



Araştırma

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**THE IMPACT OF SELF-CARE AGENCY ON QUALITY OF LIFE IN INDIVIDUALS WITH MULTIPLE SCLEROSIS  
 ACCORDING TO FATIGUE LEVELS\***  
**MULTİPL SKLEROZLU BİREYLERDE YORGUNLUK DÜZEYLERİNE GÖRE YAŞAM KALİTESİNE ÖZ BAKIM  
 GÜCÜNÜN ETKİSİ**

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**ABSTRACT**

Multiple sclerosis is a neurological disorder characterized by inflammation, demyelination, and neurodegeneration in the central nervous system. This study aimed to examine the impact of self-care agency on the quality of life in individuals with Multiple sclerosis according to their fatigue levels. A cross-sectional study was conducted with 77 participants. The mean age of the participants was 41.48±9.59 years, and 66.2% were women. The average fatigue severity was 3.86±2.4, with 49.4% of participants experiencing significant fatigue (≥4). The mean self-care agency score was 80.01±16.45. The average scores on the subscales of the Multiple Sclerosis Quality of Life Scale were 42.15±18.57 for cognitive physical health and 44.25±19.44 for cognitive mental health. Multiple regression analyses showed that self-care agency had a significant effect on both cognitive physical, and mental health. However, fatigue severity did not have a significant effect on these outcomes. Self-care agency explained a more significant portion of the variance in cognitive mental health 24.9% than in cognitive physical health 21.8%, highlighting its more substantial role than fatigue severity. As a result of the study, it was found that approximately half of the participants experienced significant fatigue, their self-care agency was at a moderate level, and their quality of life was moderate in both cognitive physical health and cognitive mental health domains. The study revealed that as self-care agency improves, there is a parallel improvement in cognitive physical health and cognitive mental health domains, and that self-care agency can play an essential role in shaping the quality of life.

**Keywords:** Fatigue, multiple sclerosis, quality of life, self-care agency.

**ÖZ**

Multipl skleroz, merkezi sinir sisteminde inflamasyon, demiyelinizasyon ve nörodejenerasyonla karakterize nörolojik bir hastalıktır. Bu çalışma, Multipl sklerozlu bireylerde yorgunluk düzeylerine göre öz bakım gücünün yaşam kalitesi üzerindeki etkisini incelemeyi amaçlamıştır. Kesitsel olarak yürütülen çalışma 77 katılımcı ile gerçekleştirilmiştir. Katılımcıların yaş ortalaması 41.48±9.59 yıl olup %66.2'si kadındır. Katılımcıların yorgunluk şiddeti ortalaması 3.86±2.4 olarak bulunmuş; %49.4'ünün anlamlı düzeyde yorgunluk yaşadığı (≥4) belirlenmiştir. Öz bakım gücü ortalaması 80.01±16.45 puan olarak saptanmıştır. Multipl Skleroz Yaşam Kalitesi Ölçeği alt ölçeklerinden bilişsel fiziksel sağlık için 42.15±18.57, bilişsel zihinsel sağlık için 44.25±19.44 puan elde edilmiştir. Çoklu regresyon analizleri öz bakım gücünün, hem bilişsel fiziksel sağlık hem de bilişsel zihinsel sağlık üzerinde anlamlı bir etkisi olduğunu göstermiştir. Ancak yorgunluk şiddeti bu sonuçlar üzerinde anlamlı bir etki göstermemiştir. Öz bakım gücü, bilişsel zihinsel sağlık varyansının %24.9'unu, bilişsel fiziksel sağlık varyansının ise %21.8'ini açıklamış olup, öz bakım gücünün yorgunluk şiddetinden daha etkili olduğu belirlenmiştir. Çalışmanın sonucunda, katılımcıların yaklaşık yarısının belirgin bir yorgunluk yaşadığı, öz bakım güçlerinin orta düzeyde olduğu ve yaşam kalitelerinin bilişsel fiziksel sağlık ve bilişsel zihinsel sağlık alanlarında orta düzeyde olduğu tespit edilmiştir. Çalışmada, öz bakım gücü geliştikçe, hem bilişsel fiziksel sağlık hem de bilişsel zihinsel sağlık alanlarında buna paralel bir iyileşme olduğu, öz bakım gücünün yaşam kalitesini şekillendirmede önemli bir rol oynayabileceği ortaya konmuştur.

