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The mediating effect of coping on the association between fatigue and quality of life in patients with multiple sclerosis

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Fatigue, as one of the most frequent symptoms in patients with multiple sclerosis (MS), has various adverse effects on the physical and mental health-related quality of life (PCS, MCS) of patients. The aim of this study was to explore whether coping mediates the relationship between fatigue and PCS and MCS. We collected data from 154 consecutive MS patients (76.0% women; mean age 40.0 ± 9.9). Patients completed the Short-Form Health Survey (SF-36), the multidimensional fatigue inventory (MFI-20) and the coping self-efficacy scale. The mediating effect of coping was analysed using linear regressions and the Sobel *z*-test. In PCS significant mediation was found in some of the fatigue dimensions (general, physical and reduced Motivation), while in MCS, it was significant in all dimensions. These results can be implemented into educational programmes for patients, their caregivers or physicians, and can also be helpful in the treatment process.

Keywords: multiple sclerosis; fatigue; coping; physical component of quality of life; mental component of quality of life

Introduction

Fatigue is a common symptom occurring frequently in the healthy population; however, in patients suffering from multiple sclerosis (MS), it is reported significantly more often, with more adverse effects on their quality of life (Papuć & Stelmasiak, 2012; Sayao, Bueno, Devonshire, & Tremlett, 2011). More than half of all MS patients consider fatigue as their worst symptom (Amato & Portaccio, 2012). It is closely related to the physical component of health-related quality of life (PCS) (Bol et al., 2010; Göksel Karatepe et al., 2011) and can lead to longitudinal changes in the activity pattern of MS patients (Motl, McAuley, Wynn, Suh, & Weikert, 2011). Various activities, such as exercise, can be difficult to perform because of the constant presence of fatigue, which only deepens effects of MS symptoms on PCS, although exercise itself can have a positive effect on fatigue and on PCS (Andreasen, Stenager, & Dalgas, 2011). Some studies suggest that modifying mental fatigue in particular as an intervention seems to be positively

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associated with exercise and physical activity (Kayes et al., 2011). Fatigue seems to affect the mental component of health-related quality of life (MCS) as well (Göksel Karatepe et al., 2011; Kargarfard, Eetemadifar, Mehrabi, Maghzi, & Hayatbakhsh, 2012) as it correlates with depression and is strongly associated with inactivity which leads to worse mental quality of life (Miletic, Toncev, Jevdjic, Jovanovic, & Canovic, 2011).

Stress can affect patients with MS in different ways than the general population. It can accelerate MS relapses and thus increase patients' disability by inflammatory processes which worsen neurodegeneration (Gold et al., 2005). Stress is also one of the factors associated with fatigue in MS patients (Mollaoğlu & Üstün, 2009). Coping strategies used in dealing with stress, from the diagnosis itself or other stressors, are crucial in maintaining good quality of life (Arnett & Randolph, 2006). Various studies have focused on coping and its influence on quality of life, with many of them resulting in praise of active, problem-oriented coping (Lode et al., 2009; Mackay & Pakenham, 2012), especially in comparison with avoidance coping (Boals, Vandellen, & Banks, 2011), although in some cases, emotion-focused coping was perceived as the most adaptive (Hager & Runtz, 2012), and in some studies, avoidance coping is even regarded as adaptive, especially when it is used in situation when the patient does not have enough control over the situation (Mikula et al., 2013; Roth & Cohen, 1986).

Although there are studies dealing with fatigue in MS and studies focused on different coping strategies used by these patients, not much attention has been paid to the mediating role of coping regarding the relationship between fatigue and quality of life. Thus, the aim of this study was to explore how the three different forms of coping mediate the relationship between the five dimensions of fatigue and PCS and MCS separately in patients with MS.

Methods

Participants

Patients who met the McDonald criteria for MS (Polman et al., 2005), the current gold standard criteria for MS, were invited to participate on a consecutive basis. The vast majority of the MS patients, who visited the neurology department during the span of the data collection process, consented to participate, 154 of 213 (72.7%). One person was deemed ineligible based on the following exclusion criteria: psychiatric diagnosis, a mini-mental state examination score of <24, and pregnancy. The final sample consisted of 76.0% women, with a mean age of 40.0 ± 9.9 years (range 18–61 years). There were no statistically significant differences between respondents and non-respondents in terms of gender or age.

