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Presenting a causal model of self-awareness in patients with multiple sclerosis based on visual-spatial development and perceived physical fitness; the mediating role of self-control (application of path analysis)

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Abstract

Introduction: The present study aimed to present a causal model of self-awareness in Multiple Sclerosis (MS) patients based on visual-spatial development and perceived physical fitness with the mediating role of self-control.

Materials and Methods: The statistical population of this correlational study included all patients with MS in Borujerd, Iran, in 2023-2024, of which 300 people were selected by convenience sampling. The questionnaires of visual-spatial development, perceived physical fitness, self-control, and self-awareness were used to collect data. The data were analyzed using SPSS 24 and AMOS software.

Results: The findings showed that visual-spatial development affected self-control (β= 0.54 and value 8.09) and self-awareness (β= 0.67 and value 11.76); perceived physical fitness had an effect on self-control (β=0.59 and value 9.96) and self-awareness (β= 0.55 and value 8.85) and self-control affected self-awareness (β= 0.47 and value 6.70) ($P< 0.01$). The findings also showed that the present model explained 33 percent of the variance in self-control and 42 percent of the variance in self-awareness. In addition, self-control plays a role as a mediating variable in the relationship between exogenous variables and self-awareness.

Conclusion: According to the results, increasing self-control and consequently increasing the level of visual-spatial development and perceived physical fitness will improve the level of self-awareness in patients with MS. This suggests that relevant authorities should pay more attention to the role of self-control as a mediating variable.

Keywords: Perceived physical fitness, Self-awareness, Self-control, Visual-spatial development

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Introduction

Multiple sclerosis (MS) is an inflammatory disease in which the myelin sheaths of brain and spinal cord nerve cells are damaged (1). MS is a disease related to the central nervous system (2,3). MS is most common in young people aged 20 to 40 years and is three times more common in women than in men (4,5). The most common symptoms of MS are fatigue, dizziness, loss of balance or numbness, blurred vision, slurred speech, prolonged double vision, sexual problems, and sensitivity to cold (6,7). According to the MS Association, concern about the future is particularly important for patients (8). Due to its unpredictable nature 9), this disease can disrupt the quality of life of the affected person (10), making it difficult to carry out daily activities (11).

Studies have shown that the level of self-awareness in MS patients undergoes many changes (12). The better patients know themselves, the more likely they are to overcome anxiety (13,14) and live a normal life (15-17). In other words, self-awareness in MS patients provides the basis for self-efficacy to control negative emotions (18,19). According to neuropsychological theorists, self-awareness is the nervous system's ultimate understanding of its nature (20-22). In psychology, self-awareness means understanding all thoughts, beliefs, strengths, and weaknesses (23,24) and helping to improve oneself in challenging situations (25). Self-awareness in MS patients has also been defined as a developed sense of mindfulness (26), perceived physical health (27), and basic self-esteem (28).

Researchers have shown that physical fitness exercises affect the level of self-awareness and mindfulness (29,30) and psychological health of MS patients (31,32). Central neuroscience researchers have shown that visual-spatial processing in MS patients undergoes many negative changes (33). People with MS are involved in psychosomatic illness and have problems in the field of visual-spatial perception and physical fitness (34). Visual-spatial processing is one of the most important processing foundations and forms mental representations about the outside world (35). Visual-spatial processing includes all spatial information, which is unfortunately severely impaired in MS patients (35). Research has shown that MS patients have problems in processing motion perception, shape and background perception, depth perception, and visual-motor coordination (35). Some studies have shown that MS patients have poor perceived physical fitness and self-assessment (36). The perception of MS patients' physical fitness directly affects their self-awareness (37). It is important to note that perceived physical fitness can help MS patients to have high self-control and self-awareness (38) by improving physical imagery (39).

