

Severity of biomedical variables associated with the course of multiple sclerosis and levels of mental resiliency

Nasilenie zmiennych biomedycznych związanych z przebiegiem stwardnienia rozsianego a poziomy prężności psychicznej

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Abstract

Introduction: Multiple sclerosis is a progressive, demyelinating illness of the central nervous system, which may lead to significant disability. Mental resiliency is a personal resource, which makes it easier to cope with difficult situations such as incurable chronic illness. Aim of the study was to verify the relationship between the level of disability, biomedical variables and resiliency in patients with multiple sclerosis.

Material and methods: The Expanded Disability Status Scale (EDSS), Guy's Neurological Disability Scale (GNDS), and the Resiliency Assessment Scale (SPP-25) were used in the presented study, in order to verify the relationship between neurological disability and resiliency. A total of 117 individuals diagnosed with multiple sclerosis took part in this study.

Results: Resiliency was not significantly related with illness duration, age of diagnosis or motor disability measured by EDSS. However, selected resiliency subscales were associated with some neurological disability levels measured using GNDS. Of the symptoms of multiple sclerosis, the strongest relationship was observed between resiliency and mood disorders. In the present study there were no statistically significant differences in the resiliency levels between patients with different forms of multiple sclerosis.

Conclusions: Both the disability itself and most of the symptoms of multiple sclerosis were not related to the level of mental resiliency. The exceptions are mood disorders, which explain only a small percentage of the variance in the case of one resiliency subscale.

Key words: multiple sclerosis, resiliency, disability, chronic illness.

Introduction

Multiple sclerosis (MS) is a chronic progressive autoimmune condition of the central

Streszczenie

Wstęp: Stwardnienie rozsiane (*sclerosis multiplex* – SM) to postępująca choroba demielinizacyjna ośrodkowego układu nerwowego, która może prowadzić do znacznej niepełnosprawności. Prężność psychiczna jest zasobem osobistym, który ułatwia radzenie sobie w trudnych sytuacjach, takich jak nieuleczalna choroba przewlekła. Celem pracy była weryfikacja związku między stopniem niepełnosprawności, zmiennymi biomedycznymi i prężnością u pacjentów z SM.

Materiał i metody: W badaniu zastosowano *Rozszerzoną skalę niepełnosprawności* (EDSS), *Skalę niesprawności neurologicznej szpitala Guy* (GNDS) oraz *Skalę pomiaru prężności* (SPP-25) w celu weryfikacji związku między niepełnosprawnością neurologiczną a prężnością. W badaniu wzięło udział łącznie 117 osób, u których zdiagnozowano SM.

Wyniki: Prężność nie była istotnie związana z czasem trwania choroby, wiekiem w chwili diagnozy lub niepełnosprawnością ruchową mierzoną za pomocą EDSS. Jednak wybrane podskale prężności były powiązane z pewnymi poziomami niepełnosprawności neurologicznej mierzonymi za pomocą GNDS. Spośród objawów SM najsilniejszy związek zaobserwowano między prężnością a zaburzeniami nastroju. W badaniu nie stwierdzono istotnych statystycznie różnic w poziomach prężności pomiędzy pacjentami z różnymi postaciami SM.

Wnioski: Zarówno sama niepełnosprawność, jak i większość objawów SM nie były związane z poziomem prężności psychicznej. Wyjątkiem były zaburzenia nastroju, które wyjaśniały tylko niewielki procent wariancji w przypadku jednej podskali prężności.

Słowa kluczowe: stwardnienie rozsiane, prężność, niepełnosprawność, choroba przewlekła.

nervous system, which causes demyelination and damage to axons in the brain and spinal cord. It is one of the most common neurological conditions in young adults and the most

common nontraumatic cause of disability in young and middle-aged individuals (Dymecka and Gerymski 2019). Multiple sclerosis usually appears in individuals aged between 20 and 40, and its course is unpredictable. The condition is characterized by a varying clinical picture and a broad range of symptoms. Symptoms include motor difficulties, sensory disturbances, vision problems, speech difficulties, problems with sphincter control, chronic pain, fatigue, as well as cognitive and emotional problems (Cross *et al.* 2012; Nylander and Hafler 2012; Selmaj 2006).

