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ABSTRACT

Background: Work difficulties in multiple sclerosis (MS) reflect the interaction of physical, cognitive, psychological, and environmental factors, highlighting the need for multidimensional assessment. **Objectives:** To translate, culturally adapt, and evaluate the psychometric properties of the Italian versions of the Multiple Sclerosis Work Difficulties Questionnaire (MSWDQ-50 and MSWDQ-23). **Methods:** Following ISPOR and COSMIN recommendations, 256 people with MS completed both questionnaires and additional measures assessing quality of life, fatigue, and urinary incontinence. Nine clinically stable participants completed a second assessment after 10 days to evaluate test–retest reliability. Results: Both versions demonstrated excellent internal consistency (Cronbach's α = 0.957 and 0.929, respectively) and test–retest reliability (intraclass correlation coefficients = 0.983 and 0.954, respectively). Construct validity was supported by associations with measures of quality of life, fatigue, and urinary incontinence in the expected directions. Known-groups validity analyses identified greater physical work difficulties among participants with progressive MS and higher total scores among unemployed participants, whereas no significant differences emerged between full-time and part-time workers. **Conclusions:** The Italian MSWDQ-50 and MSWDQ-23 demonstrated promising psychometric properties for assessing work-related difficulties in people with MS and may support occupational assessment and rehabilitation planning.

Keywords: Multiple Sclerosis; Work participation; Cross-cultural adaptation; Psychometric properties; Multiple Sclerosis Work Difficulties Questionnaire

STATEMENT AND DECLARATIONS

Author Contributions: Conceptualization: GT, AB, GG, FP. Methodology: GT, AB, GG, FP. Investigation: GT, IR, GS, AMP, EA. Data curation: GT, FP. Formal analysis: GT, FP. Writing – original draft: GT. Writing – review and editing: AB, GG, IR, GS, AMP, EA, FP. Supervision: GG, FP. All authors read and approved the final manuscript.

Authors declare that nobody who qualifies for authorship has been omitted from the list, that contributors and their funding sources have been properly acknowledged, and that authors and contributors have approved the acknowledgement of their contributions.

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Ethical consideration. The study was conducted in accordance with the Declaration of Helsinki and was approved by the Comitato Etico Territoriale Lazio Area 1 (approval date: November 6, 2023; Protocol No. 0969/2023). Written informed consent was obtained from all participants before enrolment.

Consent to Participate. Written informed consent was obtained from all participants before enrolment.

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Declaration of Generative AI Use. Generative AI tools were used to assist with language editing, improve readability, and enhance the clarity of the manuscript. All scientific content, study design, data analysis, interpretation of the findings, and final editorial decisions were developed, critically reviewed, and approved by the authors, who take full responsibility for the accuracy and integrity of the manuscript.

Italian Cross-Cultural Adaptation and Validation of the MSWDQ-50 and MSWDQ-23 in Multiple Sclerosis

INTRODUCTION

Multiple sclerosis (MS) is a chronic neurodegenerative disease of the central nervous system characterized by inflammatory and degenerative processes that progressively compromise physical and cognitive functions. The multifaceted impact of MS significantly affects the quality of life of affected individuals, interfering not only with daily living activities and social relationships but also with the ability to participate in work-related tasks and maintain stable employment [1], [2]. Evidence consistently shows that people with MS experience reduced workforce participation compared to the general population. Fatigue, cognitive impairments, mobility limitations, sensory deficits, and longer disease duration are key factors that limit work performance and increase the risk of early job loss or reliance on disability benefits [3], [4]. These consequences carry both personal and societal economic burdens, including reduced income, increased healthcare costs, and greater reliance on social support systems [5].

Beyond these clinical challenges, social and organizational barriers exacerbate difficulties in sustaining employment. Workplace stigma, inflexible job tasks or schedules, limited access to adaptive tools, and insufficient awareness of disability accommodations can all impede work retention [6], [7]. Disclosure of an MS diagnosis, when managed in a supportive work environment, facilitates communication, access to accommodations, and overall job retention [7].

Rehabilitation may support people with MS in maintaining functional capacity and work participation. However, evaluating work-related outcomes requires valid and reliable patient-reported measures capable of identifying barriers to employment, monitoring changes over time, and assessing the effects of rehabilitation and workplace interventions [2], [8], [9]. Several assessment tools in literature assess work ability, functioning and limitations across different health conditions. However, since employment in MS is profoundly influenced by the interaction of physical, cognitive, psychological, and environmental factors, a disease-specific assessment tool can provide a more specific and multidimensional view of the work difficulties encountered by people with MS (pwMS)[10]. Trying to fill this gap, in 2012 Honan et al. developed the Multiple Sclerosis Work Difficulties Questionnaire (MSWDQ)[11], a 50-item patient-reported outcome measure (PROM) aimed to measure the objective difficulties experienced by pwMS in their workplace. Moreover, to make it more suitable for various clinical settings and rehabilitation contexts, a shortened 23-item version was developed in 2014 [12]. Currently, the MSWDQ in its original and shortened version is validated in several languages and used in several experimental studies assessing the efficacy of workplace rehabilitation interventions of pwMS [13], [14], [15], [16], [17], [18], [19], [20].

In Italy, the assessment of work-related difficulties in pwMS is currently limited by the lack of a disease-specific, psychometrically validated instrument available in the Italian language. Therefore, the aim of the present study was to translate, culturally adapt, and evaluate the psychometric properties of both the original MSWDQ-50 and the shortened

version MSWDQ-23 in an Italian population of pwMS. Based on the findings of the original validation studies and previous cross-cultural adaptations, we hypothesized that both Italian versions would demonstrate adequate psychometric properties.

