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Research Paper

Core Stability Exercises Affect Hope and Its Components in Patients With Multiple Sclerosis

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ABSTRACT

Background: Young people are at a higher risk of developing multiple sclerosis (MS), which can adversely affect their social and personal lives and, thus, psychological capital such as hope.

Objectives: This study was conducted to investigate the effect of core stability exercises on the levels of hope and its components in patients with MS.

Materials & Methods: This research employed a pre-test-post-test design with a control group. This study was conducted on MS patients referred to the Omid Clinic of Babol University of Medical Sciences Babol City, Iran, from April to June 2018. Using the available sampling method, 36 patients (two groups of 18 people) were selected with the diagnosis of a neurologist and under similar drug treatments who could perform core stability exercises. The experimental group performed a core stability training protocol for 8 weeks, three sessions a week, and one day between each session, and each session took about 30 minutes. Snyder's adult hope scale was administered in the pre-test and post-test stages for both groups.

Results: This study involved 24 women and 12 men, most of whom were in their third decade. Findings indicate the effectiveness of core stability exercises on resilience, purposefulness, self-control and ability to solve problems, stubbornness, and optimism ($P<0.05$). However, it has not influenced the belief component ($P>0.05$).

Conclusion: Core stability exercises and medical and physical treatments in MS patients can improve their health because hope and its components increase with exercise.

Keywords: Multiple sclerosis, Core stability, Exercise, Hope

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Highlights

• The core stability training program significantly increased the hope of multiple sclerosis patients.

• The core stability training program significantly increased agency thinking (motivation) in multiple sclerosis patients.

• The core stability training program significantly influenced strategic thinking (paths to achieving goals) in multiple sclerosis patients.

Introduction

Multiple Sclerosis (MS) is a chronic autoimmune disease that affects the central nervous system [1, 2]. In addition to damaging the protective sheaths of nerve fibers, this disease leads to communication problems between the brain and other body parts [3]. MS symptoms vary greatly, and the causes are still unclear. MS patients pass through the asymptomatic, prodromal, and symptomatic stages. In addition to optic neuritis, brain stem syndromes and spinal cord syndromes, dominant parietal lobe syndromes are also less common [1]. MS prevalence is increasing globally but decreasing in some countries like Norway and the United States [4]. Women are more likely to develop MS [5]. The prevalence is nearly 30 per 100000 people and the incidence is 3.4 per 100000 in Iran [6]. Two essential diagnostic tests for MS are magnetic resonance imaging and cerebrospinal fluid analysis [7]. There is currently no cure for MS. Several treatments, including disease-modifying therapies, can help manage symptoms and slow disease progression [8].

Physical activity and exercise can be used as non-drug treatments for MS patients [9]. Although Petajan et al. warned MS patients to avoid exercise [10], other studies have shown that proper exercise therapy or rehabilitation techniques can benefit them [11-13]. Considering the prevalence of MS among young people, this disease can harm personal and social functioning. In addition, it can lead to emotional and psychological problems. MS may adversely affect psychological capital, such as resilience and hope [14].

Hope significantly influences life, movement and dynamics [15]. Hope is one of the key aspects of behavior. It means believing that the future will be better. It stimulates people's activity through its penetrating force, allowing them to experience various activities and develop new strengths [16]. Hopeful people always have more options and paths to pursue their goals. Despite obstacles, they remain motivated and seek alternative paths [17]. Hope plays an essential role in chronic disease recovery and adaptation. Hope has been defined as a complex, multidimensional and potentially powerful factor [18].

Standing balance is determined by body alignment and muscle tone [19]. Maintaining balance and stability of the trunk during daily activities can be achieved by strengthening primary muscles involved in maintaining balance (transverse abdominal muscles, multifidus, pelvic floor muscles) [20]. Consequently, a core stability training program can reduce movement disorders and improve activity prediction [21].

Using an effective treatment method to reduce hopelessness and increase happiness is crucial to improving MS sufferers' quality of life and disease process. Limited studies have also been conducted on how core stability exercises affect patients' hopes. In this study, we will investigate whether core stability exercises improve the level of hope, the components of active thinking, and the pathways to achieving their goals (strategic thinking) in patients with MS.