**Anahtar kelimeler:** Yorgunluk, multipl skleroz, yaşam kalitesi, öz bakım gücü.

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## INTRODUCTION

Multiple sclerosis (MS) is a common chronic illness that causes inflammation, demyelination, and neurodegeneration in the central nervous system.<sup>1</sup> With a 2:1 female-to-male ratio, women are disproportionately afflicted by relapsing forms of MS compared to men.<sup>2</sup> MS is categorized into three main clinical types: relapsing-remitting (RRMS), which involves periodic flare-ups followed by recovery; secondary progressive (SPMS), which begins as relapsing-remitting but gradually progresses to a steady decline; and primary progressive (PPMS), characterized by a continuous, gradual decline without distinct relapse.<sup>3</sup> The condition manifests through neurological symptoms, including visual disturbances, numbness and tingling, localized muscle weakness, bladder and bowel dysfunction, and cognitive impairments.<sup>4</sup>

According to the conceptual model of health-related quality of life (HRQoL) developed by Wilson and Cleary, biological and physiological variables lead to symptoms, impacting general health perception and HRQoL via functional health.<sup>5</sup> Symptoms, defined as the patient's experience of abnormal physical, emotional, or cognitive states, are integral to understanding the overall disease burden. Among these, fatigue is one of the most prevalent and debilitating symptoms of MS, significantly impairing patients' ability to maintain daily activities and reducing their quality of life.<sup>6</sup> Fatigue also affects patients because it is one of the silent motor complications.<sup>7</sup> The study by Young et al. highlighted fatigue as one of the critical factors that severely affects the quality of life in MS patients.<sup>8</sup> As fatigue worsens, the ability to carry out essential self-care tasks diminishes, compromising daily functioning. Therefore, individuals need to have self-care ability to meet their basic daily activities and provide the necessary care. Self-care, as defined by the World Health Organization<sup>9</sup>, refers to the ability of individuals, families, and communities to promote and maintain their health, prevent illness, and manage disease with or without healthcare professionals. For individuals with MS, reduced self-care agency can severely limit their ability to perform basic activities, further deteriorating their quality of life.<sup>10</sup> Thus, understanding the role of self-care agency on quality of life in individuals with MS patients based on their fatigue is critical.

This study was conducted to determine the effect of self-care agency on the quality of life in individuals with MS according to fatigue levels.

## MATERIALS AND METHODS

### Study Design

The cross-sectional study, conducted between March 1 and July 20, 2024, included individuals diagnosed with Multiple Sclerosis who used online platforms in various cities of Türkiye.

### Settings and Sample

The study's sample size was calculated using G\*power 3.1.9.7 to determine the relationship between self-care agency, fatigue, and quality of life scales through multiple regression analysis.<sup>11</sup> Based on a medium effect size (0.15), 80% power, and a 5% Type I error rate, it was determined that at least 64 participants should be included. The study was completed with 77 participants

who met the inclusion criteria. These criteria included being diagnosed with MS at least three months ago, 18 years of age or older, voluntarily agreeing to participate, having internet access, and possessing sufficient digital literacy to complete the online questionnaires.

### Data Collection Tools

The data were collected using the Personal Information Form (PIF), the Fatigue Severity Scale (FSS), the Multiple Sclerosis Quality of Life-54 (MSQoL-54), and the Exercise of Self-Care Agency scale (ESCA).

