace may even relativise the concept of work disability. PwMS with the same clinical characteristics can be classified with different degrees of work disability depending on the technological adjustments that help them perform their work. It is reasonable to imagine that a few decades ago, a worker with MS could easily be considered unfit for work, while today's modernisation of types of work and the provision of various technological resources may contribute to delay the definitive endpoint of inability to work.

This is the first scoping review dedicated to the occupational outcomes of PwMS. We highlight that a broad and rigorous search strategy was used to properly include all relevant studies describing the occupational outcomes of MS and promote reliable and accurate results. We applied a range of outcome possibilities that allowed us to accurately understand the evidence related to the impact of MS in the occupational setting. The wide variability of aspects, outcomes and measures identified motivated the breadth of our methods. This review highlighted several

opportunities for new research on the topic. Among the limitations of the study, we did not formally assess the quality of included studies, as we respected the scoping review approach. We could also have missed some data for not including results from the grey literature. Notwithstanding, we intended to disclose the current reality regarding the highest scientific evidence in the field of MS and work and, therefore, the selection of peer-reviewed articles seemed more appropriate. We decided not to use specific terms in our search strategy which may have excluded some articles from our review. Nevertheless, there is an infinite number of possible specific words and synonyms that could be characterised as occupational outcomes so that it would be impossible to cover all the possibilities. Finally, the definitions of each variable changed significantly according to the study, so that, as usually happens with systematic reviews, it was not possible to standardise a definition for each one of them.

CONCLUSIONS

This is the first scoping review dedicated to the occupational outcomes of PwMS. MS is a chronic neurological disorder that is often associated with disabilities and significant impairment of professional life. Many studies have already been published on the subject and several outcomes have been described. Nevertheless, there are still several issues that deserve further in-depth study by the scientific community in order to match the quality of scientific evidence to the undeniable complexity inherent in this topic.

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