Procedure

Data collection for this cross-sectional study took place between September 2010 and March 2013 and consisted of filling in a self-reported questionnaire (including Short-Form Health Survey (SF-36) scale, multidimensional fatigue inventory (MFI) and coping self-efficacy scale (CSE)), a semi-structured interview (surveying information on age, gender and education) and a neurological examination (assessing Expanded Disability Status Scale (EDSS) and disease duration). The invitation letter, the informed consent form, the non-response sheet and the questionnaires were sent to participants' homes by postal mail. Patients were reminded about the questionnaires by a phone call two weeks later. During this phone call, their interview and neurological examination

was scheduled as well. These then took place at the Neurology Outpatient Clinic. The neurological examination was carried by a single neurologist, and a trained interviewer conducted the semi-structured interview.

Local ethics committee approved the study before it started. Each patient provided a signed informed consent form prior to the study.

Measures

All questionnaires used in this study were translated from the original language to Slovak language. Next, a backwards translation was made to ensure that the meaning was not lost in translation. Final changes in the translated version were then made accordingly.

Health-related quality of life (HRQoL)

For assessing HRQoL, the 36-item Short-Form (SF-36) Health Survey was used (Ware & Sherbourne, 1992). Its eight dimensions cover various aspects of HRQoL, which than can be summarised into two components. Scales included in the questionnaire are as follows: (1) physical functioning (ten items); (2) role limitation due to physical health (four items); (3) bodily pain (two items); (4) general mental health (five items); (5) social functioning (two items); (6) psychological distress and well-being (five items); (7) role limitations due to emotional problems (three items); and (8) vitality, energy or fatigue (four items). Four scales make up the physical component summary (PCS) and the other four the mental component summary (MCS). In addition, one question covers changes in health status over the past year (one item). All item scores are coded and transformed for the PCS and the MCS into a scale of 0 (poor health) to 100 (optimal health). A higher score indicates better health in both dimensions. In our sample, Cronbach's alpha was .92 for the PCS and .93 for the MCS.

Fatigue

Fatigue was assessed with the MFI (Smets, Garssen, Bonke, & De Haes, 1995), which is commonly used in patients with chronic conditions (Elbers, van Wegen, Verhoef, & Kwakkel, 2012; Munch et al., 2006). It consists of five dimensions: General fatigue (four items), physical fatigue (four items), mental fatigue (four items), reduced motivation (four items) and reduced activity (four items).

Patients were asked to share how much they agree with statements like: 'I feel fit', 'I feel very active' or 'Physically I feel only able to do a little' on a five-point scale anchored in quotes: 'Yes, that is true' and 'No, that is not true', where higher score indicated more prevalent fatigue in all five scales. Ten of the items are worded in a negative way to prevent tendencies towards the response set, and scores for these items were calculated accordingly. In our sample, Cronbach's alpha was .79 for general fatigue, .84 for physical fatigue, .81 for reduced activity, .64 for reduced motivation and .78 for mental fatigue.

Coping self-efficacy

Coping self-efficacy was measured using the 26-item CSE developed specifically for chronically ill populations (Chesney, Neilands, Chambers, Taylor, & Folkman, 2006).

The CSE is a prerequisite for using actual coping strategies as patients need to be sure that they can perform coping actions before they act upon them. Therefore, in this article, we treat the terms *coping* and *coping self-efficacy* as equivalent, because both concepts are closely tied to each other. Patients were asked to respond to the following question: ‘When things are not going well for you, or when you’re having problems, how confident or certain are you that you can do the following’. Respondents then had to give the extent to which they believe they could perform each coping behaviour on an 11-point scale. The instrument consists of three subscales representing self-efficacy for the use of problem-focused coping strategies (ranging from 0 to 120), the ability to stop unpleasant emotions and thoughts (ranging from 0 to 90), and finally, the ability to get support from friends and family (ranging from 0 to 50). A higher score indicates a higher ability to cope with the situation described in the question (Chesney et al., 2006). In our sample, Cronbach’s alpha was .94 for problem-focused coping, .86 for coping focused on getting support and .93 for stopping unpleasant emotions and thoughts.

