Research Paper: The Relationship Between Sensitivity to Anxiety and Executive Functions and Quality of Life of MS Patients: Path Analysis Pattern

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ABSTRACT

Background: Multiple Sclerosis (MS) is affected by cognitive and emotional factors. The aim of this study was to investigate the relationship between sensitivity to anxiety and executive functions and the Quality of Life (QoL) of MS patients using path analysis.

Methods: This descriptive correlational research was done on all patients with MS in Gorgan MS Association in 2020. The sample size was considered to be 290 people according to the sample selection formula and based on the values obtained from the previous study selected by simple random sampling. To collect data, the Executive Functions Questionnaire of Nejati (2013), QoL questionnaire of McGuigan & Hutchinson (2004), and Sensitivity to Anxiety Questionnaires of Taylor and Cox (1998) were used. Path analysis with SPSS v. 18 and AMOS v. 23 software was used to analyze the data.

Results: The results showed that the executive functions had a positive relationship with QoL in MS patients and sensitivity to anxiety had a negative relationship with QoL in MS patients. Also, mediating role of the anxiety sensitivity variable in the relationship between executive functions with QoL in MS patients was confirmed (P≤0.01).

Conclusion: The present study indicated the importance of cognitive factors, such as executive functions, and emotional factors, such as sensitivity to anxiety in explaining the QoL in MS patients.

1. Introduction

Multiple sclerosis, abbreviated to MS, is a chronic, progressive disease of the central nervous system that attacks myelinated axons [1] and usually is observed in cases aged 20 to 25 years old [2]. About two and a half million people in the world suffer from this disease, and in Iran, the prevalence of MS is estimated at 5 to 74 per 100,000 people [3]. This disease is one of the most debilitating diseases in youth and causes many problems in the Quality of Life (QoL) [4]. It re-

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duces the patient's physical, social and cognitive functions and ultimately leading to impairment in the QoL of these people [5]. In MS patients, QoL is affected by the severity and the duration of the, which includes the individual's understanding of the situation, goals, and expectations [6].

Low QoL can lead to low adaptation and emotional responses in stressful situations [7]. Lanzilo et al. [8] indicated that due to neurological problems in these patients, other problems associated with executive functions are observed in these patients. Executive functions, which are one of the most effective processes of cognitive function, also play an effective role in controlling MS [9]. Executive functions are a set of superior organizational abilities, including predicting and creating goals and planning that at the neuro-anatomical level, are associated with different paths of neural interaction, such as the forehead cortex [10].

Better executive functions facilitate the use of new assessments and provide a greater cognitive resource to help their sustained attention, which leads to better regulation of their emotions in their daily lives [11]. Developmental neurological findings also confirm that emotional disturbance tolerance and executive functions are indirectly related and work together to analyze information and perform activities [12, 13]. Sensitivity to anxiety is defined as the level of tolerance of emotional pressure in inappropriate situations and events related to illness, anxiety, depression, restlessness, degeneration, etc. [14]. People with mild emotional distress are more likely to complain of symptoms [15]. Sensitivity to anxiety is associated with negative beliefs and impulsive and emotional behaviors [16]. In this regard, Grech et al. and Rigikouteh et al. showed that there is a relationship between the executive functions and QoL of people with MS [2, 9].

Marck et al. and Kos et al. showed that there is a relationship between the sensitivity to anxiety and the QoL of people with MS [13, 17]. Also, Vissicchio et al. showed that there is a relationship between anxiety and cognition in MS patients and anxiety has a significant effect on cognition [18].

Due to the problems caused by MS and the impact on the QoL of people, the importance of paying attention to this disease and the psychological and emotional effects to reduce the disease in these people is more important. Executive functions as a multidimensional factor affect all behaviors of people, which are more important in the emotional responses of people with MS, and on the other hand, no research has examined this variable. Therefore,

the aim of this study was to investigate the mediating role of sensitivity to anxiety in the relationship between executive functions and the QoL of MS patients.

2. Methods

The present descriptive-correlational research was done on 687 patients with MS in the MS Association of Gorgan in 2020. The sample size was estimated to be 290 cases according to the population size, based on the following equation, the values obtained from the previous study [9] and considering σ=20.35, d2=7.721, α=1.96, and power=0.90, who were selected by simple random sampling (Formula 1):

$$1. \quad n = \frac{2\sigma^2(z_{1-\frac{a}{2}}+z_{1-\beta})^2}{d^2} = \frac{2(1.50)^2(1.96+20.35)^2}{7.721} = 290.09$$

Inclusion criteria include: patients with MSdiagnosed by hospitals and clinics in Gorgan, living in Gorgan, at least 2 years to a maximum of 5 years of the disease, age rangd 25-40 years, the severity of the disease at the intermediate level according to the hospitals and clinic, announcing the readiness to cooperate, and the absence of physical and psychological problems according to the participants' reports.