MATERIALS AND METHODS

Participants

Participants were recruited between January and September 2025 from an outpatient clinic from an outpatient clinic at a university hospital in Italy. To be included in the study, participants has to (1) be over 18 years of age; (2) have a confirmed diagnosis of MS, according to the 2024 revisions of the McDonald Criteria [21]; (3) have a good knowledge and understanding of the Italian language; and (4) be currently employed or with previous work experience. People with neurological, psychiatric or cognitive comorbidities other than MS were excluded from the study. Recruitable participants were informed about the purpose of the present study and had to sign a written informed consent prior to participation [22].

A subgroup of participants under stable clinical conditions and without changes in pharmacological or rehabilitation interventions completed the administration of the two tests 10 days after the baseline to evaluate test-retest reliability.

All procedures were in accordance with the ethical standards of the institutional and national research committees and with the Declaration of Helsinki and its subsequent amendments. Written informed consent was obtained from all participants before enrolment.

Translation and Cultural Adaptation

The present study was based on the "Translation and Cultural Adaptation of Patient-Reported Outcomes (PRO) Measures – Principles of Good Practice" guidelines proposed by the International Society for Pharmacoeconomics and Outcomes Research (ISPOR)[23] and the Consensus-based Standards for the selection of health Measurement Instruments (COSMIN) guidelines [24], [25], [26]. Before starting with the translation process, formal permission for the Italian translation was requested from the original authors of the scale.

Two native Italian healthcare professionals fluent in English independently translated the MSWDQ into Italian, and the translations were reconciled into a single version. Two native English speakers fluent in Italian and blinded to the original questionnaire independently back-translated the reconciled version. An expert committee of occupational therapists reviewed all versions to ensure semantic and conceptual equivalence, after which the documentation was submitted to the original authors for approval. The pre-final version underwent cognitive debriefing with people with MS to assess clarity, comprehensibility, and cultural relevance. Participant feedback was reviewed by the expert committee and incorporated into the final proofread Italian version.

Outcome Measures

MSWDQ is a 50-items PROM questionnaire developed in 2012 by Honan et al. [11], subsequently adapted into a 23-items shortened version in 2014 [12]. The instrument aims to assess the impact of MS on work activity, with particular focus on three specific areas, physical difficulties, cognitive/psychological difficulties, and external barriers, also examining their interference with the proper performance of work tasks.

The original extended version, MSWDQ-50, consists of 50 items organized into 12 thematic subscales: General cognitive difficulties; Prospective memory difficulties; Fatigue; Low self-esteem; Interpersonal difficulties; Unsupportive work environment; Movement/mobility difficulties; Workplace inaccessibility; Bladder and bowel problems; Pain and heat sensitivity; Financial security concerns; and Difficulties balancing work and private life. It has been validated in English [11] and Serbian [13]. The shortened form, MSWDQ-23, consists of 23 items organized into three broad dimensions: Psychological/cognitive barriers; Physical barriers; and External barriers. It has been developed in English [12], then validated in Spanish [14], Turkish [15], Dutch [16], Greek [17], Persian [18], Norwegian [19] and French [20]. In both versions, items are rated on a 5-point Likert scale from 0 ("Never") to 4 ("Almost always"), referring to difficulties experienced during the previous four weeks.

The Multiple Sclerosis Quality of Life– 54 (MSQOL-54), the Fatigue Severity Scale (FSS) and the International Consultation on Incontinence Questionnaire-Urinary Incontinence Short Form (ICIQ-UI SF) were also used as external validation tools.

The MSQOL-54 is a validated clinical questionnaire that measures health-related quality of life (HRQoL) in pWMS. It combines the 36 generic questions of the SF-36 with 18 MS-specific items, organized into 12 subscales and two summary dimensions: physical health and mental health. Most of the items can be rated on a 3-, 5- or 7-point Likert scale, and one item is rated on a 10-point visual analogue scale. Higher scores demonstrate better HRQoL. It has been translated, culturally adapted and validated in Italian, showing good reliability and validity [27].

The FSS is a validated PROM widely used to assess the severity and functional impact of fatigue in pwMS and other neurological conditions. It consists of 9 items rated on a 7-point Likert scale, with higher scores indicating greater fatigue severity. The Italian version has demonstrated good psychometric properties, including reliability and validity [28].

The ICIQ-UI SF is an outcome measure specifically designed to assess the frequency, severity, and impact of urinary incontinence on quality of life. It consists of 4 items evaluating urinary leakage, the amount of leakage, its interference with everyday life, and the perceived causes of urine loss. Higher scores indicate greater symptom severity and impact. Its Italian version has been validated in healthy population, with good psychometric properties [29].

Statistical analysis

All statistical analyses in this study were carried out using the Statistical Package for the Social Sciences (SPSS), version 23.00 (IBM-SPSS, Armonk, NY, USA). Statistical significance was established at $p < 0.05$. Descriptive statistics were calculated for demographic variables, presenting continuous variables as mean ± standard deviation (SD) or median (interquartile range, IQR), depending on the data distribution, while categorical variables are reported as frequencies and percentages.

Feasibility was evaluated descriptively by examining completion rate, proportion of missing responses, administration time, and the need of support by the therapist during administration. Floor and ceiling effects were also calculated and considered present if 15% of the participants achieved the lowest or highest possible score for each score of the two tests and their respective subscales.

Internal consistency was determined using Cronbach's alpha coefficient, measuring the internal correlation between the items and the homogeneity of the scale. Values higher than 0.70 were considered acceptable as an indicator of the satisfactory homogeneity of the items within the total scale and the different subscales [30].