Clinical variables

Neurological examination on the day of data collection assessed the actual EDSS (scores range from 0.0 to 10.0, with a higher score indicating more severe disability) (Kurtzke, 1983), information on the clinical course of MS was retrieved from previous medical records with date of diagnosis set as the beginning of the disease. Patients were categorised into the clinically isolated syndrome group with high risk of conversion to clinically definite MS (Miller, Barkhof, Montalban, Thompson, & Filippi, 2005), the relapse-remitting (RRMS) course of MS or the secondary-progressive course of MS (Lublin, 2002).

Sociodemographic variables

Data on age (treated as continuous variable), gender and education (elementary, high school and university) were retrieved during the interview.

Statistical analyses

Firstly, descriptive analyses of the study variables were carried out. Next, correlations and multiple regressions between variables were carried out in order to calculate data for mediations. Finally, the mediating effect was examined using the Sobel *z*-test of the three different coping strategies on all five dimensions of fatigue and on both components of quality of life in MS patients. Statistical analyses were performed in IBM SPSS 20 and MedGraph (Jose, 2004).

Results

A basic description of the study population is given in Table 1 ($n = 154$). The MS patients who responded averaged 40.05 years and consisted of 76.0% women. The mean EDSS score was 3.12, the mean disease duration 7.1 years. The majority of patients (78.3%) belonged to RRMS clinical course (Table 1).

Multiple mediations were used to determine the mediating effect of the three different coping strategies on the relationship between the five different types of fatigue and

Table 1. Description of the study population ($N = 154$).

Variables	N (%)	Mean	SD	Range
Age (years)	154	40.05	9.97	18–61
Gender				
Male	37 (24.0)			
Female	117 (76.0)			
Education				
Elementary	6 (3.9)			
High school	110 (71.9)			
University	37 (24.2)			
Disease duration (years)		7.11	5.74	1–28
MS course				
CIS	11 (9.2)			
RRMS	94 (78.3)			
SPMS	15 (12.5)			
EDSS		3.12	1.33	1.0–8.0
Fatigue				
General fatigue		13.99	4.44	4–20
Physical fatigue		13.42	4.86	4–20
Reduced activity		10.96	4.74	4–20
Reduced motivation		8.56	3.65	4–20
Mental fatigue		10.38	4.50	4–20
Coping				
Problem		80.18	22.36	22–120
Emotion		34.00	10.01	3–50
Stopping		59.16	19.29	4–90
Quality of life				
PCS		38.52	11.26	16–60
MCS		42.94	12.22	17.39–69.85

Notes: CIS – clinically isolated syndrome; RRMS – relapse-remitting multiple sclerosis; SPMS – simple progressive multiple sclerosis; EDSS – expanded disability status scale; PCS – physical component summary; MCS – mental component summary.

Missing values: EDSS: (17.5%), Education: (.6%), Disease duration: (9.7%), MS course: (22.0%).

both PCS and MCS. Indirect effect in the table represents significant mediation of the association between fatigue and HRQoL by coping. The outcomes of the mediations showed that in PCS, all coping strategies mediate the association with general fatigue. In addition, problem-focused coping mediates the association with physical fatigue and coping focused on stopping unpleasant emotions and thoughts mediates the association with reduced motivation. In MCS, coping was generally involved in the associations between all dimensions of fatigue and MCS, as it is statistically significant and substantially mediated all different variable combinations (Table 2).

Discussion

The aim of this study was to find out whether and how three different coping strategies mediate the associations between the five dimensions of fatigue and both PCS and MCS separately. Our results provide evidence that all three types of coping mediate this relationship and are mediators of the association between all five dimensions of fatigue and MCS and mainly between general fatigue and PCS.

Regarding PCS, statistical analyses showed mild mediations of all three types of coping in general fatigue, suggesting that effective coping strategies can be beneficial

Table 2. The mediating effect of coping on the association between fatigue and PCS and MCS.