### Personal Information Form

The PIF, developed by the researcher based on relevant literature, was chosen for its comprehensive coverage of individual and MS-specific factors. It consists of 18 questions: 11 addressing individual characteristics (age, gender, marital status, education status, income level, BMI, etc.) and seven related to MS-specific factors (type of MS, disease duration, attack frequency, additional chronic disease, etc.).<sup>12,13</sup>

### The Fatigue Severity Scale

The FSS, initially developed by Krupp et al.<sup>14</sup> in 1989, was adapted into Turkish by Armutlu et al.<sup>15</sup> in 2007, with a reported Cronbach's alpha of 0.94. The scale consists of nine items rated on a 7-point Likert scale. The total score is derived by averaging the item scores, with a score of 4 or higher indicating significant fatigue. In the current study, Cronbach's alpha was determined to be 0.97.

### The Multiple Sclerosis Quality of Life

The MSQoL-54 scale was developed by Vickrey et al.<sup>16</sup> in 1995 with Cronbach's alpha values ranging from 0.75 to 0.96 and later validated in Turkish by İdman et al.<sup>17</sup> It includes two main domains: Cognitive Physical Health (CPH) and Cognitive Mental Health (CMH). The CPH domain has eight subscales, while the CMH domain includes five subscales. Scores range from 0 to 100, with higher scores indicating better quality of life. In this study, Cronbach's alpha was found to be 0.94.

### Exercise of Self-Care Agency

The ESCA scale, developed by Kearney et al.<sup>18</sup> in 1979 based on Orem's self-care theory, was adapted for Turkish validity and reliability by Nahcivan<sup>19</sup> in 1993, with a sample of healthy young adults (Cronbach's alpha = 0.92). The ESCA assesses an individual's self-care agency with a maximum possible score of 140. Self-care agency levels are categorized as follows: scores between 24 and 64 indicate low self-care agency, 65 to 100 reflect a moderate level, 101 to 112 signify a high level, and 113 to 140 represent a very high level. In the present study, Cronbach's alpha was found to be 0.81.

### Data Collection

Data were gathered through a combination of random and snowball sampling methods. The questionnaires were developed using Google Forms on a web-based platform. To ensure a broad reach, links to the forms were distributed through major social media networks (WhatsApp and Facebook). In addition, participants were encouraged to share the links with others who also had MS. The estimated time to complete the questionnaire was 10: two minutes for the FSS, five minutes for the MSQoL-54, and three minutes for the ESCA.

### Data Analysis

The normality of continuous variables was assessed using the Shapiro-Wilk test. Due to the non-normal

distribution of scale scores, Spearman's Rho correlation coefficient was applied to evaluate linear relationships between the variables. Multiple linear regression analysis was performed to explore the impact of self-care agency and fatigue levels on quality of life (CMH and CPH). Regression models were constructed using the backward elimination method to identify factors influencing the quality of life among fatigued and non-fatigued participants. The reliability of the scales was reported using Cronbach's Alpha coefficients. Descriptive statistics were presented as mean, standard deviation, median, interquartile range, minimum, and maximum values for continuous variables, and as frequencies and percentages for categorical variables. In addition, regression analysis results were reported using regression coefficients (B) and 95% confidence intervals. The level of statistical significance was set at 0.05. Data analysis was conducted with the TIBCO Statistica software.

## RESULTS

The mean age of the study participants was  $41.48 \pm 9.59$  years, with the majority being women (66.2%). Among the participants, 74.0% had a university degree or higher, 74.0% were married, and 64.9% were parents.

Regarding MS attack frequency, 36.4% of the participants experienced occasional attacks, while 49.4% had relapsing-remitting MS. Additionally, 61% had not experienced an attack in more than a year, with the average duration of attacks typically lasting only a few days (29.9%)(Table 1).

Participants' mean FSS score was  $3.86 \pm 2.4$ , and 49.4% had  $FSS \geq 4$ . The mean ESCA score was  $80.01 \pm 16.45$ , while the mean scores of the MSQOL-54 subscales for Cognitive Physical Health (CPH) and Cognitive Mental Health (CMH) were  $42.15 \pm 18.57$  and  $44.25 \pm 19.44$ , respectively (Table 2).