Multiple sclerosis affects one's professional activity and family planning (Dymecka *et al.* 2020). It is unpredictable and can be associated with a number of neurological symptoms such as cognitive problems and depression (Irvine *et al.* 2009; McReynolds *et al.* 1999), it is an extraordinary challenge for an individual's adjustment – it influences their quality of life and may affect levels of psychosocial resources at the patient's disposal (Dymecka and Gerymski 2020a).

Mental resiliency is one of the personal resources that make it easier to cope with difficult situations such as incurable chronic illness. It is the ability to regulate one's cognitive and emotional functioning, as well as behavioural control, in response to challenges and difficult situations (Block and Kremen 1996). It is a personality feature and a relatively stable disposition which determines the process of flexible adaptation to constantly changing life events, both those of traumatic character and those of everyday life (Ogińska-Bulik 2011a; Ogińska-Bulik and Juczyński 2008; Sołtys and Woźniewicz 2015). Resiliency is considered to be a meta-resource, aiding coping with difficult situations. Ogińska-Bulik and Juczyński (2008) consider resiliency to be a theoretical construct consisting of the following factors: *persistence and determination in action, openness to new experiences and sense of humour, personal competences for coping and tolerance of negative affect, tolerance of failure and treating life as a challenge, optimistic attitude towards life and ability to mobilise oneself in difficult situations.*

Mental resiliency is a resource which may have an important influence on the health of an individual; it may also affect one's ability to cope with a chronic illness (Dymecka and Gerymski 2020b). However, the illness itself may also influence levels of the resources. Research on a population of individuals affected by ischaemic heart illness, type 1 diabetes and rheumatoid arthritis found that levels of psychosocial resources differ depending on the condition one suffers from (Ziarko 2014; Nowaczyk and Cierpiałkowska 2016). This means

that biomedical variables may influence levels of resources, including mental resiliency. This is why, in line with suggestions in the literature, we assume that biomedical variables associated with the course of MS may influence levels of resiliency. The goal of the current study was to assess the relationship between biomedical variables and levels of mental resiliency in individuals with MS. Based on the presented introduction we hypothesise that:

H1: The level of disability will be correlated with study participants' resiliency.

H2: The biomedical variables will differentiate study participants' resiliency.

Material and methods

Studied sample

A total of 117 individuals between the ages of 18 and 73 ($M = 47.10$, $SD = 12.82$) diagnosed with MS took part in the study. Individuals with cognitive deficits hindering the understanding of psychological questionnaires were excluded from the study, i.e. patients who got over 3 points on the Cognitive Disability subscale of Guy's Neurological Disability Scale (GNDS). In the studied sample, most participants had the relapsing-remitting (RRMS) form of MS. The second biggest group consisted of individuals with the primary progressive form, followed by the secondary progressive form. The fewest participants had the progressive-relapsing form. The form of the illness was not defined for a significant portion of the participants. Among the examined sample of patients, the diagnosis was established at the earliest at 15 years of age and the latest at 61 years. Among patients participating in our study, the shortest illness duration was one year, and the longest was 42 years. We also took into account in the examination the level of motor disability of our study participants (Expanded Disability Status Scale – EDSS). The lowest score for disability was 0 and the highest score was 9, indicating the complete motor disability characteristic of a bed-bound patient who can communicate with those around them. Individuals with mild motor disability were the biggest group, followed by individuals who require unilateral or bilateral assistance when walking and individuals with moderate disability. Individuals with significant disability were the smallest group, including individuals restricted to a wheelchair and individuals with significant limitations in their ability to care for themselves, including bed-bound patients. More detailed sociodemographic and biomedical characteristics of the studied sample are presented in Table 1.