Materials and Methods

Patients and study type

This study employed a pre-test-post-test design with a control group. The statistical population comprised patients with MS who visited the Omid Neurology Clinic affiliated with Babol University of Medical Sciences, Babol, Iran, between April and June 2021.

The research sample was selected based on eligibility criteria and by the purposeful sampling method. Considering an alpha error of 0.8 and a beta error of 0.2 and using a Cohen's d of 0.75 derived from the study by Sun et al. [22], the final sample size was calculated to be 36

(18 individuals in the experimental group and 18 individuals in the control group). Our study was conducted by obtaining permission from related organizations and collecting a list of eligible patients referred to our clinic. Following the COVID-10 pandemic, 32 patients were included after the phone call and explanation of the study. Online follow-ups were conducted for patients before and after tests. At the appropriate times, communications were established with them through social networks in accordance with the core stability training program. Core stability exercises were performed individually for the experimental group, but the control group did not undergo any exercises. Pre-test and post-test were conducted for experimental and control groups.

Study measures

Snyder's adult hope scale (ASH) was used in this study. It is a valid and reliable tool for measuring hope in the adult population, developed by Snyder et al. in 1991 [23]. ASH is based on an 8-point Likert scale from completely false with a score of 1 to completely true with a score of 8. This scale has two subscales: the agency thinking subscale (in the sense of purposeful energy) determined by questions 2, 9, 10 and 12 and the paths subscale (planning to achieve goals) with questions 1, 4, 6 and 8 [24]. It should be noted that questions 3, 5, 7, and 11 are deviant questions from the questionnaire and are not scored. The scoring of questions 3, 5, 7 and 11 is removed as deviation questions to increase the test accuracy. Therefore, the range of scores is from 8 to 64. In other words, the minimum score in this test is 8, and the maximum score is 64 [25]. It is important to note that this questionnaire was validated by Alali et al. who reported a Cronbach α of 0.83 for males and 0.81 for females. Principal component analysis (PCA) indicated a three-factor structure, which explained a substantial portion of the total variance. Additionally, convergent validity was established through correlations with the satisfaction with life scale, the life orientation test-revised, and the Oxford happiness inventory. Divergent validity was confirmed by significant negative correlations with Beck's anxiety and depression scales ($P<0.05$ for all measures) [26]. Moreover, in a study by Nooripour et al. involving patients with MS, the Persian version of this questionnaire demonstrated a good fit with a two-factor structure based on confirmatory factor analysis, with fit indices of CFI=0.91, GFI=0.93 and RMSEA=0.079. Convergent validity was also confirmed through correlations with the general self-efficacy scale, while divergent validity was confirmed via significant negative correlations with Beck's anxiety and depression scales [25]. In this study, we used the Persian version of the questionnaire.

Exercise protocol

Jeffrey's core stability exercises were used in this study [27]. During the eight weeks of training, participants contributed to three sessions a week, every other day, and for about 30 minutes each. The protocol contains specific exercises designed to stabilize the spine, retrain the lumbopelvic proprioception, and contract the multifidus muscles while hollowing the pelvis. Keeping the aforementioned stabilizing maneuver in mind, adding dynamic components to the dynamic stability (movement of the limbs, use of a Swiss ball) was the next stage as we maintained the stabilizing maneuver in different positions (vaulter, palms, kneeling).

Jeffrey recommends five levels of core stability exercises. Static contractions and slow movements in a stable environment are part of level two exercises, and static contractions are part of level three exercises. At level four, dynamic movements in an unstable environment and errors and dynamic movements in a stable environment are included. In level five exercises, Swiss balls were used in a stable environment for active and resistance movements [27].

Based on the limitations of MS patients, level one to three exercises [28] have been used in the present study. Due to the COVID-19 epidemic and the fact that patients are unable to use the gym, they are taking drugs that weaken their immune systems, so we have presented them online (Table 1).