It was determined, according to multiple regression analyses, that the effect of ESCA on both CPH and CMH was positive and statistically significant ( $p < 0.001$ ). Each unit increase in ESCA score was associated with 0.53 and 0.55 unit increases in CPH and CMH scores, respectively.

Although FSS had a negative effect on both outcome variables, these effects were not statistically significant ( $p > 0.05$ ). ESCA and FSS explained 21.8% of the variance in CPH and 24.9% in CMH, indicating that ESCA has a more pronounced effect on cognitive health than FSS (Table 3).

In the study, separate multiple linear regression models

**Table 1.** Distribution of Demographic and Clinical Characteristics in Individuals of Multiple Sclerosis ( $n=77$ )

Characteristics		Mean $\pm$ SD	Minimum-Maximum
Age (years)		41.48 $\pm$ 9.59	22-68
BMI (kg/m <sup>2</sup> )		25.61 $\pm$ 5.24	17.51-50.12
Duration of MS Diagnosis (years)		11.22 $\pm$ 7.68	1-28
		<b>n</b>	<b>%</b>
Gender	Female	51	66.2
	Male	26	33.8
Education Level	Primary school	3	3.9
	High school	17	22.1
	University and above	57	74.0
Marital Status	Single	20	26.0
	Married	57	74.0
Parenthood Status	Yes	50	64.9
	No	27	35.1
Employment Status	Employed	40	51.9
	Unemployed	37	48.1
Income Status	Income less than expenses	18	23.4
	Income equal to expenses	49	63.6
	Income more than expenses	10	13.0
MS Attack Frequency	No attack	15	19.5
	Rare	27	35.1
	Sometimes	28	36.4
	Frequent	7	9.1
MS type	Relapsing-remitting form	38	49.4
	Secondary progressive form	9	11.7
	Primary progressive form	9	11.7
	Unknown	21	27.3
Time Since Last MS Attack	One week ago	2	2.6
	One month ago	7	9.1
	Six months - one year ago	21	27.3
	More than 1 year	47	61.0
Average MS Attack Duration	Several hours	5	6.5
	Several days	23	29.9
	Several weeks	18	23.4
	One month	13	16.9
	More than one month	18	23.4
Presence of Comorbid Chronic Illness	Yes	28	36.4
	No	49	63.6
Use of Medication for MS Treatment	Yes	67	87.0
	No	10	13.0

SD: Standart Deviation

**Table 2.** Distribution of FSS, ESCA, and MSQOL-54 Questionnaire Scores

Questionnaires	Mean±SD	Median [IQR]	Minimum-Maximum
<b>FSS</b>	3.86±2.4	3.89 [1.67-6.5]	0-7
FSS≥4 (fatigue) <i>n</i> (%)	38 (49.4)		
FSS<4 (not fatigue) <i>n</i> (%)	39 (50.6)		
<b>ESCA</b>	80.01±16.45	82 [71-92]	32-113
<b>MSQOL-54 Subcales</b>			
<b>CPH Domains</b>			
PH composite score	42.15±18.57	38.81 [27.8-56.13]	10.93-89.28
Physical function	7.99±5.3	6.8 [3.4-13.6]	0-17
Role limitations due to physical problems	3.74±5.04	0 [0-9]	0-12
Pain	5.78±2.75	5.13 [3.48-7.7]	0.73-11
Energy	4.72±2.26	4.8 [2.64-6.72]	0.48-10.56
Social function	6.06±2.83	6 [4-8]	1-12
Health perception	7.16±3.73	6.8 [4.25-8.5]	0.85-17
Health distress	4.36±3.39	3.85 [1.1-7.15]	0-11
Sexual function	4.54±2.49	4.67 [2.66-6.67]	0-8
<b>CMH Domains</b>			
MH composite score	44.25±19.44	39.07 [31.23-59.19]	10.63-86.97
Role limitations due to emotional problems	8.21±10.05	0 [0-16]	0-24
Emotional wellbeing	14.52±5.79	13.92 [9.28-17.4]	2.32-27.84
Health distress	5.55±4.31	4.9 [1.4-9.1]	0-14
Cognitive function	6.94±4.33	6.75 [3.75-10.5]	0-15
Overall quality of life	6.93±1.59	7.2 [6.3-7.95]	0.9-10.8
Change in health	43.83±26.64	50 [25-50]	0-100
Satisfaction with sexual function	47.08±33.68	50 [25-75]	0-100