Test-retest reliability was assessed in a sample of clinically stable participants who completed a second MSWDQ-50 and MSWDQ-23 administration after 10 days. Reliability was investigated through the Intraclass Correlation Coefficient (ICC), with ICC values of 0.70 and corresponding 95% confidence intervals considered acceptable [31].

Construct validity was measured through a priori hypothesis testing using Spearman's rank correlation coefficients between both the original and short version of the test and the MSQOL-54, the FSS, and the ICIQ-UI SF [32]. Based on the previous MSWDQ validation studies, moderate-to-strong negative correlations were expected between the total scores of both scale and the MSQOL-54 physical and mental health composite scores, as greater work difficulties were expected to be associated with poorer health-related quality of life. Moderate-to-strong positive correlations were expected with the FSS, given the recognized contribution of fatigue to work difficulties in pwMS. Positive correlations were also expected with ICIQ-UI SF scores, particularly for MSWDQ dimensions reflecting physical and bladder/bowel-related difficulties. Stronger correlations were hypothesized between conceptually related domains than between less closely related constructs, providing evidence of convergent and divergent validity. Correlations with an absolute Spearman's rho ($|\rho|$) of 0.30–0.49 were considered moderate and those ≥0.50 strong. Construct validity was considered supported when at least 75% of the predefined hypotheses were confirmed.

Known-groups validity was assessed by testing a priori hypotheses regarding differences in MSWDQ-50 and MSWDQ-23 scores across clinically and occupationally relevant groups. Based on previous MSWDQ validation studies and the expected impact of disease progression on work functioning, participants with primary progressive MS (PPMS) and secondary progressive MS (SPMS) were hypothesized to report greater work difficulties than those with relapsing-remitting MS (RRMS), particularly in physical-related domains and total scores. Participants who were unaware of their

MS phenotype were excluded from this analysis. Participants working part-time were expected to report greater work difficulties than those working full-time, while differences according to employment status were also investigated. For variables comprising two independent groups, Student's t-test was used when the assumptions for parametric testing were satisfied. Welch's t-test was applied in the presence of unequal variances, whereas the Mann–Whitney U test was used for non-normally distributed variables. For variables comprising three or more independent groups, one-way analysis of variance (ANOVA) was used when parametric assumptions were met, Welch's ANOVA was applied in the presence of unequal variances, and the Kruskal–Wallis test was used for non-normally distributed variables. When the Kruskal–Wallis test indicated a significant overall difference, pairwise Mann–Whitney U tests with Holm adjustment for multiple comparisons were performed. Statistical significance was set at $p < 0.05$.

RESULTS

Translation and cultural adaptation

The translation and cross-cultural adaptation process resulted in an Italian version that maintained conceptual equivalence with the original questionnaire. Several items required minor linguistic or cultural adaptations where literal translation did not adequately convey the intended meaning in Italian. For example, Q9 was reformulated to clarify that hand difficulties referred to task performance, Q24 was adapted to avoid an overly colloquial translation, and in Q28 the financial meaning of "support myself" was made explicit.

Participants

A total of 256 pwMS were recruited and included in the reliability phase of the study. At the time of administration, most participants were between 25 and 44 years of age (63.6%), were female (82.4%), and had relapsing-remitting multiple sclerosis (74.2%). The demographic characteristics of the sample is summarized in Table 1.

Feasibility

All participants completed the assessment, resulting in a completion rate of 100% with no missing responses recorded. The mean administration time was 20.1 ± 3.6 minutes. Occupational therapist support was not required during questionnaire administration; all items were considered understandable by users. The occupational therapists involved in the study rated the ease of administration between 6 and 7 on a 10-point numerical rating scale, indicating good feasibility and ease of use in routine clinical practice.

Internal Consistency

The internal consistency of the MSWDQ-50 and its short version demonstrated acceptable to excellent reliability. Corrected item-total correlations were satisfactory for all items, and no substantial improvement in Cronbach's alpha was

observed following the deletion of any individual item. Cronbach's alpha (α) for the total of both scales and their subscales are reported in Table 2.

Reliability

A subgroup of nine participants representative of the target population completed both versions of the test a second time, 10 days after the first administration. The results were included in the test-retest reliability analysis, with excellent results for both questionnaire versions. Detailed reliability values, including the standard error of measurement (SEM) and the minimal detectable change at the 95% confidence level (MDC95), are presented in Table 3.

Construct validity

Construct validity was examined by assessing the correlations between the total and subscale scores of the MSWDQ-50 and MSWDQ-23 and external measures of HRQoL, fatigue, and urinary incontinence (Table 4).

Both MSWDQ total scores showed strong negative correlations with the MSQOL-54 Physical and Mental Health Composites and positive correlations with the FSS (Table 4). At the domain level, Physical Barriers showed the strongest association with the MSQOL-54 Physical Health Composite ($\rho = -0.725$), whereas Psychological/Cognitive Barriers were strongly associated with the Mental Health Composite ($\rho = -0.638$). The MSWDQ-50 Fatigue subscale correlated moderately with the FSS ($\rho = 0.451$), while the strongest ICIQ-UI SF associations were observed with Bladder/Bowel Difficulties ($\rho = 0.527$) and Physical Barriers ($\rho = 0.510$; all $p < 0.001$). Overall, the direction and magnitude of correlations were consistent with the predefined hypotheses.

Known-groups validity was examined by comparing MSWDQ-50 and MSWDQ-23 scores across clinically and occupationally relevant groups, according to MS phenotype, working schedule, and employment status (Table 5).