Table 1. Sociodemographic and biomedical characteristics of the studied sample (N = 117)

Characteristics	n	%	Characteristics	n	%
Sex			Work status		
Male	55	47.01	Active	26	22.22
Female	62	52.99	Inactive	18	15.38
Inhabitancy			On pension or retirement	73	62.39
Country	28	23.93	EDSS		
City	89	76.07	Motor disability	48	41.02
Marital status			Unilateral or bilateral assistance	23	19.66
Single	28	23.93	Moderate disability	22	18.80
Cohabitation	5	4.27	Restricted to a wheelchair	17	14.53
Married	66	56.41	Bed-bound	6	5.12
Divorced	13	11.11	Multiple sclerosis form		
Widowed	5	4.27	Relapsing-remitting	36	30.76
Education			Primary progressive	27	23.08
Elementary school education	2	1.71	Secondary progressive	19	16.24
Basic vocational education	21	17.95	Progressive-relapsing	8	6.34
High school education	50	42.74	Unspecified	27	23.08
University education	43	36.75		M	SD
Material situation (subjective evaluation)			Age	47.10	12.82
Very good	1	0.85	Age of the diagnosis	34.56	10.63
Good	30	25.64	Illness duration	14.84	8.59
Average	71	60.68	EDSS	4.66	2.09
Bad	12	10.26	GNDS	16.71	8.35
Very bad	3	2.56	SPP-25	70.27	15.09

Research methods

The EDSS by Kurtzke is the most commonly used and most popular scale for assessing disability in individuals suffering from MS. The scale includes 20 levels of disability, but in order to make the scoring consistent with the older version of the scale (DSS), scoring every half point was introduced. The higher the result on the scale, the more severe is the disability (Kurtzke 2000; Selmaj 2006). Reliability of this scale can be assessed using the kappa coefficient. EDSS demonstrates acceptable reliability (Meyer-Moock *et al.* 2014).

Guy's Neurological Disability Scale (GNDS) was used for assessment of disability and symptoms exhibited by individuals with MS. It consists of 12 subscales concerning separate areas of functioning: *cognitive disability, mood disability, visual disability, speech and communication disability, swallowing disability, upper limb disability, lower limb disability, bladder disability, bowel disability, sexual disabilities, fatigue, and other disabilities*. Every subscale assesses the disability on 6 severity levels. Results on separate subscales are summed up in order to describe the patient's overall dis-

ability. The higher the score, the more severe is the disability (Dymecka *et al.* 2017). In the present study, the scale showed good reliability (Cronbach's $\alpha = 0.73$, McDonald's $\omega = 0.75$).

Finally, the Resiliency Assessment Scale (SPP-25) by Ogińska-Bulik and Juczyński (2008) was used for the assessment of resiliency in the studied sample. It consists of 25 items which form 5 subscales measuring 5 factors: *persistence and determination in action, openness to new experiences and sense of humour, personal competences for coping and tolerance of negative affect, tolerance of failure and treating life as a challenge, and optimistic attitude towards life and ability to mobilise oneself in difficult situations*. All items are assessed on a 5-level Likert-like scale, where 0 indicates 'strongly disagree', 2 'neither agree nor disagree', and 4 'strongly agree'. The higher the score, the higher are the levels of mental resiliency. In the present study, SPP-25 questionnaire showed very good reliability (Cronbach's $\alpha = 0.93$, McDonald's $\omega = 0.94$).