Psychologists also believe that perceived physical fitness in MS patients helps to control and overcome the disease (39). Therefore, it is clear that MS patients who increase their level of perceived physical fitness will have a more positive attitude, higher self-awareness, and more self-control in MS and will be able to cope with this disease better and more favorably (32,33). Other studies have reached interesting and, of course, different results. One of these findings is that the self-control construct (16,18,21,27,34,36,38) mediates the relationship between influential and predictive variables of self-awareness, such as visuospatial development and perceived physical fitness in MS patients. Researchers have recently investigated the effect of self-control in implementing mindfulness techniques to accelerate the psychological well-being of MS patients (39). Therefore, and in light of the above, the present study aims to present a model of self-awareness based on visuospatial development and perceived physical fitness and the mediating role of self-control in MS patients.

Materials and Methods

The present research design was based on the correlational approach using path analysis. The statistical population included all women with MS in Borujerd, Iran, in 2023-2024 (n= 1561) who were selected using the convenience sampling method. For studies based on model drawing, the following rule of thumb has been suggested for sample selection: The minimum sample size for each calculated parameter is 5, a ratio of 10 to 1 is considered more appropriate, and a ratio of 15 to 1 is considered desirable. Since there are 20 observed parameters in the present study, a ratio of approximately 15 to 1 was used, and 300 people were selected using the convenience method. The inclusion criteria were age over 35, no debilitating diseases or chronic heart and respiratory diseases, no participation in treatment programs, and being literate and willing to participate in the research.

The exclusion criteria were lack of participation and cooperation in the research implementation process.

Research instruments

A) Visual-Spatial Development Questionnaire: This questionnaire, developed by Harry and Wider, has 51 questions and six subscales: body awareness and sense, body location in space, body-environment relationship and environment-other relationship, spatial maintenance, visual, logical reasoning, and representational thinking. The three-point scoring range is from never= 3 to always= 1. The minimum and maximum scores in the entire questionnaire are 51 and 153, respectively. This questionnaire has been assessed as appropriate in the content, face, and criterion validity project (40).

B) Perceived Physical Fitness Questionnaire: The questions of this tool are scored on a 5-point Likert scale from strongly disagree= 1 to strongly agree= 5. This questionnaire has 12 questions and four sections: physical condition (questions 1 to 3), flexibility (questions 4 to 6), muscle condition (questions 7 to 9), and body composition (questions 10 to 12). The minimum and maximum scores in the entire questionnaire are 12 and 60, respectively. Cronbach's alpha for the entire instrument is reported to be 0.88 and is desirable (41).

C) Self-awareness questionnaire: This scale was developed by Cooper and consisted of 25 questions. The questionnaire has three subscales: private self-awareness (questions 1 to 10), general self-awareness (questions 11 to 18), and social self-awareness (questions 19 to 25), which are set on a 5-point Likert scale from never= 1 to very much= 5. The minimum score in this instrument is 25, and the maximum is 125. Cronbach's alpha for the entire instrument was reported to be 0.75 and desirable (42).

After obtaining the necessary permits, the researchers referred to a comprehensive health center in Borujerd dedicated to providing services to MS patients. A list of all patients was provided to the researchers, who were selected from a list of 300 people using the available method. In the next stage, they were contacted based on their psychiatric and medical records, including their ID card details, address, and home phone number.

After contacting them, the process of providing the questionnaires began, along with the study objectives and obtaining consent. Filling out the questionnaires was done in two ways. In the first method, women with MS answered the questionnaires in person. In the second method, some MS women who could not come to the center in person were sent the questionnaires online, and they answered them. To be precise, 293 participants answered the questionnaires accurately and completely. In other words, seven people did not answer the questions completely, and these seven people were excluded from the analysis.

The present study used descriptive statistical methods to analyze the collected data. SPSS24 and AMOS24 software were used for quantitative statistical analyses.

Results

Demographic findings showed that 53% of the participants were between the ages of 20 and 30, and 47% were between the ages of 31 and 50. In addition, findings related to employment status, family economic status, and education level showed that 71.66% of women were employed and 28.33% were unemployed.

