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Occupational performance in multiple sclerosis and its relationship with quality of life and fatigue

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ABSTRACT

Background. Performance and perceived satisfaction of daily occupations in people with multiple sclerosis (MS) can affect the perception of their quality of life and be impacted by the level of fatigue. **Aim.** To describe the performance and occupational self-perception, as well as to analyze whether there is a relationship between the perception of occupational performance and the quality of life and perceived fatigue. **Design.** A descriptive cross-sectional study. **Setting.** Participants were referred by the services of Neurology of the various hospitals in Madrid. The assessment process was performed either at the MS' associations, in the participants' home, or at the Laboratory of Cognitive Intervention of the Health Sciences Faculty of the University. **Population.** A total sample of 30 people with MS (pwMS) selected by non-probabilistic consecutive sampling during a three-months uptake patient recruitment period **Method.** The outcome measures used were the Canadian Occupational Performance Measure (COPM), the Modified Fatigue Impact Scale (MFIS) and the Multiple Sclerosis Quality of Life 54 (MSQoL-54). Descriptive analysis, parametric and non-parametric tests and multiple linear regression models were used. **Results.** A statistically significant positive correlation was found between occupational performance and physical and mental health. Also, high physical health scores were associated with high satisfaction scores. Multiple regression models indicated that high levels of satisfaction were associated with high levels of physical health ($p = 0.013$). **Conclusions**: The better the perception of the physical aspects that influence the quality of life, the better the perceived satisfaction of pwMS. Fatigue may not influence self-perceived satisfaction and performance. **Clinical rehabilitation impact**: The physical factors affecting perceived satisfaction should be considered when planning interventions to promote quality of life in pwMS. Although

fatigue associated with MS may influence perceived performance and satisfaction, no relevant associations were found between variables.

Keywords: multiple sclerosis, activities of daily living, self-perception, fatigue, quality of life.

TEXT

Introduction

The clinical course descriptions (phenotypes) published by Lublin and Reingold (1996) divide multiple sclerosis (MS) into relapsing remitting MS, secondary progressive MS (SPMS), and primary progressive MS (PPMS) subtypes. However, updated phenotype descriptions (Lublin et al, 2014), include clinically isolated syndrome (CIS) as a part of the spectrum of MS, emphasizing the observation of evidence of recurrent inflammatory disease, in addition to the presence or absence of insidious worsening of neurological function.

Since some forms of MS are characterized by a progressive worsening of neurological function, the symptoms and motor deficits in pwMS can affect their occupational performance of activities of daily living (AVD), which can lead to decreased independence (Shahrbanian, Duquette & Mayo, 2018) and participation in their occupational performance (DO) in comparison with people without a neurological pathology (Kalia and O'Connor, 2005).

In moderate and severe stages of the illness, the capacity for the performance of basic and instrumental activities of daily living may be reduced, and, despite the fact that some patients may be independent in basic activities, the performance of instrumental activities is usually affected and is not performed satisfactorily (Månsson & Lexell, 2004), which leads to a significant impact on the performance of social roles, family wellbeing and quality of life (Månsson y Lexell, 2004).

The ability to participate in ADL, work and leisure activities among pwMS (Heine, Verschuren & Hoogervorst, 2017; Salah et al., 2017; Yozbatiran, Baskurt, Baskurt, Ozakbas & Idiman, 2006) may be affected due to the impact of fatigue on functionality and participation (Newland, Lunsford & Flach, 2017). These factors have a negative impact, determining the quality of life perceived by pwMS (Zwibel, 2009), which leads to a greater feeling of discomfort, negatively influencing family life (Eilertsen et al., 2015).

In recent decades, the personal perception of the quality of life has been shown to influence the perception of one's well-being, becoming one of the most studied factors as it enhances the understanding of the patient's expectations, and facilitates clinical decisions and the design of effective treatment programs (Camfield & Skevington, 2008; Hadgkiss, et al, 2013).