Exclusion criteria: incomplete filling of the questionnaire. Before sampling, the subjects were given explanations about the purpose of the study and were assured of the confidentiality of the information, and also informed consent was received from the subjects. The collected data were analyzed using path analysis using SPSS v. 18 and Amos 23 software, USA, California, Stanford University.

Research tools

Executive functions questionnaire

The Executive functions questionnaire was designed by Nejati [19]. This questionnaire has 30 items and is scored on a five-point Likert scale (1 to 5). The high score on this questionnaire indicates the higher level of executive functions of individuals (minimum total score is 30 and the maximum score is 150). In Nejati [19] research, its structural and convergent validity and its reliability using Cronbach's alpha of 0.83 were confirmed. In the present study, the total reliability of the scale was confirmed using Cronbach's alpha of 0.82.

Quality of life questionnaire for MS patients

The QoL questionnaire for MS patients was designed by McGuigan and Hutchinson [20]. This questionnaire contains 29 items and is rated on a five-point Likert scale (1 to 5) and each item is given a score between 1 and 5. A higher score indicates a lower overall health QoL. Its construct and content validity has been confirmed. In Iran, Ayatollahi et al. [21] confirmed its construct validity and convergence, and its reliability was confirmed by a Cronbach's alpha of 0.70. In the present study, the reliability of the scale was confirmed by a Cronbach's alpha of 0.73.

The anxiety sensitivity questionnaire

The anxiety sensitivity questionnaire is a 36-item self-report questionnaire. This questionnaire was developed by Taylor and Cox [22] and is scored on a five-point Likert scale (very low=0 to very high=4). The more severe fear of anxiety symptoms is determined by higher scores (minimum total score is 0 and the maximum score is 144). Its reliability was confirmed with a Cronbach's alpha of 0.90. Moradi et al. [23] confirmed the structural and convergent validity of the scale and its reliability was confirmed with a Cronbach's alpha of 0.87. In the present study, the reliability of the alpha method was confirmed with a Cronbach's alpha of 0.88.

3. Results

Statistical assumptions were examined using the Kolmogorov-Smirnov test and the normality of the data was confirmed and also the measurement model of the three research variables was confirmed.

The results of Table 1 indicate a significant correlation between executive functions, sensitivity to anxiety, and QoL in the subjects. There was a significant negative relationship (0.01) between executive functions and sensitivity to anxiety and QoL. This means that by increasing executive functions and sensitivity to anxiety, cybercrime decreases in MS patients.

According to Table 2, the value of Root Mean Square Error of Approximation (RMSEA) is equal to 0.028, which is less than 0.1 that indicates that the mean square of the model errors is appropriate and the model is acceptable. In addition, the χ^2/df (2.135) was between 1 and 3, and the values of Goodness of fit index (GFI), Comparative Fit Index (CFI), and Normed Fit Index (NFI) indices are approximately equal to and greater than 0.9, indicating that the measurement model of the research variables is an appropriate model.

According to Table 3, pathways, executive functions, and sensitivity to anxiety had a significant direct effect on the QoL. Specifically, executive functions had an effect of -0.371 on QoL, and sensitivity to anxiety had an effect of -0.254 on QoL.

As can be seen in Table 4, the two indirect paths considered were significant and confirmed by the bootstrap method at the level of 0.01 according to the obtained values.

4. Discussion

The main purpose of this study was to investigate the relationship between sensitivity to anxiety and executive functions and QoL of MS patients and according to the results, there was a relationship between emotional disturbance tolerance and executive functions and QoL in MS patients. Also, these results are in line with the findings of Grech et al. indicating the effect of executive function on sensitivity to anxiety and QoL in MS (Figure 1) [9, 24-26]. Marck et al. and Kos et al. showed that there is a relationship between the sensitivity to anxiety and the QoL of people with MS [13, 17]. Vissicchio et al. showed that there is a relationship between anxiety and cognition in MS patients and anxiety has a significant effect on cognition [18]. Also, Rigikouteh et al. showed that there is a relationship between the executive functions and QoL of people with MS [2].