Significant differences according to MS phenotype were observed predominantly in physical-related domains. Participants with PPMS and SPMS reported higher scores than those with RRMS for MSWDQ-23 Physical Barriers ($p < 0.001$), MSWDQ-50 Movement/Mobility Difficulties ($p < 0.001$), and Workplace Inaccessibility ($p < 0.001$). Post-hoc comparisons confirmed significantly higher scores in both progressive phenotypes compared with RRMS, whereas no significant differences were observed between PPMS and SPMS. Bladder/Bowel Difficulties also differed across MS phenotypes ($p = 0.009$), with significantly higher scores in participants with SPMS than in those with RRMS after adjustment for multiple comparisons ($p = 0.042$). No significant differences according to MS phenotype were observed for either the MSWDQ-50 or MSWDQ-23 total score ($p = 0.365$ and $p = 0.264$, respectively).

Significant differences in MSWDQ scores were also observed across employment-status groups. Significant overall differences were found for both the MSWDQ-50 ($p < 0.001$) and MSWDQ-23 total scores ($p = 0.008$), as well as for

several cognitive, physical, and symptom-related domains. Post-hoc comparisons showed that unemployed participants reported significantly greater overall work difficulties than employees on both the MSWDQ-50 ($p < 0.001$) and MSWDQ-23 ($p = 0.003$). Unemployed participants also showed significantly higher scores than employees across several specific domains.

No significant differences in MSWDQ-50 or MSWDQ-23 total or subscale scores were observed between participants working full-time and those working part-time (all $p > 0.05$). Therefore, the predefined hypothesis that part-time workers would report greater work difficulties was not supported.

DISCUSSION

The aim of this study was to describe the Italian cross-cultural adaptation and evaluate the psychometric properties of the MSWDQ-50 and MSWDQ-23 in pwMS. Overall, both versions demonstrated satisfactory internal consistency, good-to-excellent test–retest reliability, and low measurement error.

The translation and cross-cultural adaptation process resulted in an Italian version of the MSWDQ that preserved the conceptual content of the original instrument while requiring only a limited number of targeted linguistic and cultural adaptations, intended to improve comprehensibility while maintaining conceptual equivalence with the original items. The feasibility findings further supported the appropriateness of the adapted version. All participants completed the questionnaire, with no missing responses, and none required occupational therapist assistance during administration. The absence of difficulties in understanding the items suggests that the linguistic and cultural adaptations were successful in producing wording that was accessible to Italian respondents with MS. The mean administration time of 20.1 ± 3.6 minutes indicates that the instrument can provide a detailed assessment of work-related difficulties within a relatively limited time frame. In addition, occupational therapists rated ease of administration between 6 and 7 on a 10-point numerical rating scale, supporting its practical usability in the clinical setting. Taken together, the complete response rate, these results suggest good feasibility of the Italian MSWDQ.

The internal consistency findings support the reliability of both Italian MSWDQ versions. The MSWDQ-50 showed excellent internal consistency for the total score (Cronbach's $\alpha = 0.957$), while coefficients for the 12 original subscales ranged from 0.703 (Low Self-esteem subscale) to 0.913 (General Cognitive Difficulties subscale), reaching the conventional threshold for acceptable internal consistency. A similar pattern of variability in internal consistency was already observed in the original development study [11] as well as in the subsequent cross-cultural validation in Serbian MS population [13]. Likewise, the Italian version of the MSWDQ-23 demonstrated excellent internal consistency for the total score ($\alpha = 0.929$), with good-to-excellent coefficients for the 3 subscales, in line with previous cross-cultural adaptations [14], [15], [16], [17], [18], [19], [20]. As already highlighted in previous studies, the observed variability may

partly reflect differences in the number and conceptual homogeneity of the items included in each domain, as well as by the heterogeneous impact of MS symptoms on different dimensions of work functioning [4]. However, the close agreement between these estimates suggests that the three-domain structure of the MSWDQ-23 yields highly consistent scores across different linguistic and cultural contexts.

Test–retest reliability was high for both version of the Italian MSWDQ. Specifically, the MSWDQ-50 total score showed excellent stability over the retest interval (ICC = 0.983), while the 12 subscales ranged from good for General Cognitive Difficulties (ICC = 0.819) to excellent for Workplace Inaccessibility (ICC = 0.996). Similarly, the MSWDQ-23 total score showed excellent test–retest reliability (ICC = 0.954), consistent with previous cross-cultural validations of the MSWDQ-23. The low SEM and MDC95 values suggest that both versions of the MSWDQ have limited measurement error. For the total scores, the MDC95 was found to be 7.09 points for the MSWDQ-50 and 13.36 points for the MSWDQ-23, meaning that greater changes in values are more likely to reflect a real change rather than measurement error. However, these results should be interpreted with caution since the test–retest analysis was based on a small subsample (n = 9). Further studies in larger samples are needed to confirm these findings.