SD: Standart Deviation, IQR: Interquartile Ranges, FSS: Fatigue Severity Scale, ESCA: Exercise of Self-Care Agency, CPH: Cognitive Physical Health, CMH: Cognitive Mental Health

**Table 3.** Effects of ESCA and FSS Scores on CPH and CMH: Multiple Linear Regression Analysis

MSQOL-54 subscales		Unstandardized Coefficients		Standardized Coefficients	95.0% Confidence Interval for B		t	p
		B	Std. Error	Beta	Lower Bound	Upper Bound		
Dependent Variable: CPH	<b>(Constant)</b>	4.26	10.10		-15.87		0.42	0.674
R <sup>2</sup> :0.218	<b>ESCA</b>	0.53	0.12	0.45	0.29	24.39	4.37	<b>&lt;0.001</b>
F:10.342	<b>FSS</b>	-5.07	3.97	-0.13	-12.98	2.84	-1.28	0.205
p <sub>model</sub> <0.001								
Dependent Variable: CMH	<b>(Constant)</b>	-0.17	9.46		-19.01	18.67	-0.02	0.986
R <sup>2</sup> :0.249	<b>ESCA</b>	0.55	0.11	0.49	0.33	0.78	4.86	<b>&lt;0.001</b>
F:12.279	<b>FSS</b>	-3.78	3.72	-0.10	-11.18	3.63	-1.02	0.313
p <sub>model</sub> <0.001								

p: Multiple Linear Regression, FSS: Fatigue Severity Scale, ESCA: Exercise of Self-Care Agency, CPH: Cognitive Physical Health, CMH: Cognitive Mental Health

were created for fatigued and non-fatigued individuals using the backward elimination method to examine the factors affecting CMH scores. In the regression analysis for non-fatigued individuals, the model's explanatory power (R<sup>2</sup>) was found to be 38.1% (F=8.789, p<0.001). In this model, the self-care variable was found to have a strong and significant positive effect on the CMH score (B=0.70, p<0.001, Beta=0.63). Additionally, when the average attack duration exceeded one month, the CMH score significantly decreased (B=-13.03, p=0.038, Beta=-0.29), with this effect being moderate.

Furthermore, there was a tendency for a decrease in CMH scores when the attack duration was a few weeks, but this effect was not statistically significant (B=-11.11, p=0.091, Beta=-0.24). In the regression analysis for fatigued individuals, the model's explanatory power (R<sup>2</sup>) was found to be 47.2% (F=5.728, p<0.001). In this model, body mass index (BMI) was found to have a positive and significant effect on CMH score (B=0.81, p=0.048, Beta=0.26), indicating that CMH score also

rises as BMI increases. Female gender was also found to have a positive and significant effect on CMH score (B=10.55, p=0.040, Beta=0.26). As the diagnosis duration increased, the CMH score showed a strong increase (B=0.80, p=0.010, Beta=0.38). Regarding disease frequency, the absence of attacks resulted in a significant increase in CMH score (B=29.27, p<0.001, Beta=0.66). However, Primary Progressive MS type significantly reduced CMH score (B=-31.06, p=0.001, Beta=-0.49 (Table 4).