Statistical analysis

The collected data were recorded in SPSS software, version 22 and descriptive and inferential statistics indicators were used to describe and analyze the information. Frequency and percentage values were also included to indicate the status of the studied groups. The normality of the total score of Snyder's ASH was checked using the Shapiro-Wilk test. The research hypothesis was evaluated using analysis of covariance (ANCOVA) analysis at a significance level of 0.05.

Results

In this study, 36 patients were investigated, most of whom were in the age range of 31 to 40 years; 24 were women (66.7%) and 12 were men (33.3%). The participants were divided into two groups of 18 people, control and experimental, examined in pre-test and post-test. Among both groups, more than half of the participants were women, and in terms of age, nearly half were in

Table 1. Core stability training program

Weeks	Type of Exercise	No. of Sets and Repetitions
1st and 2nd week	Contraction of the transverse abdominal muscle: The participant lies in an arched position with knees bent and feet flat on the floor. Then, they act by bending the abdomen (abdominal flexion) without rotating the pelvis.	Two turns and each turn takes ten seconds*
	Contraction of the transverse abdominal muscle: The participant squats and hollows in without rotating the pelvis.	Two turns and each turn takes ten seconds
3rd week	Contraction of the transversus abdominis muscle: The participant is squatting, then while doing abdominal tucks without rotating the pelvis, they slowly straighten one leg and place the foot on the ground.	Three turns for each leg and ten repetitions in each turn
	While contracting the transversus abdominis muscle (hollowing in), the participant squats and slowly raises one leg from the back to the trunk level.	Three turns for each leg and ten repetitions in each turn
4th week	The participant sleeps in an arched position with bent legs and knees. Then, while doing stomach tucks without turning the pelvis, he or she slowly bends one leg from the thigh to the inside of the abdomen.	Three times for each leg with ten repetitions
	While contracting the transverse abdominal muscle (hollowing in), the participant is squatting slowly, moving one leg from side to side.	Three times for each leg with ten repetitions
	The participant is placed in a standing position. While contracting the transversus abdominis muscle (hollowing in), we bend the trunk from the waist forward.	Three turns and each turn takes ten seconds
5th week	The participant is in a standing position. While contracting, the transversus abdominis muscle (hollowing in) slowly bends one leg from the knee at an angle of 90 degrees and places the toe of the other foot on the ground while the knee is bent.	Three turns and each turn takes ten seconds
	While the participant lies on one side, he gently puts his or her head and neck on his or her arm. The participant bends his or her knee at a 90-degree angle with the thigh and contracts the transversus abdominis muscle. The participant performs this action in the next step with straight and extended legs.	Three repetitions and seven seconds rest for each side of the body
	While the participant lies on one side, she gently puts her or his head and neck on her or his arm. While contracting the transverse abdominal muscle, the participant opens her or his knees and simultaneously lifts her or his leg from the ground.	Three repetitions and seven seconds rest for each side of the body
6th week	Participant sleeps with his or her knees bent and feet flat on the ground in an arched position. Then, without rotating the pelvis, he or she rotates the abdomen, lifts the pelvis off the floor and keeps the body in a straight position.	Three turns and each turn takes ten seconds
	The participant squats, raises the opposite arm and leg, and keeps it straight.	Three turns and ten repetitions for each opposite arm and leg
	The participant first sleeps on his or her back. Then, leaning on the elbows and forearms, he or she lifts his trunk from the waist and performs the contraction of the transverse abdominal muscle (hollowing in). In the next step, he or she slowly lifts the trunk and pelvis from the ground while squeezing the stomach.	Three turns and each turn takes ten seconds
7th week	The participant repeats the contractions of the transversus abdominis muscle (in an arch, palmar, and lateral position) that she or he has done in these few weeks, with or without the help of the Swiss ball.	-
8th week	Similar to week seven	-

*It should be noted that the rest time between turns is 1 minute, and between movements is 5 minutes.

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their fourth decade of life (Table 2). The results of Table 2 show that the two studied groups are similar in terms of gender and age group, and no significant difference was observed in terms of gender (P=0.157) and age group (P=0.796).