Construct validity was supported by the pattern of associations between the MSWDQ scores and measures of HRQoL, fatigue, and urinary incontinence. Both the MSWDQ-50 and MSWDQ-23 total scores showed strong negative correlations with the PHC (MSWDQ-50: $\rho = -0.659$; MSWDQ-23: $\rho = -0.627$) and MHC (MSWDQ-50: $\rho = -0.651$; MSWDQ-23: $\rho = -0.626$) scores of the MSQOL-54, indicating that greater perceived work difficulties were associated with poorer HRQoL. The domain-specific correlations further supported the conceptual validity of the questionnaire. Psychological/Cognitive Barriers subscale was more strongly associated with the MSQOL-54 MHC ($\rho = -0.638$, $p < 0.001$) than with the PHC ($\rho = -0.486$, $p < 0.001$). Conversely, Physical Barriers subscale showed a stronger association with the PHC ($\rho = -0.725$, $p < 0.001$) than with the MHC ($\rho = -0.471$, $p < 0.001$). Similar domain-specific relationships have been reported in the Norwegian [19] and French [20] validations, where psychological/cognitive work difficulties were more closely associated with mental HRQoL, whereas physical work difficulties were more strongly related to physical health and disability. This pattern is also consistent with the broader MS literature. For example, cognitive impairments have been repeatedly associated with difficulties in maintaining employment and with adverse work outcomes such as deficits in information-processing speed, memory, and executive functioning [33]. Conversely, the stronger relationship between Physical Barriers and the MSQOL-54 PHC can be considered clinically plausible since mobility impairment and physical disability can directly affect both work performance and broader physical functioning. In fact, difficulties like moving within the workplace or performing physically demanding tasks may restrict the ability to meet occupational demands, while simultaneously reducing physical aspects of HRQoL [34].

The associations with fatigue provided further evidence of convergent validity. Higher fatigue severity was strongly associated with greater overall work difficulties on both the MSWDQ-50 ($\rho = 0.541$, $p < 0.001$) and MSWDQ-23 ($\rho = 0.523$, $p < 0.001$), while the MSWDQ-50 Fatigue subscale showed a moderate correlation with the FSS ($\rho = 0.451$, $p < 0.001$). A comparable pattern has been observed in the original development study and in the Dutch validation of the tool [11], [12], [16], in which different fatigue outcome measures have been adopted. On the other hand, the FSS was also used in the Persian validation study [18], reporting a stronger association between fatigue and the overall MSWDQ-23 score. Despite differences in the magnitude of the correlations, the findings of the present study and previous validation studies consistently suggest what already established in the broader MS literature. Fatigue has been consistently identified as an important factor associated with difficulties in maintaining employment, reduced ability to meet work demands, increased sickness absence, and lower productivity while at work [35], [36] . Evidence from an Italian population further supports this relationship, showing that higher fatigue levels are associated with greater perceived difficulties in the workplace [10].

Urinary incontinence showed the expected pattern of associations with MSWDQ domains. The strongest association with the ICIQ-UI SF was observed for the MSWDQ-50 Bladder/Bowel Difficulties subscale ($\rho = 0.527$, $p < 0.001$), while the MSWDQ-23 Physical Barriers domain also showed a strong correlation ($\rho = 0.510$, $p < 0.001$). Although specific urinary or bowel symptom measures were not included as convergent validity comparators in previous cross-cultural validations of the MSWDQ, bladder- and bowel-related items have consistently contributed to the Physical Barriers domain of the MSWDQ-23 [19], [20]. This pattern appears to be clinically coherent with the specific occupational consequences of urinary dysfunction in MS. Urgency, frequency, and fear of incontinence may create difficulties when work requires mobility, prolonged activities, or limited flexibility in accessing toilet facilities, thereby linking urinary symptoms more directly to physical and bladder-related work barriers [37]. Consistent with this interpretation, previous studies have associated bladder and bowel dysfunction with greater work-related difficulties, sickness absence, and poorer employment outcomes in pwMS [38].

Known-groups analysis according to MS phenotype showed a pattern of greater physical work difficulties in participants with progressive forms of MS. Participants with PPMS and SPMS reported significantly higher Physical Barriers, Movement/Mobility Difficulties, and Workplace Inaccessibility scores than those with RRMS, while Bladder/Bowel Difficulties also differed across phenotypes. This pattern is consistent with the Spanish and Norwegian validation studies [14], [19], which similarly identified greater physical work barriers in progressive MS. The predominance of physical work difficulties in progressive MS is clinically plausible, given the greater accumulation of disability and mobility limitations typically associated with progressive disease courses [39]. This interpretation is consistent with the broader literature showing that progressive MS phenotypes are generally associated with poorer employment outcomes, including

lower employment rates, greater absence sickness, and higher use of disability pension compared with RRMS [40], [41]. However, these differences appear to be strongly influenced by the greater disability burden associated with progressive disease rather than by disease phenotype alone [36].

Employment status showed a clearer relationship with perceived work difficulties, with unemployed participants reporting significantly higher MSWDQ-50 and MSWDQ-23 total scores than employees, together with differences across several physical, cognitive, and symptom-related domains. Similar findings have been reported in the Norwegian and French cross-cultural adaptations [19], [20] and in current scientific literature, in which higher levels of physical disability and poorer cognitive functioning have been repeatedly associated with unemployment, early retirement, and reduced work ability in pwMS [42].

Working schedule did not discriminate MSWDQ scores in the present sample, with no significant differences between full-time and part-time workers for either the MSWDQ-50 or MSWDQ-23. This result is not consistent with the Greek validation [17], in which substantially greater difficulties among part-time workers were reported across all domains and the total score of the shorter version of the tool.

Taken together, the findings of the present study indicate that both Italian versions of the MSWDQ-50 and MSWDQ-23 provide reliable and clinically meaningful information on work-related difficulties in pwMS. Their multidimensional structure allows the assessment of psychological/cognitive, physical, symptom-related, and contextual barriers, while domain-specific scores may provide clinically relevant information beyond the total score and support more targeted interventions. An early identification of work is indeed particularly relevant in MS, as changes in occupational functioning may occur before complete withdrawal from employment.