Factors affecting CPH scores were examined in both fatigued and non-fatigued individuals. The first model, created for non-fatigued individuals, had an explanatory power (R<sup>2</sup>) of 36.7% (F=23.039, p<0.001). This model found a strong and significant positive effect of self-care on BFS scores (B=0.67, p<0.001, Beta=0.62). In the second model, developed for fatigued individuals, the R<sup>2</sup> value was 40.1% (F=5.946, p=0.001). This model identified a negative and significant effect of age on CPH

**Table 4.** Impact of Fatigue Severity and MS-Related Factors on Cognitive Mental Health: A Multiple Linear Regression Analysis

		Unstandardized Coefficients		Standardized Coefficients	95.0% Confidence Interval for B		t	p
		B	Std. Error	Beta	Lower Bound	Upper Bound		
<b>FSS&lt;4</b> R <sup>2</sup> :0.381 F:8.789 p <sub>model</sub> <0.001	(Constant)	-5.82	11.64		-29.44	17.81	-0.50	0.620
	Average MS attack duration (Several weeks)	-11.11	6.40	-0.24	-24.09	1.88	-1.74	0.091
	Average MS attack duration (More than one month)	-13.03	6.04	-0.29	-25.29	-0.77	-2.16	<b>0.038</b>
	<b>ESCA</b>	0.70	0.14	0.63	0.40	0.99	4.82	<b>&lt;0.001</b>
<b>FSS≥4</b> R <sup>2</sup> :0.472 F:5.728 p <sub>model</sub> <0.001	(Constant)	5.95	10.90		-16.32	28.22	0.55	0.589
	BMI	0.81	0.39	0.26	0.01	1.61	2.06	<b>0.048</b>
	Gender (Female)	10.55	4.92	0.26	0.49	20.61	2.14	<b>0.040</b>
	Duration of MS Diagnosis	0.80	0.29	0.38	0.20	1.39	2.73	<b>0.010</b>
	MS attack frequency (No attack)	29.27	6.79	0.66	15.40	43.13	4.31	<b>&lt;0.001</b>
	MS type (Primary progressive form)	-31.06	8.53	-0.49	-48.49	-13.64	-3.64	<b>0.001</b>
	Average MS attack duration (One month)	-15.43	6.08	-0.35	-27.86	-3.01	-2.54	<b>0.017</b>
	Average MS attack duration (More than one month)	-17.31	5.80	-0.41	-29.16	-5.47	-2.98	<b>0.006</b>

Dependent variable: *CMH*

p: Multiple Linear Regression, FSS: Fatigue Severity Scale, ESCA: Exercise of Self-Care Agency, CMH: Cognitive Mental Health

scores (B=-0.63, p=0.028, Beta=-0.32), indicating that as age increased, CPH scores decreased. Body mass index (BMI) was found to have a positive and significant effect on CPH scores (B=1.19, p=0.019, Beta=0.34). Regarding disease frequency, the absence of attacks led to a substantial increase in CPH scores (B=25.38, p=0.001, Beta=0.51). On the other hand, Primary Progressive MS type significantly reduced CPH scores (B=-23.26, p=0.024, Beta=-0.32). Additionally, when the average attack duration was one month, a significant decrease in CPH scores was observed (B=-14.67, p=0.045, Beta=-0.29) (Table 5).

clinically significant fatigue, with their self-care agency assessed as moderate. Additionally, their QoL scores were generally mild in both physical and mental health domains.