To investigate the effect of core stability exercises on hope and its subscales in the two studied groups, by considering the pre-test scores as covariate variables, ANCOVA analysis was used after checking its assumptions. The normality of the total hope score was checked and confirmed using the Shapiro-Wilk test (P=0.201). The assumption of homogeneity of variance was established according to Levene's test (P>0.05), and a relationship between the pre-test and post-test scores for each of the hope indices was evaluated (Table 3).

It was found that both groups had better performance reports based on their post-test scores regarding hope and its subscales than pre-test scores, indicating a significant correlation between doing exercises and improving hope (Figure 1).

Next, we examined the effect of core stability exercises on hope and its subscales. Core stability exercises have been significantly practical on hope and its subscale in the studied groups (P<0.05 in all cases) (Table 4).

Table 2. Demographic characteristics of the participants at the beginning of the study (n=18)

Variables		No. (%)			P
		Total	Experimental Group	Control Group	
gender	Male	12(33.3)	4(22.2)	8(44.4)	0.157
	Female	24(66.7)	14(77.8)	10(55.6)	
Age (y)	<20	3(8.3)	1(5.6)	2(11.1)	0.796
	20-30	10(27.8)	4(22.2)	6(33.3)	
	31-40	16(44.4)	9(50.0)	7(38.9)	
	>40	7(19.4)	4(22.2)	3(16.7)	

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Table 3. Descriptive indicators of hope and its dimensions in the experimental and control groups (n=36)

Variables		Mean±SD		P
		Pre-test	Post-test	
Hope	Experimental group	2.72±0.294	3.24±0.292	<0.001
	Control group	2.85±0.241	3.38±0.269	<0.001
Agency	Experimental group	2.79±0.613	3.08±0.542	0.016
	Control group	3.30±0.416	3.55±0.265	0.040
Pathways	Experimental group	3.11±0.311	3.38±0.287	0.001
	Control group	3.26±0.358	3.43±0.351	0.002

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Table 4. The results of analysis of covariance to investigate the effectiveness of core stability exercises on patients' resilience

Variables		Mean Square	F	P*	Effect Size**	Observed Power
Hope	Pre-test	0.622	10.540	0.003	0.648	0.999
	Post-test	0.391	8.528	0.003	0.516	0.999
Agency	Pre-test	2.088	17.478	<0.001	0.646	0.999
	Post-test	0.146	1.218	0.008	0.636	0.998
Pathways	Pre-test	1.783	34.149	<0.001	0.509	1.000
	Post-test	0.033	0.638	<0.001	0.619	0.999

*P<0.05 is significant, degree of freedom=1 in all cases.

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**Partial Eta squared.