Limitations

This study has several limitations. First, test–retest reliability and measurement error were estimated in a small subsample (n = 9). Although ICC values were high, the corresponding SEM and MDC95 estimates should therefore be considered preliminary and require confirmation in a larger sample. Second, construct and known-groups validity were examined using cross-sectional data, so that the observed associations cannot establish causal relationships between clinical characteristics and work difficulties, nor can they determine whether higher MSWDQ scores predict subsequent changes in employment. Moreover, some subgroups included in the known-groups analyses were considerably smaller than the reference groups, which may have reduced the precision of comparisons. Finally, responsiveness was not assessed in the present study; therefore, the ability of the Italian MSWDQ-50 and MSWDQ-23 to detect changes in work-related difficulties over time remains to be established.

CONCLUSION

In conclusion, the Italian versions of the MSWDQ-50 and MSWDQ-23 demonstrated good feasibility and satisfactory psychometric properties in pwMS. Both versions showed adequate-to-excellent internal consistency, high test–retest reliability, and limited measurement error, while construct validity was supported by theoretically coherent associations with HRQoL, fatigue, and urinary symptoms. Known-groups analyses provided additional evidence of validity, particularly through the ability of specific MSWDQ domains to distinguish MS phenotypes and employment-status groups, although working schedule did not discriminate questionnaire scores. Taken together, these findings support the use of both Italian MSWDQ versions for assessing perceived work-related difficulties in pwMS. Further longitudinal and structural validation studies are warranted to strengthen the interpretation and clinical application of these measures. From an occupational perspective, the MSWDQ may help identify barriers affecting work participation and occupational performance, supporting occupational therapists and other rehabilitation professionals in assessment, goal setting, and the planning of person-centred interventions aimed at maintaining employment and participation in meaningful productive roles. Further longitudinal and structural validation studies are warranted to strengthen the interpretation and clinical application of these measures.

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Table 1. Demographic characteristics of the sample (n = 256)

Category	Frequency	Percentage (%)
Gender		
Female	211	82
Male	45	18
Education		
Elementary school	0	0
Middle school	21	8
High school diploma	107	42
Bachelor's degree	43	17
Master's degree	71	28
Other	14	5
MS Phenotype		
Relapsing-Remitting Multiple Sclerosis (RRMS)	190	74
Primary Progressive Multiple Sclerosis (PPMS)	23	9
Secondary Progressive Multiple Sclerosis (SPMS)	25	10
Unknown	18	7
Employment status		
Employee	170	66
Freelancer	26	10
Retired	17	7
Unemployed	28	11
Other	15	6
Working schedule		
Full-time	138	54
Part-time	75	29
Not working	43	17

Table 2. Internal consistency of the Italian version of the MSWDQ-50 and MSWDQ-23

	Cronbach's α
MSWDQ-50 total scale	0.957
General Cognitive Difficulties	0.913
Prospective Memory	0.900
Fatigue	0.790
Low Self-esteem	0.703
Interpersonal Difficulties	0.742
Non-supportive Workplace	0.870
Movement/Mobility	0.892
Workplace Inaccessibility	0.764
Bladder/Bowel Problems	0.823
Pain/Temperature Sensitivity	0.709
Financial Security	0.774
Work/Home Balance	0.827
MSWDQ-23 total scale	0.929
Psychological/Cognitive Barriers	0.910
Physical barriers	0.842
External barriers	0.843

Table 3. Internal consistency of the Italian version of the MSWDQ-50 and MSWDQ-23

MSWDQ-50	Mean ± SD (t0)	Mean ± SD (t1)	ICC (95% CI)	SEM	MDC95
Total score	27.4 ± 19.6	25.7 ± 19.2	0.98 (0.93–0.99)	2.56	7.09
General Cognitive Difficulties	27.8 ± 24.3	25.9 ± 24.5	0.91 (0.66–0.98)	7.38	20.45
Prospective Memory	22.2 ± 32.0	23.2 ± 33.0	0.97 (0.86–0.99)	5.90	16.36
Fatigue	36.1 ± 31.5	33.9 ± 30.1	0.98 (0.95–0.99)	3.72	10.32
Low Self-esteem	28.2 ± 31.7	26.9 ± 30.6	0.99 (0.96–0.99)	3.26	9.04
Interpersonal Difficulties	15.9 ± 23.4	15.8 ± 23.4	0.99 (0.98–0.99)	1.47	4.08
Non-supportive Workplace	22.2 ± 22.7	14.6 ± 22.1	0.84 (0.57–0.96)	9.00	24.96
Movement/Mobility	32.4 ± 20.6	28.7 ± 24.3	0.89 (0.65–0.97)	7.34	20.35
Workplace Inaccessibility	27.8 ± 34.8	25.0 ± 34.9	0.97 (0.91–0.99)	5.51	15.28
Bladder/Bowel Problems	41.7 ± 34.1	37.9 ± 29.5	0.92 (0.70–0.98)	9.23	25.57
Pain/Temperature Sensitivity	25.9 ± 17.9	23.6 ± 20.6	0.82 (0.39–0.96)	8.22	22.78
Financial Security	14.4 ± 18.5	15.0 ± 17.7	0.91 (0.65–0.98)	5.43	15.05
Work/Home Balance	34.3 ± 19.7	37.9 ± 20.5	0.88 (0.63–0.97)	6.79	18.82
MSWDQ-23					
Total scale	26.5 ± 21.4	25.2 ± 23.6	0.95 (0.82–0.99)	4.82	13.36
Psychological/Cognitive Barriers	24.2 ± 20.6	25.3 ± 22.8	0.96 (0.86–0.99)	4.01	11.13
Physical barriers	23.3 ± 20.4	22.6 ± 20.9	0.97 (0.86–0.92)	3.76	10.43
External barriers	31.9 ± 34.6	27.8 ± 33.7	0.90 (0.65–0.97)	10.64	29.50