Coping	Fatigue	PCS			MCS		
		Sobel z-value	Sig	Indirect effect (%)	Sobel z-value	Sig	Indirect effect (%)
Problem	General fatigue (GF)	2.34	.01*	12.0	-3.65	.00*	26.9
	Physical fatigue (PF)	1.92	.05		-3.27	.00*	30.6
	Reduced activity (RA)	1.47	.13		-3.12	.00*	23.3
	Reduced motivation (RM)	1.32	.18		-3.38	.00*	24.8
	Mental fatigue (MF)	.74	.45		-3.24	.00*	21.0
Emotions	General fatigue (GF)	2.00	.04*	9.3	-3.25	.00*	22.8
	Physical fatigue (PF)	1.81	.06		-3.01	.00*	26.4
	Reduced activity (RA)	1.44	.14		-2.97	.00*	21.0
	Reduced motivation (RM)	1.49	.13		-2.80	.00*	21.2
	Mental fatigue (MF)	.65	.50		-2.88	.00*	17.8
Stopping	General fatigue (GF)	2.86	.00*	15.0	-3.78	.00*	29.5
	Physical fatigue (PF)	1.97	.04*	5.1	-2.79	.00*	26.9
	Reduced activity (RA)	1.77	.07		-2.83	.00*	22.5
	Reduced motivation (RM)	2.46	.01*	32.6	-3.71	.00*	30.4
	Mental fatigue (MF)	1.75	.07		-3.66	.00*	25.6

* $p < 0.05$.

for patients, which is in line with findings in other chronic conditions (Ai, Wink, & Shearer, 2012; Penedo et al., 2013). Besides general fatigue, only physical fatigue and reduced motivation in stopping unpleasant emotions and thoughts were mediated by coping in PCS, from which reduced motivation seemed to be buffered most, indicating that stopping thoughts about MS can help patients to increase their motivation, which then has a positive effect on PCS.

Whereas in PCS coping seems to be only partially significant or in most cases not significant at all, in MCS, its buffering effect proved to be significant in all cases. Appropriate coping strategies seem to have a buffering effect in many situations dealing with chronic health conditions (Krok, Baker, & McMillan, 2013; Treharne, Lyons, Booth, & Kitas, 2007), and in the case of all dimensions of fatigue in MS, it indirectly affects this relationship as well. Coping seems to mitigate the adverse effect of fatigue on MCS in various cases of chronic diseases (Poppe, Crombez, Hanouille, Vogelaers, & Petrovic, 2012; Reddick, Nanda, Campbell, Ryman, & Gaston-Johansson, 2005), and even in cases, when it may have a negative effect on physical functioning, coping might soften fatigue effects (Smith, Strachan, & Buchwald, 2009).

The reason why coping is generally more prominent in the association between fatigue and MCS rather than in the association between fatigue and PCS may be explained by the fact that patients have very little control over their disease. MS in most patients is a chronic progressive disease, and no optimal cure has thus far been found (Dennison, Moss-Morris, & Chalder, 2009); so, when patients lose the ability to control the disease and have to learn how to live with it, coping can help them to reduce the stress that MS brings and thus improve their MCS, while PCS is not affected to such an extent. These results suggest that problem-focused coping, emotion-focused coping and even coping focused on stopping unpleasant emotions and thoughts are important factors in effectively dealing with one of the most prevalent and disabling symptoms that patients with MS have to deal with.

Strengths and limitations

Among the strengths of this study are the high response rate (72.7%) and the consecutive method of collecting data. Some limitations should be noted, however. Although the women-to-men ratio in MS is 2:1, in studied sample, the ratio was higher (76.0% women), so the results may better explain fatigue, coping and the quality of life of women than men. Also, patients with a lower disease severity (mean EDSS of 3.2) were more likely to participate in the study, while patients with a more serious disability were more likely to refuse to participate.

Implications

Based on the results of this study, the associations between fatigue with both PCS and MCS seem to be mediated by coping strategies, although these associations seem universal for all dimensions of fatigue only in MCS, while in PCS, mainly general fatigue was associated. This study may be beneficial in bringing a new perspective on the complicated relationship between fatigue, coping and HRQoL. Coping in some cases may reduce the adverse effect of fatigue on PCS and may act as a protective factor in MCS. This information can be implemented into educational programmes for patients with MS and can be shared with health professionals, caregivers and patients themselves in order to help them learn how to live with symptoms of MS. Understanding this relationship can be beneficial in therapy as well. In particular, such forms of treatment that involve techniques that can diminish the effect of fatigue in patients with chronic conditions (Cosio, Jin, Siddique, & Mohr, 2011; Nordin & Rorsman, 2012), either in long individual therapies or in education about the role of coping, which could be included in shorter pragmatic programs (Goudsmit, Ho-Yen, & Dancey, 2009). Future research into coping as a mediator of the relationship between fatigue and both PCS and MCS in the therapy process is needed; however, as is the unravelling of the pathway between these three variables during the course of the disease.

Disclosure statement

The authors report no conflict of interests. The authors alone are responsible for the content and writing of the study.

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