Procedure

Each patient had a single one-on-one meeting with a researcher; there was no time limit and

Table 2. Relationship between the level of study participants' disability and their resiliency (N = 117)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
1. Age of diagnosis	-																					
2. Illness duration	0.10	-																				
3. EDSS	0.03	0.10	-																			
4. GND5	-0.03	0.19	0.37***	-																		
5. GND51	-0.24	-0.03	-0.12	0.41***	-																	
6. GND52	-0.05	0.07	-0.01	0.54***	0.48***	-																
7. GND53	-0.09	-0.04	0.14	0.41***	0.33***	0.25*	-															
8. GND54	-0.05	-0.10	-0.07	0.35***	0.39***	0.37***	0.16	-														
9. GND55	0.04	-0.02	-0.21	0.31***	0.32***	0.34**	0.21	0.50***	-													
10. GND56	0.06	0.22	0.53***	0.59***	0.06	0.11	0.19	0.14	0.10	-												
11. GND57	-0.07	0.08	0.87***	0.50***	0.01	0.10	0.31**	-0.03	-0.17	0.54***	-											
12. GND58	0.10	0.16	0.28***	0.53***	-0.08	0.03	-0.09	0.07	-0.10	0.30***	0.30***	-										
13. GND59	-0.04	0.01	0.15	0.52***	0.20	0.16	0.14	0.01	0.11	0.12	0.25**	0.32**	-									
14. GND510	-0.11	0.12	0.12	0.53***	-0.04	0.15	0.10	-0.01	0.03	0.36***	0.19	0.36**	0.17	-								
15. GND511	0.10	0.12	0.14	0.60***	0.13	0.21	0.15	0.07	0.13	0.28**	0.19	0.27**	0.27**	0.20	-							
16. GND512	0.03	0.29*	0.08	0.62***	0.31**	0.34*	0.28**	0.06	0.14	0.27**	0.12	0.14	0.32**	0.16	0.46***	-						
17. SPP-25	0.07	0.08	-0.02	-0.20	-0.17	-0.33**	-0.10	-0.12	-0.03	0.10	-0.13	-0.18	-0.16	0.07	-0.13	-0.05	-					
18. SPP1	0.11	0.05	-0.06	-0.03	0.06	-0.15	-0.03	-0.08	0.16	0.19	-0.14	-0.19	-0.06	0.04	0.01	0.12	0.76***	-				
19. SPP2	0.05	0.02	-0.03	-0.20	-0.18	-0.36***	-0.10	-0.06	-0.14	0.08	-0.07	-0.12	-0.15	0.11	-0.15	-0.13	0.86***	0.53***	-			
20. SPP3	0.08	-0.02	-0.06	-0.37***	-0.31**	-0.42***	-0.15	-0.18	-0.04	-0.04	-0.21	-0.24*	-0.20	-0.07	-0.23*	-0.11	0.90***	0.61***	0.75***	-		
21. SPP4	-0.01	0.09	-0.03	-0.13	-0.11	-0.25*	-0.04	-0.11	-0.09	0.14	-0.09	-0.07	-0.20	0.13	-0.11	-0.04	0.92***	0.63***	0.78***	0.79***	-	
22. SPP5	0.07	0.15	0.06	-0.18	-0.18	-0.34**	-0.17	-0.13	-0.06	0.11	-0.06	-0.14	-0.14	0.09	-0.14	-0.06	0.94***	0.62***	0.78***	0.82***	0.85***	-

*p < 0.05, **p < 0.01, ***p < 0.001; GND51 – cognitive disability, GND52 – mood disability, GND53 – visual disability, GND54 – speech and communication disability, GND55 – swallowing disability, GND56 – upper limb disability, GND57 – lower limb disability, GND58 – bladder disability, GND59 – bowel disability, GND510 – sexual disabilities, GND511 – fatigue, GND512 – other disabilities, SPP1 – persistence and determination in action, SPP2 – openness to new experiences and sense of humour, SPP3 – personal competences for coping and tolerance of negative affect, SPP4 – tolerance of failure and treating life as a challenge, SPP5 – optimistic attitude towards life and ability to mobilise oneself in difficult situations

the duration was adjusted based on the psychophysical abilities of the patients. The meeting consisted of filling in a set of questionnaires, which were always given in the same order. The study was approved by the University of Gdansk Faculty of Psychology Ethics Committee. All participants gave consent to participate in the study.