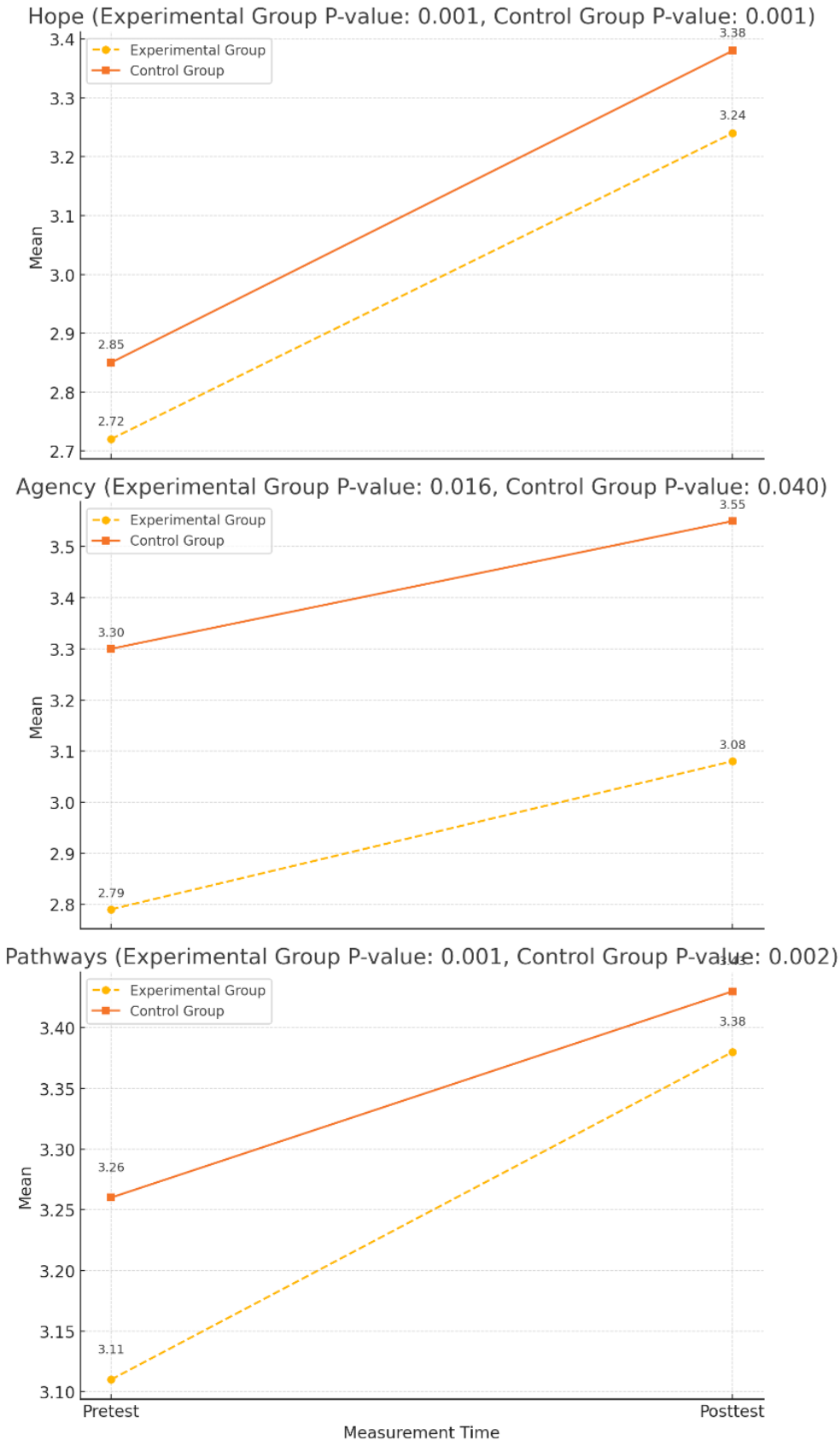

Figure 1. Comparing the average scores of hope and its indicators in the pre-test and post-test

Discussion

Based on the pre-test and post-test results, it was found that the training program significantly increased the hope of MS patients (P<0.05). These results agree with Anderson and Feldman's research [29], which investigated the relationship between hope and exercise. The results indicate that hope is related to the program's objectives and the amount of exercise and activity. It is also consistent with the findings of Ghafari et al. [30], which examined the effects of high and moderate aerobic exercise on quality of life, life expectancy, and anthropometric index in diabetic neuropathy patients.

Based on the results obtained from the pre-test and post-test, it was found that the selected exercise program had a significant effect on increasing agency thinking (motivation) in patients with MS (P<0.05). The results show that since hope is an important coping mechanism in chronic diseases, including MS, it is a multidimensional factor in a person's recovery and adaptation to his or her disease [31]. A patient's problem is divided into two parts. One aspect of MS is its irreversibility. Therefore, patients need to accept that it cannot be cured. In addition, if these patients exercise, eat right and keep an optimistic attitude, they can live healthier and longer.