In an attempt to deepen our understanding of these constructs, the aim of this study was to identify the possible relationship between perception and self-perceived satisfaction of ADL, fatigue and quality of life in pwMS, and the influence of these factors on satisfaction and perceived performance. We hypothesized that fatigue and perceived quality of life would probably influence the self-perception of satisfaction and occupational performance.

Methods

Study design

A descriptive, cross-sectional study was performed, to analyze whether the subjective perception of occupational performance in pwMS is related with quality of life and perceived fatigue. This study was approved by the Research Ethics Committee of the Rey Juan Carlos' University in accordance with the ethical principles for medical research on

human subjects laid down in the Helsinki Declaration in its latest revision at the 64th General Assembly of the AMM performed in Fortaleza (Brazil) in October 2013.

Sample size and recruitment

The final sample of the study was obtained by sampling non-probabilistic convenience during a three-months patient recruitment period. The sample comprised 30 subjects: 13 men and 17 women, who were classified according to the phenotypes proposed by Lublin (2014).

The inclusion criteria were: (a) people aged between 25 and 60 years; (b) diagnosed with MS; (c) not experiencing relapses over the last three months, and (d) individuals who accepted and signed the informed consent.

The study participants were recruited between the end of 2015 and the beginning of 2016, and were referred by the services of Neurology of the various hospitals of the Community of Madrid, to the associations of patients with MS who collaborated in the study. The assessment process of participants was performed at the beginning of the year 2016 and was performed either at the patient associations, in the participants' home, or at the Laboratory of Cognitive Intervention of the Health Sciences Faculty of the University.

Outcome measures

All participants completed three standardized assessments: the Canadian Occupational Performance Measure (COPM), the Modified Fatigue Index Scale (MFIS) and the Multiple Sclerosis Quality of Life 54 (MSQoL-54). Besides, the Expanded Disability Status Scale (EDSS) (Kurtzke, 1983) was performed to determine the degree of severity of the illness and clinical and demographic data were collected to provide data related with sex, age, level of studies, subtype of MS and its duration.

The Canadian Occupational Performance Measure (Law et al., 1990). Enables the identification of specific problems perceived by the person regarding the performance of

ADLs in their everyday life, via a semi-structured interview. The COPM includes a classification divided into three areas, each of which is subdivided into several subgroups: self-care (personal care, functional mobility and community management); productivity (paid/unpaid work, household management and play/school); and leisure (quiet recreation, active recreation and socialization). During the first stage of the interview, the participant indicates those activities which they found difficult and subsequently these are graded according to the level of importance on a scale of 0 to 10 (0: not very important; 10: very important). Once graded, the participant identifies the five activities they consider most important, to later be scored according to the performance and perceived satisfaction.

Modified Fatigue Impact Scale (MFIS) (Pavan et al., 2007). The MFIS is the summarised version of the Fatigue Impact Scale (FIS) consisting of 40 items. The MFIS enables the ability to quantify the impact of patient fatigue over the last month on an ordinal scale of 0 to 4. This is a self-administered test with 21 questions grouped into three subscales: physical (9 items), cognitive (10 items) and psychosocial (2 items) (Kos et al., 2005).

The Multiple Sclerosis Quality of Life survey (MSQoL-54) (Vickrey, Hays, Harooni, Myers & Ellison, 1995). This is a measure of the perception of the quality of life of pwMS. This is a self-administered questionnaire which takes 15-20 minutes for patients to complete, and which includes 18 specific items of MS out of 54 and includes a scale of 0 to 10 where subjects must rate their overall quality of life. Scores range between 0 to 100 points, with greater scores indicating greater quality of life (Rosato et al., 2016; Fricska-Nagy et al., 2016; Parkin et al., 2000).