Also, 38.33% of MS women had low economic status, 40.00% had medium economic status, and 21.66% had high economic status. In addition, 26% of MS patients had a diploma or lower diploma education, 50.66% had a postgraduate diploma or bachelor's degree, and 23.33% had a postgraduate degree or higher.

Table 1 reports descriptive findings related to the mean and standard deviation of the variables. Based on the Pearson correlation coefficient method, it was determined that the self-awareness variable has a positive and significant relationship with visual-spatial development ($P< 0.05$, r= 0.57) and mental balance ($P< 0.05$, r= 0.44). In addition, the correlation between visual-spatial development and mental balance is ($P< 0.05$, r= 0.42). The results showed that the assumptions of normality, multivariate normality (Mardia coefficient= 4.78), multiple non-collinearity, univariate outliers (using boxplots), and multivariate outliers (using Mahalanobis distance) were met. The results of the Bootstrap method showed that the path of visual-spatial transformation to self-awareness mediated by mental balance was in the range of the lower limit= 0.215 and the upper limit -0.302 at a significance level of 0.005. In this study, the assumption of linearity was confirmed using the scatterplot method.

Table1. Descriptive indicators in the variables of visual-spatial development, mental balance, and self-awareness

Variable	Subscale	Mean	Standard Error	Skewness		Skewness		Index of Multiple Collinearity	
				Index	Standard Deviation	Index	Standard Deviation	Tolerance Factor	Inflation Factor
Visual-spatial development	Representational thinking	21.45	2.44	1.74	0.14	2.43	0.25	0.47	2.22
	Visual logical reasoning	19.80	2.40	1.08	0.14	2.22	0.25	0.70	1.75
	Maintaining space	20.49	2.89	2.72	0.14	0.74	0.25	0.66	1.10
	Body awareness and sense	21.82	2.71	0.99	0.14	0.53	0.25	0.49	2.20
	Location of the body in space	20.21	2.90	0.99	0.14	0.53	0.25	0.72	1.11
	Relationship of the environment with others and body with the environment	22.73	2.14	0.52	0.14	0.20	0.25	0.70	1.36
	Visual-spatial development (total score)	121.67	11.83	1.03	0.14	0.56	0.25	0.74	1.83
Mental balance	Experiential acceptance	29.30	4.21	3.09	0.11	11.09	0.23	0.42	2.29
	Non-reaction	36.48	5.14	1.41	0.11	1.40	0.23	0.73	1.71
	Mental balance	100.96	9.12	1.23	0.11	0.73	0.23	0.74	1.75
Self-awarenes	Private self-awareness	33.55	3.25	1.87	0.15	0.70	0.26	0.70	1.11
	Public self-awareness	36.32	4.10	1.80	0.15	0.79	0.26	0.63	1.29
	Social self-awareness	22.87	3.85	1.81	0.15	0.77	0.26	0.50	2.32
	Self-awareness	96.15	10.28	1.86	0.15	0.74	0.26	0.69	1.10