In explaining these results, it can be stated that the goal of proper functioning of executive functions is to increase behaviors that are likely to lead to rewards

Table 1. Descriptive statistics and Pearson correlation matrix between executive functions and sensitivity to anxiety and QoL

Variables	Mean±SD	1	2	3
1- Executive functions	87.37±11.45	1		
2- Sensitivity to anxiety	93.27±17.28	-0.34**	1	
3- Quality of life	87.66±16.15	-0.41**	0.36**	1

** Significant at the level of 0.01.

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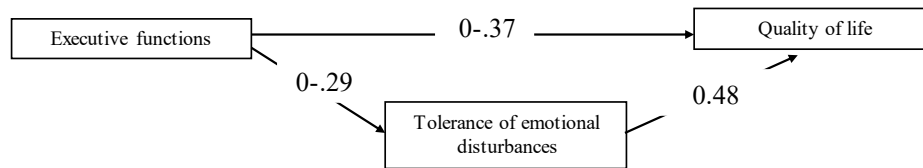
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Figure 1. The final tested model along with standardized prediction statistics

from the patient, pleasure or sense of accomplishment (internal) or social attention (external) [6]. This increase in rewards first helps to improve the patient's positive emotional tolerance and ultimately improves intimate relationships [18]. The use of appropriate executive functions by reducing anxiety and sensitivity to anxiety leading to improving proper cognitive and emotional performance makes the MS patients able to solve the problem and increase their QoL [2]. Also, people with MS who are accustomed to using positive strategies to think about positive events instead of negative ones will have a higher QoL [27, 28]. In other words, it can be said that people with improper executive functions fail to regulate sensitivity to anxiety and negative emotions cre-

ating the ground for psychological vulnerability in these people [15]. According to the biological view of executive functions, when an organism receives a boost from the environment; therefore, its drivers or internal forces are more focused and directed in the process of enduring sensitivity to anxiety [29] and its behaviors will be based on appropriate executive functions in response to stress, such as progressive MS [30]. In this behavioral process, the organism can always have adaptive behaviors to gain self-care, which is the motivating factor that ultimately guarantees a better QoL in the affected person.

Table 2. Fit indices derived from data analysis and variables

Tests	Acceptable Amounts	Achieved Amount
x^2/df (Relative Chi-square)	<3	2.135
RMSEA (Root Mean Square Error)	<0.1	0.028
GFI (Goodness of Fit Index)	>0.9	0.999
NFI (Normed Fit Index)	>0.9	0.996
CFI (Comparative Fit Index)	>0.9	0.997
DF (Degrees of Freedom)	128	

Table 3. Direct model estimation by maximum likelihood [ML[3]] method

Variables	b	β	R^2	t	Sig.
Executive functions on quality of life	-0.512	-0.371	0.189	3.362	0.001
Sensitivity to anxiety on quality of life	0.367	0.254	0.093	2.754	0.001

Table 4. Direct estimation of the model by the Bootstrap method

Variable	Value	Lower Limit	Upper Limit	Sig.
The effect of executive functions on quality of life of MS patients with the mediating role of sensitivity to anxiety	-0.412	-0.527	-0.369	0.001

5. Conclusion

This study showed that sensitivity to anxiety had a mediating role in the relationship between executive functions and QoL of MS patients and in general, 0.31 of the variance of QoL was explained by sensitivity to anxiety and executive functions in direct and indirect paths. The present study showed the importance of cognitive factors, such as executive functions and sensitivity to anxiety, and emotional factors, such as sensitivity to anxiety in explaining the QoL in MS patients. In general, MS patients with stronger executive functions have better tolerance for sensitivity to anxiety and a better QoL. It is suggested that research in this field be conducted using larger sample sizes from different and larger communities so that the results can be more generalized. Also, therapists of this disease should always pay special attention to the role of cognitive and emotional factors at the same time.

This research faced limitations; given that this study was conducted in Gorgan's MS Association in 2020, caution should be taken in generalizing the results. Causality cannot be inferred from the path analysis. Also, caution should be taken in generalizing the results to other groups and communities because this study was carried out on MS patients. In addition, the limitations of conducting research during the outbreak of Coronavirus disease 2019 (COVID-19) made it difficult to access patients and do the sampling process.

Ethical Considerations

Compliance with ethical guidelines

All ethical principles were considered in this article. The participants were informed about the purpose of the research and its implementation stages and signed the informed consent. They were also assured about the confidentiality of their information. Moreover, they were allowed to leave the study whenever they wish, and if desired, and were informed that the results of the research would be available to them. The present study was approved by the ethics committee of Azad University, Sari Branch (Code: IR.IAU.SARI.REC.1398.107).

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Authors' contributions

All authors equally contributed to preparing this article.

Conflict of interest

The authors declared no conflict of interest.

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