Procedure

Participants were recruited from the two associations of patients with MS of the

Community of Madrid, after receiving information and signing the informed consent. The researchers of the university visited the association or the participant's home in order to perform the initial assessment. This initial assessment and all the evaluation tools mentioned above were administered rigorously by an occupational therapist with clinical experience and specific training in the administration of the assessments.

Data analysis

The descriptive statistics (Table 1), the mean scores (M) and the standard deviations (SD) of the COPM, the MFIS and the MSQoL-54 were calculated according to the subtype of MS (Table 3) and the participant's gender (Table 4). The variables were analyzed using the IBM SPSS Statistical program for Windows, version 22.0 (Copyright © 2013 IBM SPSS Corp.).

We analyzed the degree of correlation between satisfaction and perceived performance, fatigue and quality of life, according to their distribution, normal or not, with the Pearson and Spearman coefficients, respectively, calculating a 95% confidence interval. The comparison of means between the different subgroups of MS was performed using the ANOVA parametric test and the Kruskall-Wallis nonparametric test; in the case of the gender variable, the parametric Student's t-test was used due to the normal distribution of the variables and the non-parametric Mann-Whitney test was used because the normality of the variable could not be assumed, even after the transformation of the data into logarithms. Multiple linear regression models were made (Table 5), adjusted for the gender variables, the duration of the disease and the type of MS in order to determine the possible influence of the MFIS, and the physical and mental health composites of the MSQoL-54 scale on the dimensions of the COPM.

Results

The mean age of participants was 47.5 ± 8.48 in men and 44.5 ± 7.83 in the group of women. Among the group of men, the mean duration of the illness was 11.27± 7.81 years, with a mean score on the EDSS of 5.2 ± 1.69. In the women, the mean duration of the illness was 9.26 ± 6.52 years and the score on the EDSS scale was 4.8 ± 1.8.

From a total of 136 activities identified in the COPM, the participants identified the area of self-care as the area where they experienced the greatest difficulties (57.4%), followed by the areas of productivity (30.1%) and leisure (12.5%). Of the nine subgroups analyzed in the COPM, the activities for personal care (27.9%), home management (27.2%) and functional mobility (15.4%) were the activities most reported in this sample.

The activities related with personal care and community management were those with the highest score in performance and satisfaction, while the functional mobility was the activity with the lowest score in both sections.

Table 2 shows the mean scores and standard deviation, the reliability index and the correlations between the scales. The results indicate that performance correlates in a statistically significant and positive way with physical health ($r = 0.408$, $p = 0.025$) and mental health ($r = 0.371$, $p = 0.044$) composites of the MSQoL-54, which indicates that higher scores in physical and mental health are associated with higher performance scores. Furthermore, higher scores in physical health are associated with higher satisfaction scores ($r = 0.408$, $p = 0.025$).

Table 3 shows the comparison of means between the different groups of MS. The ANOVA indicates that there are no statistically significant differences in the performance and satisfaction scores of the COPM, nor in the MFIS, but significant differences and a medium effect size were observed in the physical function variable of the MSQoL-54 ($F(3,65) = 40.25$, $p < 0.05$, $\eta 2 = 0.21$). The post-hoc analysis indicates that only the subtypes of RRMS and PPMS differ from each other ($p < 0.05$).

Table 4 shows the comparison of means according to gender. No statistically significant differences were observed in the performance and satisfaction scores of COPM, nor in the MFIS. However, there were statistically significant differences in the total physical health score, social function, energy / fatigue, associated stress to physical health and mental health and the total mental health score of the MSQoL-54 scale.

Table 5 shows the results of the multiple linear regression model, which reveals that in terms of performance, none of the variables considered showed a statistically significant effect. However, physical health showed a statistically significant and positive effect on the satisfaction score, thus, high levels of satisfaction are associated with high levels of physical health ($p = 0.013$).