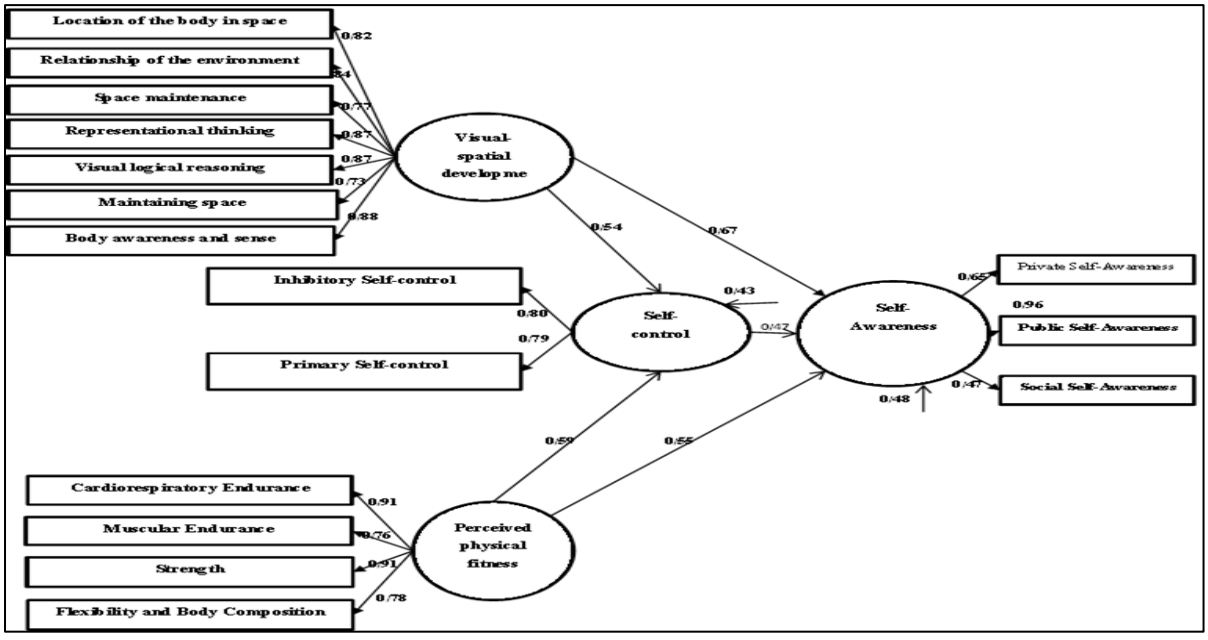

Figure 1. Model in standard coefficients mode

As shown in Figure 1, the present model explains 33% of the variance in self-control, 30% in mental balance, and 42% in self-awareness. The results showed that visual-spatial development had an effect on self-control with an impact coefficient of 0.54 and a value of 8.09; on mental balance with an impact coefficient of 0.60 and a value of 9.58; and on self-awareness with an impact coefficient of 0.67 and a critical value of 11.76. The results also showed that perceived physical fitness had an effect on self-control, with an impact coefficient of 0.59 and a value of 9.96; on mental balance, with an impact coefficient of 0.46 and a value of 6.58; and on self-awareness, with an impact coefficient of 0.55 and a critical value of 8.85. In addition, the results showed that sports mindfulness affected self-control, with an impact coefficient of 0.50 and a value of 7.10; mental balance, with an impact coefficient of 0.59 and a value of 9.97; and self-awareness, with an impact coefficient of 0.51 and a critical value of 64.7; self-control had an impact on self-awareness with an impact coefficient of 0.47 and a value of 70.6, and mental balance had an impact on self-awareness with an impact coefficient of 0.57 and a value of 39.8. Table 2 and the findings related to the model fit indices show that the model has a good fit.

Table 2. Parameters for measuring direct relationships between variables in the proposed model and model fit indices

Path	SD	B	β	CR	α
visual-spatial development on mental balance	0.60	0.65	0.60	3.47	0.001
visual-spatial development on self-awarenes	0.67	0.70	0.67	1.75	0.001
mental balance on self-awarenes	0.50	0.63	0.57	1.24	0.001
		Model fit indices			
indices		F		Accepted domain	Result
(X^2)		426.42		> 0.05	
(P.value)		0.001			Non Desirable
(X^2/DF)		2.76		< 5	Desirable
(GFI)		0.85		> 0.90	Desirable
(RMSEA)		0.042		< 0.1	Desirable
(CFI)		0.91		> 0.90	Desirable
(TLI)		0.90		> 0.90	Desirable
(NFI)		0.87		> 0.90	Desirable
(PNFI)		0.74		> 0.50	Desirable

Discussion

The present study aimed to test the fit of the causal model of self-awareness in MS patients based on visuospatial development and perceived physical fitness with the mediating role of self-control. The results showed that the direct effect of visuospatial development on self-control and self-awareness is significant. This finding is consistent with the results of studies in terms of results (7,11,22). The self-control construct in Clinton et al.'s theory is generally understood as the ability to change or adapt oneself to the world around one's body to create a better fit between oneself and the world. On the other hand, the concept of visuospatial development has an important subcomponent called the relationship between the individual and the environment.