Furthermore, they can continue medications under physician supervision. Goals are Snyder's primary motivation. Positive emotions are fueled by achieving goals or imagining approaching them; this fuels hope. Goals must increase motivation and be sustainable to be effective. Goals should be clearly defined, moderately difficult, and will be reached within the next few months [32]. According to Anderson et al. the level of hope changes with the individual's sports goals, type of sport, activity level, and fitness level [29]. Sports exercises increase hope. Shahrjardi et al.'s research has shown that core stability exercises (the ability to maintain body balance while moving the limbs) stabilize the body and maintain body balance [33]. Core stability exercises seem to have a specific goal, and creating excitement and positive motivation is one of the pillars of hope. Essentially, motivation drives them in the right direction. Snyder defines agency thinking as mental energy focused on the goal and determination to achieve it. The theory of hope in psychology states that agency thinking (motivation) increases in two ways: It is directly targeted or indirectly reinforced by increasing agency thinking [32]. Alternatively, psychologists believe that people engage in behaviors because they expect them to lead to a desirable outcome (positive motivation) or to prevent an undesirable outcome (negative motivation) [34]. In this research, core stability exercises increased positive motivation.

According to the pre-test and post-test, the exercise program significantly improved strategic thinking in patients with MS. Hope, contrary to Snyder's theory, strengthens physiological and psychological performance, preventing premature impairment. Snyder says cognitions based on hope are crucial. Strategic thinking (perceived capability to accomplish desired goals) and agency thinking (necessary motivation to accomplish them) are both necessary to achieve desired goals [32]. As a result, strategic thinking is another essential component and concept. This type of thinking describes individuals' ability to identify and create paths to reach their goals. An approach goal should be set to achieve favorable judgments and demonstrate competence. In addition, they want to apply their talents and skills to work, pursue optimal challenges, and master them [35]. Different levels of ability can perform Jeffrey's core stability exercises. Exercises ranging from level one to three were used to meet MS patients' limitations [13]. As a result of core stability exercises improving balance and endurance, as well as designing exercises to create a positive perception of ability in the individual, it appears that the results obtained also fulfill the strategic thinking component, which involves feeling better when exercising. To gain new experiences, individuals need to stimulate their activity. In times of hardship, adversity, and critical circumstances, individuals benefit from creating acclaimed forces, which act as powerful and multidimensional adaptation factors.

Conclusion

MS patients experienced a significant increase in hope and its components due to a period of core stability sports training activity. Sport is all about hope. There are two reasons for this: dimension factors (orientation toward predetermined goals and the ability to use experience to smooth the path of the past) and strategic factors (solving problems and using different solutions for different problems). This study indicates that officials involved in patient care and issues relating to their psychosocial health can be recommended to perform sports activities, especially core stability exercises that require tools, in medical centers and medical services. Also, they can spread the word that there are no special facilities for patients to do so and to support it to improve their health.

Study limitations

In this research, only relapsing and recovering MS patients were considered, so the results cannot be generalized to other types of MS patients. Also, due to the spread of COVID-19, there was no in-person follow-up

to perform the exercises, and there was only the possibility of online accompaniment, which had other limitations. Our other limitations include the lack of long-term follow-up of the subjects, the limited number of similar research, and, as a result, not being able to compare the research results with similar studies. There is also the limitation of overlooking important essential variables such as mental status, medical records, etc. which may confound our results.

Ethical Considerations

Compliance with ethical guidelines

The study was approved by the Ethics Committee of Babol University of Medical Sciences, Babol, Iran (Code: IR.MUBABOL.HRI.REC.1399.108). Patients participated in the study with informed consent, and the patients' information remained confidential.

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Authors contributions

Conceptualization: Seyedeh Fatemeh Shafaei, Ensiyeh Babaie, Payam Saadat and Pouyan Ebrahimi; Methodology: Alireza Shahsavar, Ensiyeh Babaie and Sepanta Saadat; Software: Ensiyeh Babaie and Sepanta Saadat; Validation: Seyedeh Fatemeh Shafaei; Formal analysis: Alireza Shahsavar; Investigation: Seyedeh Fatemeh Shafaei and Pouyan Ebrahimi; Data collection: Alireza Shahsavar and Seyedeh Fatemeh Shafaei; Writing the original draft: Pouyan Ebrahimi and Sepanta Saadat; Review, editing: Seyedeh Fatemeh Shafaei and Pouyan Ebrahimi; Visualization and resources: Alireza Shahsavar and Ensiyeh Babaie; Funding acquisition, supervision and project administration: Payam Saadat.

Conflict of interest

The authors declared no conflict of interest.

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