Statistical analyses

Analyses were conducted using IBM SPSS 24. All statistical tests were two-tailed and the significance level was set to $\alpha = 0.05$. Pearson's r correlation and multivariate regression were used to estimate the relationships between selected variables. Additionally, ANOVA analysis and Tukey's HSD post-hoc test were used to verify the significance of the differences between groups.

Results

Age of the diagnosis and illness duration were not significantly related to patients' levels of disability and resiliency. Expanded Disability Status Scale summary score was not significantly related to the resiliency scores. A different relationship

was observed between resiliency and GNDS. Summary score of the resiliency questionnaire was significantly related to the mood disability subscale of GNDS. Persistence and determination in the action subscale of SPP-25 was not related to any disability constructs. Openness to new experiences and sense of humour was correlated with the GNDS mood disability scores. Personal competences for coping and tolerance of negative affect was related to summary GNDS score and its subscales: cognitive disability, mood disability, bladder disability and fatigue. Both tolerance of failure and treating life as a challenge and optimistic attitude towards life and ability to mobilise oneself in difficult situations subscales of SPP-25 were significantly related to the mood disability subscale of the GNDS questionnaire. All of the presented relationships can be described as negative and moderate. For more detailed information see Table 2.

Due to the important relationship between resiliency and mood disability scores it was decided to conduct the regression analysis in order to verify the significance of mood disability as a predictor of patients' resiliency. Multivariate regression showed that mood disability was a significant predictor of patients' resiliency ($\beta = -0.23$, $SE_{\beta} = 0.09$, $t_{115} = -2.53$, $p =$

Table 3. Group comparisons using ANOVA analysis ($N = 109$)

	$F_{3,105}$	p	η^2	η^2_p	ω^2
Motor disability	4.78	0.004	0.12	0.12	0.09
Neurological disability	4.24	0.007	0.11	0.11	0.08
Cognitive disability	0.72	0.544	0.02	0.02	< 0.01
Mood disability	0.53	0.665	0.01	0.01	< 0.01
Visual disability	0.99	0.397	0.03	0.03	< 0.01
Speech and communication disability	0.61	0.612	0.02	0.02	< 0.01
Swallowing disability	1.39	0.249	0.04	0.04	0.01
Upper limb disability	2.81	0.043	0.07	0.07	0.04
Lower limb disability	4.05	0.009	0.10	0.10	0.07
Bladder disability	5.84	< 0.001	0.14	0.14	0.11
Bowel disability	2.68	0.051	0.07	0.07	0.04
Sexual disabilities	0.66	0.582	0.03	0.03	< 0.01
Fatigue	2.72	0.049	0.07	0.07	0.04
Other	2.90	0.039	0.08	0.08	0.05
Resiliency	1.52	0.214	0.04	0.04	0.01
Persistence and determination in action	1.45	0.233	0.04	0.04	0.01
Openness to new experiences and sense of humour	1.51	0.217	0.04	0.04	0.01
Personal competences for coping and tolerance of negative affect	1.46	0.231	0.04	0.04	0.01
Tolerance of failure and treating life as a challenge	1.21	0.308	0.03	0.03	0.01
Optimistic attitude towards life and ability to mobilise oneself in difficult situations	2.06	0.110	0.06	0.06	0.03

Table 4. Results of the Tukey HSD post-hoc analysis (N = 109)