Discussion

Based on the results of the first phase of the study by Lexell and Lexell (2004) and in the description of the performance and satisfaction perceived by pwMS, documented in previous studies (Lexell & Lexell, 2004; Lexell, Iwarson & Lexell, 2007; Fynlayson, Winkler-Impey, Nicolle & Edwards, 1998; Lexell, Flansbjer & Lexell, 2014; Esnouf, Taylor, Mann & Barrett, 2010), the results of this study reinforce the scientific evidence of the impact of the disease in the performance of self-care activities and productivity.

Despite not showing significant results in our study, the impact of fatigue on the personal satisfaction of pwMS seems to interfere in the occupations involving displacement, such as those related to functional mobility and recreational activities. Our results, support previous research (Zwibel, 2009; Heesen et al., 2008), reporting that fatigue is mainly associated with mobility and displacement and has the greatest negative impact on personal satisfaction. Nevertheless, in our study, and in contrast to the studies by Tellez et al. (2006), and Abdulah, Badr & Manee (2018), in which fatigue is identified as one of

the factors that interferes the most with the performance of ADLs, fatigue is not associated with a worse perceived performance, therefore, the results did not confirm the hypothesis that fatigue influences self-perceived satisfaction and performance.

This may be due to the fact that fatigue may be influenced by a number of very diverse parameters, not only physical but also emotional, as noted in previous studies that have indicated that fatigue has a significant impact in health perception and social functioning (Janardhan & Bakshi, 2002). Other studies have found that fatigue only interferes negatively with emotional aspects, such as the perception of quality of life (Kooshiar et al., 2015; Tarakci, Yeldan, Huseyinsinoglu, Zenginler and Eraksoy, 2013; Strober, 2018). In our study, quality of life and its associated physical factors predispose individuals towards a greater satisfaction in perceived occupational performance, which supports the evidence of the positive impact that self-perception has on perceived quality of life and personal self-efficacy, as indicated by Strober (2018).

The perception of quality of life and the associated physical and mental factors are those that most significantly influence the performance and perceived satisfaction of people with MS, and have been previously identified as predictors of quality of life in patients with MS (Benedict et al., 2005). Other emotional aspects, such as self-esteem and self-efficacy, may improve participation throughout the therapeutic process (Wilski & Tasiemski, 2016) and even influence the benefits of the intervention (Wilski et al., 2019). In the study by Molt et al, (2017), the association between self-efficacy and walking performance in pwMS was examined, finding an association between self-efficacy, particularly for functioning with MS, and objective walking performance. All the above reinforces the importance of emotional aspects and self-perception during the process of recovery, and which, in turn, most likely influence the perception of performance and satisfaction of ADLs.

These significant associations between different concepts, have been observed in a study performed by Karhula, et al (2019), reporting significant associations between participation, autonomy and quality of life in pwMS, with moderate to severe disability. Therefore, our results contribute towards a multidimensional understanding of the disease and support the use of self-assessment tools that identify the underlying factors that impact on occupational performance.

Study limitations

Because of the small sample size, the possibilities to draw generalizable conclusions from the results obtained are limited. On the other hand, the number of intragroup participants is unbalanced due to the difficulty of recruiting a larger sample and a because of the limited time for patient recruitment.

Conclusions

The better the perception of the physical aspects that influence the quality of life of the pwMS, the greater the perceived satisfaction of their performance. Therefore, the use of occupation-based and client-centered evaluation tools such as the COPM, which provide information based on self-perceived occupational performance and satisfaction, and the use of MSQoL-54 together, contribute to the understanding of the impact of the disease on the person's daily life.

Conflicts of interest

The authors declare that there is no conflict of interest.

Implications for Occupational Therapy Practice

The results of this study have the following implications for occupational therapy practice with pwMS:

- Physical factors affecting perceived satisfaction should be considered when planning interventions to promote quality of life in MS patients.
- Although fatigue associated with multiple sclerosis may influence perceived performance and satisfaction, the associations between variables were not relevant.

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TABLES

Table 1.
Sociodemographic characteristics of patients.