The current study confirmed that self-care agency had a significant positive impact on both CPH and CMH, while fatigue severity did not show a significant effect on these health domains. The combination of ESCA and FSS accounted for 21.8% of the variance in CPH and 24.9% in CMH, highlighting the stronger influence of self-care skills, particularly on mental health outcomes. Gürkan and Özdelikara's study on MS patients found that self-

**Table 5.** Impact of Fatigue Severity and MS-Related Factors on Cognitive Physical Health: A Multiple Linear Regression Analysis

		Unstandardized Coefficients		Standardized Coefficients	95.0% Confidence Interval for B		t	p
		B	Std. Error	Beta	Lower Bound	Upper Bound		
<b>FSS&lt;4</b> R <sup>2</sup> :0.367 F:23.039 p <sub>model</sub> <0.001	(Constant)	-6.59	11.37		-2.63	16.45	-0.58	0.565
	<b>ESCA</b>	0.67	0.14	0.62	0.39	0.95	4.80	<b>&lt;0.001</b>
	(Constant)	37.52	17.67		1.53	73.52	2.12	<b>0.042</b>
<b>FSS≥4</b> R <sup>2</sup> :0.401 F:5.946 p <sub>model</sub> :0.001	Age	-0.63	0.27	-0.32	-1.19	-0.07	-2.30	<b>0.028</b>
	BMI	1.19	0.48	0.34	0.21	2.16	2.48	<b>0.019</b>
	MS attack frequency (No attack)	25.38	7.29	0.51	10.53	40.23	3.48	<b>0.001</b>
	MS type (Primary progressive form)	-23.26	9.83	-0.32	-43.29	-3.23	-2.37	<b>0.024</b>
	Average MS attack duration (One month)	-14.67	7.02	-0.29	-28.98	-0.36	-2.09	<b>0.045</b>

Dependent variable: *CPH*

p: Multiple Linear Regression, FSS: Fatigue Severity Scale, ESCA: Exercise of Self-Care Agency, CPH: Cognitive Physical Health

**DISCUSSION**

The present study revealed that self-care agency significantly influences the quality of life in individuals with MS, particularly concerning fatigue levels. Approximately half of the participants experienced

care agency significantly improved physical and mental health, further supporting the importance of fostering self-care agency in disease management.<sup>20</sup> Similarly, the systematic review and meta-analysis by Gonzalez et al. emphasized the strong association between quality of

life, fatigue, self-care capacity, and psychosocial factors in MS patients, underscoring the importance of these elements in managing the disease.<sup>21</sup> Thus, this study's findings indicated that promoting self-care agency is a crucial component of MS treatment, especially given their critical role in mental health recovery.

Non-fatigued individuals had 38.1% of the variance in CMH explained by the regression model, while for fatigued individuals, it explained 47.2%. Furthermore, in non-fatigued individuals, self-care agency substantially affected CMH, with CMH scores increasing significantly as self-care levels improved. Barrios et al. found that non-fatigued MS patients exhibited higher cognitive performance, and similarly, this current study revealed that self-care agency positively impacted CMH, particularly in non-fatigued individuals.<sup>22</sup> This study's finding highlights the importance of self-care, not just for physical health but for mental health as well. In addition, there was a significant decrease in CMH scores when the average attack duration exceeded one month. This result showed that the length of the attack duration had a moderate negative effect on CMH. In cases where the attack duration was several weeks, there was a tendency for a decrease in CMH scores, although this effect was not statistically significant. These findings indicated that the impact of attack duration on mental health could become more pronounced as the duration increases, underscoring the need for effective management of more prolonged attacks to mitigate their mental health impact. In addition, in those fatigued, BMI, female gender, diagnosis duration, and attack-free periods significantly increased the CMH score. In the study conducted by Sellitto et al. on patients with MS, individuals with lower BMI were found to experience greater levels of fatigue.<sup>23</sup> This result suggests that changes in fatigue and metabolic health indicators may be independent of one another, implying that factors other than metabolic health might contribute to perceived fatigue in these patients. Moreover, primary progressive MS type and long-term attacks had a negative impact on general health status in the current study. In the literature there exist publications reporting that primary-progressive MS (PPMS) is a disease course in which the functional capacity steadily declines after the onset of the disease, which also supports the current finding.<sup>24</sup> These findings emphasize that detrimental effects, such as MS type and long-term attacks, should also be taken into account in fatigue coping strategies and health management.