	Group 1		Group 2		Motor disability			Neurological disability			Upper limb disability			Lower limb disability			Bladder Disability			Fatigue			Other Disabilities				
	<i>M</i> _{diff}	<i>t</i> ₁₀₅	<i>M</i> _{diff}	<i>t</i> ₁₀₅	<i>M</i> _{diff}	<i>P</i> _{Tukey}	<i>t</i> ₁₀₅	<i>M</i> _{diff}	<i>P</i> _{Tukey}	<i>t</i> ₁₀₅	<i>M</i> _{diff}	<i>P</i> _{Tukey}	<i>t</i> ₁₀₅	<i>M</i> _{diff}	<i>P</i> _{Tukey}	<i>t</i> ₁₀₅	<i>M</i> _{diff}	<i>P</i> _{Tukey}	<i>t</i> ₁₀₅	<i>M</i> _{diff}	<i>P</i> _{Tukey}	<i>t</i> ₁₀₅	<i>M</i> _{diff}	<i>P</i> _{Tukey}	<i>t</i> ₁₀₅	<i>M</i> _{diff}	<i>P</i> _{Tukey}
Relapsing-remitting	-1.86	-3.24	0.009	-7.00	-3.05	0.015	-1.45	0.470	-1.28	-3.16	0.011	-1.93	-3.79	0.001	-1.31	-2.69	0.040	-1.20	-2.41	-2.41	-2.41	0.083	-1.20	-2.41	-2.41	-2.41	0.083
Primary progressive	-1.56	-2.99	0.018	-5.66	-2.75	0.035	-2.88	0.024	-0.79	-2.19	0.131	-1.32	-2.90	0.023	-0.55	-1.25	0.599	-0.97	-2.08	-2.08	-2.08	0.167	-0.97	-2.08	-2.08	-2.08	0.167
Unspecified	-0.70	-1.37	0.522	-2.21	-1.07	0.706	-1.34	0.542	-0.24	-0.66	0.910	-0.55	-1.20	0.631	-0.15	-0.34	0.987	-0.14	-0.30	-0.30	-0.30	0.990	-0.14	-0.30	-0.30	-0.30	0.990
Secondary progressive	0.32	0.53	0.952	1.35	0.56	0.945	-1.07	0.706	0.48	1.13	0.672	0.60	1.12	0.675	0.76	1.48	0.456	0.24	0.44	0.44	0.44	0.972	0.24	0.44	0.44	0.44	0.972
Unspecified	1.15	1.91	0.232	4.79	1.98	0.203	0.24	0.995	1.04	2.43	0.077	1.38	2.57	0.055	1.17	2.28	0.110	1.07	2.02	2.02	2.02	0.187	1.07	2.02	2.02	2.02	0.187
Primary progressive	0.83	1.52	0.432	3.44	1.56	0.403	1.45	0.475	0.56	1.43	0.482	0.78	1.59	0.387	0.41	0.86	0.825	0.83	1.68	1.68	1.68	0.340	0.83	1.68	1.68	1.68	0.340

0.013), but explained only 5% of the resiliency scores variance ($F_{1,115} = 6.38, p = 0.013, R^2 = 0.05$).

Finally, it was decided to verify whether the type of MS differentiates patients' resiliency levels. Patients with progressive-relapsing form of MS were not included in the analysis due to the low sample size of that group ($n = 8$). Results of the ANOVA analysis indicate the existence of statistically significant differences in the case of motor disability, neurological disability, upper limb disability, lower limb disability, bladder disability, fatigue and other unspecified types of neurological disability. For more detailed information see Table 3.

Tukey's HSD post-hoc analysis indicated that statistically significant differences occurred between patients with the relapsing-remitting and the secondary progressive form of SM in the level of motor disability, neurological disability, bladder disability, and fatigue. Patients with the secondary progressive form of SM scored higher on all discussed scales. In addition, statistically significant differences were found between patients with relapsing-remitting and primary progressive forms of SM in the level of motor disability, neurological disability, upper limb disability and bladder disability. Patients with the primary progressive form of SM scored higher on all discussed scales. Other differences were not significant. For more detailed information see Table 4.