	Men	**Women**
Gender	13	17
Age (years		
- **M±SD (range)**	47.5 ± 8.48 (31-58)	44.5 ± 7.83 (32-55)
Duration of illness (years)		
- **M±SD (range)**	11.27 ± 7.81 (3-27)	9.26 ± 6.52 (0.5-23)
Subtype of MS		

- **Relapsing remitting (RRMS)**	6	9
- **Primary progressive (PPMS)**	4	4
- **Secondary progressive (SPMS)**	3	4
EDSS score*		
- **M±SD (range)**	5.2 ± 1.69 (1-7)	4.8 ± 1.8 (1.5-6.5)
Level of studies		
- **Basic studies**	1	3
- **Secondary studies**	6	8
- **University education**	6	6

M: Mean; SD: Standard Deviation; EDDS: Expanded Disability Status Scale

Table 2.
Mean, standard deviations, reliability and scale correlations

	M(SD)	***Cronbach's Alpha***	**1**	**2**	**3**	**4**
1. COPM Performance	4,3 (1,6)	0,897	1			
2. COPM Satisfaction	4,1 (2,1)	0,889	,691***	1		
3. MFIS	44,3 (13,8)	0,814	-,078	-,135	1	
4. Physical Health (MSQOL-54)	43,1 (16,8)	0,819	,408*	,408*	-,591**	1
5. Mental Health (MSQOL-54)	59,0 (22,1)	0,86	,371*	,144	-,469**	,712***

COPM: Canadian Occupational Performance Measure; MFIS: Modified Fatigue Impact Scale; MSQoL-54: The Multiple Sclerosis Quality of Life survey
p <, 05 ** p <, 01 *** p <, 001

Table 3.
Descriptive analysis of the scores obtained on the COPM, the MFIS scale and the MSQoL-54 questionnaire according to the subtype of MS

	RRMS	PPMS	SPMS	p[1]	p[2]
COPM Satisfaction					
- **M ± SD ; (range)**	4.26 ± 1.92; (1.66-8.20)	3.22 ± 2.15; (1.00-8.00)	4.66 ± 5.53; (1.75-9.00)	p=0.39	
COPM Performance					
- **M ± SD ; (range)**	4.19 ± 1.14; (1.60-6.00)	4.07 ± 1.84; (1.8-7.33)	4.78 ± 2.07; (2.33-9.00)	p=0.65	
MFIS					
- **Physical Subscale (M ± SD)**	23.60 ± 7.26 (6.00-33.00)	25.50 ± 5.53 (17.00-32.00)	22.86 ± 6.94 (13.00-30.00)	p= 0.72	
- **Cognitive Subscale (M ± SD)**	18.00 ± 6.52 (5.00-28.00)	13.38 ± 7.89 (3.00-28.00)	14.57 ± 11.41 (1.00-29.00)	p= 0.39	
- **Psychosocial Subscale (M ± SD)**	4.80 ± 2.27 (0.00-8.00)	4.13 ± 1.96 (1.00-6.00)	4.00 ± 1.91 (1.00-7.00)	p= 0.63	
- **MFIS Total Score (M ± SD)**	46.40 ± 15.02 (23.00-61.00)	43.00 ± 13.93 (26.00-62.00)	41.43 ± 15.02 (23.00-61.00)	p= 0.71	
MSQoL-54					----
Physical Health Scale (M ± SD; range)					----
- **Physical Health Composite Score**	42.02 ± 17.85; (15.32-83.69)	43.15 ± 17.38; (21.78-68.61)	45.47 ± 16.32; (22.13-68.67)	p= 0.91	p= 0.16
- **Physical Function**	6.52 ± 4.14; (0.85-13.60)	2.71 ± 2.22; (0.00-5.50)	4.25 ± 1.96; (1.70-6.80)	p= 0.03	----
- **Health Perception**	4.78 ± 2.32; (2.55-11.90)	6.48 ± 3.21; (2.55-11.05)	6.68 ± 2.27; (3.40-9.35)	----	p= 0.53
- **Energy/Fatigue**	4.69 ± 2.18; (0.48-9.12)	5.58 ± 2.34; (2.88-9.12)	4.53 ± 2.37; (1.92-8.16)	p= 0.59	----
- **Role Limitations-Physical**	4.60 ± 5.05; (0.00-12.00)	2.63 ± 2.50; (0.00-6.00)	5.57 ± 4.72; (0.00-12.00)	----	p= 0.48
- **Bodily Pain**	5.61 ± 3.42; (0.00-11.00)	6.97 ± 3.68; (2.20-11.00)	6.70 ± 3.67; (1.76-11.00)	p= 0.63	----
- **Social Function**	6.50 ± 2.35; (4.00-12.00)	7.77 ± 2.59; (3.33-12.00)	7.00 ± 2.95; (1.99-10.00)	----	
- **Health Distress**	5.50 ± 2.76; (0.00-8.80)	7.66 ± 3.75; (2.75-14.00)	7.62 ± 3.05; (2.20-11.00)	p= 0.18	