Therefore, one of the important reasons for explaining why the direct effect of visuospatial development on self-control was significant is the existence of a common element of trying to connect the individual with the environment optimally (13). Regarding the effect of visual-spatial development on self-awareness, one of the important explanations is that there is an

element of self-attention and review of mental, intellectual, and physical conditions in visual-spatial development and self-awareness. Another explanation, in agreement with the studies of Carletto (7), Dietmaier (11), and Kang (22). Our findings showed that the direct effect of perceived physical fitness on self-awareness and self-control is significant. This finding is consistent with the results of studies. Studies have shown that people who are more physically fit also have a higher level of self-awareness. This is because people with higher physical fitness care more about their physical and mental health, and while in the concept of self-awareness, attention to the health of the individual's personality and identity is also important. Therefore, in general, attention to the health of the body and mind in both the concept of perceived fitness and the concept of self-awareness is the main reason that perceived physical fitness has been able to have a causal and direct effect on the concept of self-awareness. One of the main reasons that perceived physical fitness has been able to significantly predict self-control is that in the structure of physical fitness, there are concepts such as attention to physical health, sports management, and regular exercise. In contrast, in the concept of self-control, attention to physical health and daily life is of particular importance (10,18,30,33).

Another explanation, consistent with the studies of Dickstein (10), Hobson (18), Mertens (30), and Ogunwale (33) which conducted on women. In addition, the sample size in the studies of Mertens (30) and Ogunwale (33) was 300, similar to the present study.

The results showed that self-control significantly mediates the relationship between visuospatial development and perceived physical fitness with self-awareness. This finding is consistent with the results of studies (16,27,34,38). In the self-awareness theory of MacRae, it is believed that people who are involved in MS should have a higher level of self-awareness about their disease so that they can better cope with control and follow up on treatment. On the other hand, people who have higher perceived physical fitness and better visual-spatial development have higher self-awareness because high perceived physical fitness and higher self-control and visual-spatial development make people control their emotions better and have more optimal arousal levels. So, self-control can mediate the relationship between perceived physical fitness and visual-spatial development with self-awareness and indirectly and significantly affect self-awareness. So, in general, and based on theoretical and empirical foundations, it can be said that the existence of common elements in the concepts of perceived physical fitness, visual-spatial development, and self-control has caused self-control to have a mediating and positive role in the relationship between perceived physical fitness and visual-spatial development with self-awareness (33). Another explanation, in agreement with the studies of Han (16), London (27), Potoczny (34), and Shi (38). One limitation of the present study is that it was conducted on women with MS, and the results cannot be generalized to male patients. Given the mediating role of self-control in the relationship between visuospatial development and perceived physical fitness with self-awareness, it is suggested that the importance of this concept be further emphasized.

Conclusion

Based on the findings, self-control mediates the relationship between visual-spatial development, perceived physical fitness, and self-awareness, significantly. Therefore, paying attention to these variables is crucial in increasing the level of self-awareness of MS patients.

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Conflict of Interest

The authors declare no conflict of interest.

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Ethical Considerations

This article is based on the master's thesis at the Islamic Azad University, Boroujerd Branch.

Code of Ethics

IR.MEDAPAU.REC.1398.015

Authors' Contributions

The design and implementation were carried out by Mehdi Yousefvand and Ahmad Haqi; Mehdi Yousefvand carried out the introduction and statement of the problem; Ahmad Haqi carried out the methodology, discussion, and conclusion; and Zahra Ziyar and Zolaikha Zarei carried out the findings and general review of the work under the supervision of Mehdi Yousefvand.

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