Discussion

According to the Polish norm, levels of resiliency in the studied population of individuals diagnosed with MS can be considered average (Ogińska-Bulik and Juczyński 2008). This result ($M = 70.27$) cannot be compared with all the available research due to conceptual differences regarding resiliency; it can only be compared with results of studies that used the SPSS-25 scale. The results of our participants on this scale do not differ significantly from the results observed in different groups. It is close to the results of patients after cardiovascular surgery ($M = 68.40$; Ogińska-Bulik and Juczyński 2011), civil servants ($M = 68.56$), paramedics ($M = 69.67$), students ($M = 69.80$; Ogińska-Bulik and Juczyński 2008); nurses ($M = 70.48$; Mróz 2014), women suffering from cancer ($M = 71.00$; Ogińska-Bulik 2011b), grieving individuals ($M = 71.35$), people with diabetes ($M = 72.75$), policemen ($M = 73.14$), and fire-

men ($M = 77.10$; Ogińska-Bulik and Juczyński 2008).

Previous studies on other groups of individuals affected by chronic illnesses showed that there were differences in resiliency levels depending on the type of illness (Ziarko 2014), which is why it was hypothesised that biomedical variables would be related to levels of mental resiliency. Duration of illness and the age of the diagnosis were the first biomedical variables whose relationship to resiliency was analysed. In our study, there was no significant relationship between these variables. There are no data in the literature regarding the influence of the duration of chronic illnesses or other negative life events on levels of resiliency, and so there are no data that could be compared with this result. It can only be supposed that individuals who have been ill for a long time have already struggled with many strong stressors. If a person has been successful in these struggles, they may feel capable of also coping effectively in other stressful situations. Because of this, their levels of ego resiliency might increase. It is probably also associated with the process of adaptation to the illness. However, during the course of the illness the level of disability also increases, which can negatively affect the level of resiliency.

In the present study, resiliency was not related to motor disability as measured by the EDSS. The scale is oriented towards motor and physical disability, which may be the reason for it not being related to levels of mental resiliency and its factors. Neurological disability, levels of mental resiliency and the most of its factors were also not statistically correlated. Among the factors constituting mental resiliency only personal competences for coping and tolerance of negative affect was correlated with neurological disability. The available literature does not contain any data regarding levels of resiliency in disabled individuals or which factor of resiliency is most affected by disability. One could suppose that a strong relationship between neurological disability and personal competences for coping and tolerance of negative affect stems from the influence of disability on ability to cope in everyday situations. Moreover, mood disorders, which are a component of neurological disability, may negatively impact tolerance of negative emotions.

Mood disorders are the only symptoms of the condition associated with both the global resiliency index and the most of its factors. Positive emotions may foster developing resiliency and increase the chance that positive meaning will be attributed to negative events (Ogińska-Bulik

and Juczyński 2010; Tugade *et al.* 2004). Previous research has shown that individuals characterised by low resiliency frequently experience anxiety and have existential doubts (Block and Kremen 1996), are more likely to react negatively to various environmental stressors, and are susceptible to mood disorders (Block *et al.* 1991) and to use of psychoactive substances (Block *et al.* 1988). Individuals characterised by low resiliency often have features associated with depressiveness, such as a sense of isolation and alienation, compulsive analysis of one's experiences, increased neurotic tendencies, inability to feel happy with life due to experienced difficulties, or obsessing over small failures (Iskra 2011). This relationship was also confirmed by research on individuals with ischaemic heart illness, type 1 diabetes, and rheumatoid arthritis, in which resiliency was found to be associated with levels of depression (Ziarko 2014).

Cognitive impairment was significantly correlated with personal competences for coping and tolerance of negative affect. It is the only factor of resiliency associated with cognitive problems. Resiliency is a personal resource which is associated with resourcefulness and flexibility in adaptation to stressful life events (Block and Kremen 1996). Moreover, it is associated with the ability to analyse the demands of a situation and one's options (Kaczmarek and Aleszczyk 2013), which is affected by one's cognitive skills. Resiliency is sometimes also described as a competence which influences optimal functioning and achieving one's life goals (Junik 2011), which is also associated with cognitive processes. It is a resource composed of cognitive, emotional, and behavioural elements, and so its relationship with cognitive problems, which hinder one's orientation in their environment, is not surprising.