SD = standard deviation; t0 = first assessment; t1 = retest assessment; ICC = intraclass correlation coefficient; CI = confidence interval; SEM = standard error of measurement; MDC95 = minimal detectable change at the 95% confidence level

Table 4. Spearman correlation coefficients between the MSWDQ-50 and MSWDQ-23 and external outcome measures

	MSQOL-54 PH_CP	**MSQOL-54 MH_CP**	**FSS**	**ICIQ-UI SF**
MSWDQ-50				
Total score	**−0.659 (p<0.001)**	**−0.651 (p<0.001)**	**0.541 (p<0.001)**	0.301 (p<0.001)
General Cognitive Difficulties	−0.392 (p<0.001)	**−0.606 (p<0.001)**	0.329 (p<0.001)	0.202 (p=0.001)
Prospective Memory	−0.357 (p<0.001)	**−0.528 (p<0.001)**	0.287 (p<0.001)	0.185 (p=0.003)
Fatigue	−0.497 (p<0.001)	**−0.536 (p<0.001)**	0.451 (p<0.001)	0.151 (p=0.016)
Low Self-esteem	−0.376 (p<0.001)	**−0.506 (p<0.001)**	0.335 (p<0.001)	0.145 (p=0.020)
Interpersonal Difficulties	−0.439 (p<0.001)	−0.487 (p<0.001)	0.341 (p<0.001)	0.216 (p<0.001)
Non-supportive Workplace	−0.360 (p<0.001)	−0.364 (p<0.001)	0.356 (p<0.001)	0.088 (p=0.159)
Movement/Mobility	**−0.712 (p<0.001)**	−0.410 (p<0.001)	0.465 (p<0.001)	0.483 (p<0.001)
Workplace Inaccessibility	**−0.637 (p<0.001)**	−0.374 (p<0.001)	0.474 (p<0.001)	0.392 (p<0.001)
Bladder/Bowel Problems	**−0.513 (p<0.001)**	−0.365 (p<0.001)	0.302 (p<0.001)	**0.527 (p<0.001)**
Pain/Temperature Sensitivity	**−0.563 (p<0.001)**	−0.401 (p<0.001)	0.395 (p<0.001)	0.123 (p=0.050)
Financial Security	−0.315 (p<0.001)	−0.441 (p<0.001)	0.306 (p<0.001)	0.034 (p=0.592)
Work/Home Balance	−0.388 (p<0.001)	−0.471 (p<0.001)	0.411 (p<0.001)	0.078 (p=0.211)
MSWDQ-23				
Total scale	**−0.627 (p<0.001)**	**−0.626 (p<0.001)**	**0.523 (p<0.001)**	0.299 (p<0.001)
Psychological/Cognitive Barriers	−0.486 (p<0.001)	**−0.638 (p<0.001)**	0.444 (p<0.001)	0.216 (p<0.001)
Physical barriers	**−0.725 (p<0.001)**	−0.471 (p<0.001)	0.489 (p<0.001)	**0.510 (p<0.001)**
External barriers	−0.430 (p<0.001)	**−0.502 (p<0.001)**	0.416 (p<0.001)	0.127 (p=0.042)

MSWDQ-50 = Multiple Sclerosis Work Difficulties Questionnaire-50; MSWDQ-23 = Multiple Sclerosis Work Difficulties Questionnaire-23; MSQOL-54 = Multiple Sclerosis Quality of Life-54; PH_CP = Physical Health Composite; MH_CP = Mental Health Composite; FSS = Fatigue Severity Scale; ICIQ-UI SF = International Consultation on Incontinence Questionnaire-Urinary Incontinence Short Form.
Strong correlations are shown in bold.