Mental Health Scale (M ± SD; range)					----
- **Mental Health Composite Score**	55.60 ± 19.39; (25.55-87.01)	62.30 ± 25.20; (23.11-91.08)	62.37 ± 26.16; (18.12-90.89)	p= 0.72	p= 0.86
- **Health Distress**	7.00 ± 3.51; (0.00-11.20)	8.98 ± 4.38; (2.80-14.00)	9.70 ± 3.89; (2.80-14.00)	p= 0.25	----
- **Overall Quality of Life**	10.52 ± 2.71; (8.10-15.60)	9.98 ± 1.62; (8.10-1320)	10.03 ± 2.97; (7.20-14.69)	----	p= 0.89
- **Emotional Wellbeing**	17.25 ± 5.13; (9.28 – 24.36)	18.99 ± 6.65; (6.96-26.68)	18.89 ± 6.31; (8.12-25.52)	p= 0.72	----
- **Role Limitations-Emotional**	12.80 ± 11.63; (0.00-24.00)	13.00 ± 12.05; (0.00-24.00)	14.86 ± 11.71; (0.00-24.00)	----	
- **Cognitive Function**	8.03 ± 3.77; (3.00-15.00)	11.34 ± 3.19; (5.25-15.00)	8.89 ± 6.05; (0.00-15.00)	p= 0.22	

RRMS= relapsing remitting multiple sclerosis; PPMS= primary progressive multiple sclerosis; SPMS= secondary progressive multiple sclerosis; COPM= Canadian Occupational Performance Measure; MFIS= Modified Fatigue Impact Scale; MSQoL-54=The Multiple Sclerosis Quality of Life survey; M= mean; SD= standard deviation

[1] ANOVA test (differences between groups $p<0.05$)

[2] Kruskall-Wallis test (differences between groups $p<0.05$)

Table 4.
Descriptive analysis of the scores obtained on the COPM, the MFIS scale and the MSQoL-54 questionnaire according to the sex of participants