Other symptoms of MS such as fatigue and bladder problems were associated only with personal competences for coping and tolerance of negative affect. It is possible that urinary incontinence, which is associated with lack of control and negative emotions, as well as a sense of embarrassment and humiliation, anxiety, withdrawal, unwillingness to leave one's home, and social isolation (Dymecka and Bidzan 2015), may influence levels of this resiliency factor. Fatigue is also a factor influencing the daily functioning of patients and their competence to deal with difficulties.

The current study also analysed the relationship between the form of MS and levels of mental resiliency. It was found that the form of the illness did not differentiate the levels of

psychosocial resources in the studied sample. The lack of significant differences between people with different forms of MS and levels of resiliency may be related to the fact that the level of disability and other symptoms, which have a bigger impact on the levels of psychosocial resources, interfere in the relationship between the form of illness and resiliency. It is most likely that it is not the form of MS itself that influences the resiliency, but how severe the course is and the kind of symptoms to which it leads.

Conclusion and limitations

The results of current research are optimistic. It can be concluded that both the disability itself and most of the symptoms of MS are not related to the level of mental resiliency. The exceptions are mood disorders, which explain only a small percentage of the variance in the case of one resiliency subscale. The current study contributes to the broader area of research on the role of psychosocial resources in coping with difficult situations. Since Antonovsky's (2005) proposal of the salutogenic theory, resources such as sense of coherence, sense of self-efficacy, and mental resiliency have been analysed in the context of health, sickness, and coping with sickness. Theoretical concepts suggest that resources, which are considered stable properties of an individual, may also be influenced by negative life events. The current study does not confirm this. Thus, it seems extremely important to continue researching the relationships of biomedical variables related to the course of other chronic conditions with levels of mental resiliency and other psychosocial resources. Such research would help with better understanding of the relationship between chronic conditions, personal resources, individuals' functioning and their struggle with difficult situations.

The current study is not free of limitations. First, mental resiliency is an ambiguous term. Some authors consider it to be a personal resource and others consider it to be a process. In the literature there appear terms such as ego resiliency, mental resiliency (Ogińska-Bulik 2011a; Ogińska-Bulik and Juczyński 2008; Kaczmarek *et al.* 2011) and resilience (Borucka and Ostaszewski 2008; Junik 2011). The polysemy of the term can render the analysis and comparisons between different research projects more difficult. Moreover, some biomedical variables are hard to control during a study, e.g. the form of the condition. In most patients, MS begins in the remitting-relapsing form; however, sometimes

relapses stop after a dozen or so years and instead gradual progression of disability is observed. Patients in this transitional period may be difficult to correctly assign to a specific group. It is also difficult to compare research on Polish patients to research from other countries. In Poland access to treatment which modifies the course of illness is difficult and many treatments are not refunded, so the illness may progress faster and with a more aggressive course.

The results of the current study indicate that it is worthwhile to assess levels of functioning using not only the most popular EDSS scale, but also other tools which can assess 'invisible' symptoms such as mood disorders, cognitive problems, or fatigue. The relationship of these 'invisible' symptoms with levels of mental resiliency may suggest that they have the biggest influence on an individual's functioning, rather than, as is usually believed, physical disability related to lower limb functioning. In connection to this, it seems justified to complement physical rehabilitation with neuropsychological rehabilitation, pharmacological treatment of mood disorders and psychotherapy. The implementation of psychotherapy might be particularly important, given that it is possible to form and develop resiliency. This may be done through gaining new experiences, efficient coping with difficulties, experiencing positive emotions, or developing skills of proactive coping (Ogińska-Bulik and Juczyński 2011). Development of resiliency and the associated positive emotionality may positively influence coping with symptoms such as mood disorders, which are one of the more burdensome symptoms of MS.

Ethics

The study was approved by the University of Gdansk Ethics Committee (No. 19/06/2015). All participants gave consent to participate in the study.

Disclosure

The authors declare no conflict of interest.

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