Table 5. Known-groups validity of the Italian MSWDQ-50 and MSWDQ-23

MSWDQ-50	MS Phenotype				Employment status						Working schedule		
	RR	PP	SP	p	1	2	3	4	5	p	Full-time	Part-time	p
Total score	39.0 ± 15.7	40.6 ± 19.0	45.2 ± 20.8	0.365	38.4 ± 14.1	40.0 ± 21.3	40.0 ± 27.1	51.5 ± 11.6	37.9 ± 19.8	**<0.001**	**38.4 ± 16.6**	**39.2 ± 13.1**	0.703
General Cognitive Difficulties	45.8 [25.0–58.3]	41.7 [27.1–47.9]	29.2 [20.8–66.7]	0.701	41.7 [25.0–54.2]	45.8 [29.2–62.5]	45.8 [16.7–70.8]	56.2 [41.7–66.7]	29.2 [20.8–58.3]	**0.037**	41.7 [25.0–58.3]	41.7 [25.0–54.2]	0.973
Prospective Memory	25.0 [10.0–45.0]	20.0 [0.0–35.0]	20.0 [5.0–50.0]	0.324	20.0 [10.0–40.0]	25.0 [15.0–48.8]	30.0 [0.0–65.0]	32.5 [23.8–55.0]	15.0 [7.5–35.0]	**0.0499**	25.0 [10.0–40.0]	20.0 [10.0–38.8]	0.435
Fatigue	50.0 [41.7–66.7]	41.7 [25.0–62.5]	50.0 [33.3–66.7]	0.446	50.0 [35.4–66.7]	54.2 [33.3–75.0]	41.7 [25.0–75.0]	66.7 [58.3–75.0]	58.3 [29.2–66.7]	**0.002**	50.0 [33.3–66.7]	50.0 [41.7–66.7]	0.254
Low Self-esteem	41.7 [25.0–50.0]	25.0 [8.3–50.0]	33.3 [16.7–58.3]	0.093	33.3 [25.0–50.0]	41.7 [18.8–56.2]	25.0 [8.3–50.0]	50.0 [39.6–66.7]	33.3 [16.7–50.0]	**0.011**	33.3 [20.8–50.0]	41.7 [25.0–56.2]	0.262
Interpersonal Difficulties	33.3 [16.7–50.0]	33.3 [4.2–41.7]	33.3 [33.3–58.3]	0.255	33.3 [16.7–50.0]	8.3 [0.0–50.0]	33.3 [0.0–58.3]	41.7 [33.3–52.1]	16.7 [8.3–58.3]	0.082	33.3 [12.5–50.0]	33.3 [16.7–50.0]	0.548
Non-supportive Workplace	35.0 [15.0–53.8]	30.0 [17.5–57.5]	40.0 [15.0–55.0]	0.808	40.0 [15.0–55.0]	20.0 [5.0–38.8]	25.0 [20.0–60.0]	40.0 [25.0–56.3]	30.0 [10.0–40.0]	0.118	35.0 [15.0–55.0]	35.0 [20.0–50.0]	0.850
Movement/Mobility	39.3 [18.8–53.6]	64.3 [53.6–80.4]	64.3 [53.6–85.7]	**<0.001**	39.3 [22.3–53.6]	42.9 [25.9–63.4]	57.1 [46.4–78.6]	60.7 [38.4–72.3]	25.0 [10.7–55.4]	**<0.001**	39.3 [21.4–53.6]	44.6 [25.0–57.1]	0.168
Workplace Inaccessibility	12.5 [0.0–25.0]	31.2 [12.5–62.5]	43.8 [31.2–56.2]	**<0.001**	12.5 [1.6–31.2]	12.5 [6.2–25.0]	31.2 [12.5–56.2]	31.2 [18.8–50.0]	12.5 [3.1–18.8]	**0.001**	12.5 [0.0–31.2]	15.6 [6.2–25.0]	0.356
Bladder/Bowel Problems	25.0 [12.5–50.0]	50.0 [25.0–56.2]	43.8 [25.0–62.5]	**0.009**	25.0 [12.5–50.0]	34.4 [25.0–50.0]	31.2 [0.0–68.8]	46.9 [31.2–62.5]	25.0 [9.4–43.8]	**0.021**	25.0 [12.5–50.0]	25.0 [12.5–48.4]	0.896
Pain/Temperature Sensitivity	41.7 [25.0–58.3]	50.0 [33.3–66.7]	50.0 [25.0–83.3]	0.219	41.7 [25.0–58.3]	45.8 [18.8–66.7]	33.3 [16.7–66.7]	66.7 [47.9–83.3]	41.7 [33.3–66.7]	**<0.001**	41.7 [25.0–58.3]	50.0 [33.3–58.3]	0.136
Financial Security	62.5 [43.8–81.2]	56.2 [21.9–75.0]	50.0 [37.5–87.5]	0.108	62.5 [43.8–81.2]	59.4 [37.5–85.9]	25.0 [12.5–43.8]	75.0 [56.2–82.8]	43.8 [25.0–90.6]	**0.002**	62.5 [43.8–87.5]	62.5 [43.8–75.0]	0.340

Work/Home Balance	50.0 [33.3–64.6]	41.7 [16.7–58.3]	50.0 [16.7–58.3]	0.457	50.0 [27.1–58.3]	50.0 [25.0–66.7]	33.3 [25.0–50.0]	50.0 [33.3–66.7]	50.0 [37.5–66.7]	0.624	50.0 [25.0–66.7]	50.0 [33.3–58.3]	0.840
MSWDQ-23													
Total scale	40.0 ± 19.0	43.4 ± 21.6	46.4 ± 23.5	0.264	40.4 ± 18.5	41.0 ± 22.5	38.2 ± 28.4	52.3 ± 14.2	37.3 ± 23.2	**0.008**	40.3 ± 20.2	40.4 ± 17.9	0.974
Psychological/Cognitive Barriers	36.4 [20.5–47.7]	36.4 [13.6–50.0]	29.5 [13.6–56.8]	0.973	35.2 [18.8–47.2]	31.8 [13.6–47.2]	29.5 [13.6–61.4]	46.6 [35.8–52.8]	36.4 [15.9–50.0]	0.068	36.4 [15.9–47.7]	34.1 [20.5–44.9]	0.875
Physical barriers	31.2 [18.8–46.9]	59.4 [39.1–67.2]	56.2 [37.5–68.8]	**<0.001**	34.4 [18.8–46.9]	37.5 [28.1–48.4]	37.5 [25.0–65.6]	50.0 [36.7–63.3]	25.0 [17.2–39.1]	**0.003**	34.4 [15.6–46.9]	37.5 [21.9–52.3]	0.252
External barriers	50.0 [31.2–75.0]	50.0 [15.6–62.5]	50.0 [31.2–75.0]	0.524	56.2 [31.2–75.0]	50.0 [28.1–75.0]	25.0 [6.2–56.2]	59.4 [48.4–82.8]	50.0 [12.5–78.1]	**0.039**	56.2 [31.2–75.0]	50.0 [31.2–75.0]	0.497

Data are presented as median [IQR] for subscale scores and mean ± SD for total scores. Employment status: 1 = employee; 2 = self-employed; 3 = retired; 4 = unemployed; 5 = other. RRMS = relapsing-remitting multiple sclerosis; PPMS = primary progressive multiple sclerosis; SPMS = secondary progressive multiple sclerosis.

Group sizes: RRMS, n = 190; PPMS, n = 23; SPMS, n = 25; employee, n = 170; self-employed, n = 26; retired, n = 17; unemployed, n = 28; other, n = 15; full-time, n = 135; part-time, n = 74.

Significant p-values are shown in bold.