For non-fatigued individuals, self-care had a strong and significant effect on CPH scores in the overall model, with the explanatory power determined to be 36.7%. In contrast, the explanatory power was 40.1% for fatigued individuals. In addition, self-care was found to be a strong determinant of CPH in non-fatigued individuals, while factors such as age, BMI, MS type, and attack duration significantly affected CPH scores in fatigued individuals. The effect of self-care on cognitive and physical health has also been emphasized in previous studies, especially in chronic diseases and elderly individuals. In the study Han et al. determined that there was a significant positive relationship between chronic disease self-management skills and quality of

life.<sup>25</sup> Self-care allows individuals to regulate their health behaviors and age more healthily, which could be a factor that supports cognitive and physical health. Furthermore, fatigued individuals showed a negative effect of age on CPH scores, consistent with the literature. Decreasing cognitive reserve with age may lead to cognitive dysfunction in older adults.<sup>26</sup> Therefore, in the current study, this result explains why fatigued individuals have lower CPH scores due to age. In addition, a significant decrease in CPH scores was observed when the attack duration was one month, indicating the direct effect of the disease's activity level on individuals' functional capacities. However, the positive effect of BMI ( $25.61 \pm 5.24$ ) on CPH scores may be due to specific characteristics of the individuals assessed in this study. Patients with MS may have muscle weakness due to the natural course of their disease. Thus, a slight weight gain may not adversely affect cognitive and physical health. It may even constitute a reserve for strength or physical health in some individuals. In addition, for fatigued individuals, closely monitoring factors such as age, BMI, and disease course is essential for improving health outcomes.

Self-care agency might be an intervention factor in non-fatigued individuals, whereas fatigued individuals may require comprehensive management of additional factors. Chronic disease management should begin with educational and counseling services to enhance self-care skills in MS individuals, alongside fatigue management guidance. For those experiencing severe fatigue, energy conservation strategies should be prioritized. Moreover, multidisciplinary support should be provided to improve their overall quality of life, including attack management, healthy nutrition, and exercise recommendations.

## CONCLUSION

This study explored the influence of self-care agency on the quality of life in individuals with MS based on their fatigue levels. Nearly half of the participants experienced significant fatigue. Their self-care agency and quality of life were moderate in the physical and mental health domains. Self-care agency had a strong and positive effect on physical and mental health, but the impact was partially limited by significant fatigue. Based on the study findings, self-care skills were identified as a significant positive factor for physical and mental health among individuals with MS, highlighting the importance of self-care in enhancing the quality of life. Significant fatigue appeared to limit the positive impact of self-care skills on health outcomes, indicating that severe fatigue may hinder the full potential of self-care's impact on health outcomes. Notably, higher BMI, absence of attacks, and female gender were significant predictors of improved mental health scores in fatigued individuals. In contrast, age, MS type (PPMS), and average MS attack duration (one month) negatively impacted physical health scores. Additionally, primary progressive MS and longer attack duration were associated with poorer physical and mental health outcomes. These results underscore the crucial role of self-care skills, disease management, and demographic factors in influencing the health-related quality of life in individuals with MS.

Severe visual impairments that can be observed in individuals with MS may have indirectly limited participation in the online survey, potentially restricting the generalizability of the results.

**Ethics Committee Approval:** Ethics committee approval was received for this study from the Scientific Research and Publication Ethics Committee of Cukurova University (Date: 13.10.2023 Number:63/137), and the study was conducted in accordance with the principles of the Declaration of Helsinki.

**Informed Consent:** Written and/or verbal consent was obtained online from participants in the study.

**Peer-review:** Externally peer-reviewed.

**Author Contributions:** Concept-PYD; Design-PYD, SBY; Supervision-SBY, ZE; Resources-PYD; Materials-PYD; Data Collection and/or Processing-PYD, ZE; Analysis and/or Interpretation- PYD, SBY; Literature Search-PYD; Writing Manuscript- PYD; Critical Review- SBY, ZE.

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