	Men	Women	p[1]	p[2]
COPM Satisfaction				
- **M ± SD ; (range)**	3.99 ± 1.54; (1.80-8.00)	4.14 ± 2.53; (1.00-9.00)	p= 0.84	
COPM Performance	4.33 ± 1.39; (1.80-7.33)	4.27 ± 1.71; (1.60-9.00)	p= 0.91	
- **M ± SD ; (range)**				
MFIS				
- **Physical Subscale (M ± SD)**	24.00 ± 5.21; (16.00-32.00)	23.88 ± 7.68; (6.00-33.00)	p= 0.96	
- **Cognitive Subscale (M ± SD)**	14.69 ± 8.62; (1.00-28.00)	16.94 ± 7.96; (5.00-29.00)	p= 0.46	
- **Psychosocial Subscale (M ± SD)**	4.08 ± 1.93; (1.00-8.00)	4.71 ± 2.20; (0.00-8.00)	p= 0.41	
- **MFIS Total Score (M ± SD)**	42.77 ± 12.15; (23.00-57.00)	45.53 ± 15.25; (14.00-65.00)	p= 0.19	
MSQoL-54				
Physical Health Scale (M ± SD; range)				
- **Physical Health Composite Score**	51.50 ± 13.04; (30.02-68.67)	36.73 ± 16.92; (15.32-83.69)	p= 0.01	----
- **Physical Function**	6.02 ± 3.57; (0.00-12.75)	4.17 ± 3.57; (0.00-13.60)	----	p= 0.08
- **Health Perception**	6.28 ± 2.72; (2.55-11.05)	5.21 ± 2.57; (2.55-11.90)	----	p= 0.27
- **Energy/Fatigue**	5.78 ± 1.63; (3.58-9.12)	4.21 ± 2.42; (0.48-9.12)	p= 0.05	----
- **Role Limitations-Physical**	4.62 ± 3.99; (0.00-12.00)	4.06 ± 4.85; (0.00-12.00)	----	p= 0.60
- **Bodily Pain**	7.53 ± 2.83; (3.48-11.00)	5.23 ± 3.68; (0.00-11.00)	p= 0.07	----
- **Social Function**	8.00 ± 2.20; (4.00-12.00)	6.15 ± 2.52; (1.99-12.00)	p= 0.04	----
- **Health Distress**	8.61 ± 2.61; (4.44-14.00)	5.01 ± 2.67; (0.00-8.80)	p= 0.01	----
Mental Health Scale (M ± SD; range)				
- **Mental Health Composite Score**	68.91 ± 20.05; (35.61-91.08)	51.36 ± 21.00; (18.12-87.01)	p= 0.02	----
- **Health Distress**	10.66 ± 2.89; (5.60-14.00)	6.25 ± 3.50; (0.00-11.20)	p= 0.01	----
- **Overall Quality of Life**	10.78 ± 275; (780-1560)	9.86 ± 2.22; (7.20-14.70)	p= 0.32	----
- **Emotional Wellbeing**	20.08 ± 4.93; (12.76-26.68)	16.58 ± 5.90; (6.96-24.36)	p= 0.09	----
- **Role Limitations-Emotional**	17.23 ± 10.76; (0.00-24.00)	10.35 ± 11.23; (0.00-24.00)	----	p=0.09
- **Cognitive Function**	10.18 ± 4.18; (2.25-15.00)	8.29 ± 4.42; (0.00-15.00)	p= 0.24	----

COPM= Canadian Occupational Performance Measure; MFIS= Modified Fatigue Impact Scale; MSQoL-54=The Multiple Sclerosis Quality of Life survey; M= mean; SD= standard deviation

[1] Student's t-test (between-group differences if $p<0.05$)

[2] U Mann-Whitney test (between-group differences if $p<0.05$)

Table 5.
Effect of fatigue impact and the dimensions of physical health and mental health on performance and satisfaction.

	COPM Performance			COPM Satisfaction		
	β(SE)	*t*	*p*-value	*β(SE)*	*t*	*p*-value
MFIS	0.04 (0.03)	1.72	0.1	0.03 (0.04)	0.88	0.39
Physical Health Composite Score (MSQOL-54)	0.05 (0.03)	1.88	0.073	0.10 (0.04)	2.7	0.013
Mental Health Composite Score (MSQOL-54)	0.01 (0.02)	0.74	0.466	-0.02 (0.03)	-0.75	0.461
R^2 (%)		9.8			32.7	
Model	$F(7,22)=1.64$, $p = 0.177$			$F(7,22)=1.53$, $p = 0.209$		

COPM= Canadian Occupational Performance Measure; MFIS= Modified Fatigue Impact Scale; MSQoL-54= The Multiple Sclerosis Quality of Life survey; SE= standard error