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Original Article

The effect of a mobile-based self-care program on tremor of people with multiple sclerosis

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Abstract

Background and aims: Multiple sclerosis (MS) is one of the most common progressive neurological diseases in young people. Tremor is a common and debilitating symptom in people with MS, significantly affecting their quality of life. This study aimed to evaluate the effect of a self-care program based on a mobile application on tremors in people with MS.

Methods: This semi-experimental study was conducted on 72 patients with MS in Chaharmahal and Bakhtiari province in 2019. Samples were selected by convenience sampling and randomly assigned to intervention and control groups (36 people in each group). For the intervention group, a self-care program in the form of a mobile application was installed on their mobile phones and, for two months, used by patients. The use of the program was measured using self-report checklists and telephone tracking. The control group receives routine intervention only. Data were collected before and two months after the intervention using the Fahn-Tolosa-Marin Tremor Rating Scale and analyzed using SPSS software version 21 and descriptive and inferential statistics (chi-square, independent *t* test, and paired *t* test).

Results: There was no statistically significant difference between the two groups in the mean tremor score before the intervention ($P=0.768$). However, after the intervention, this difference was significant ($P=0.022$).

Conclusion: According to the findings, teaching a self-care program through a mobile application effectively improves the tremor of patients with MS and can be considered an effective intervention method.

Keywords: Self-care, Mobile application, Tremor, Multiple sclerosis

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Introduction

Multiple sclerosis (MS) is a chronic and incurable inflammatory disease of the central nervous system that affects more than 2 million people worldwide (1). According to the statistics of the Iranian MS Association, 70 000 people in Iran suffer from MS (2), which Iran ranks first among patients in the Middle East (3). Isfahan province, with 93.06 per 100 000 people, and Chaharmahal and Bakhtiari province, 92.7 people per 100 000, have the highest number of patients with MS in Iran (4). The most important symptoms of this disease include fatigue, sensory problems, pain, vision problems, movement and balance problems, dysfunction of the intestines and urinary tract, and tremors (5).

Tremor is also a common and debilitating symptom seen in 26%-58% of people with MS and significantly affects their quality of life (6). Tremors in these patients are associated with increased dependence on mobility aids such as wheelchairs (7). Tremor also causes severe disability, disruption of most daily activities, and embarrassment to patients, and is challenging to manage (8). Due to tremors, these patients have difficulty performing activities such as eating, writing, dressing, and bathing (9).

Although MS does not have a definitive cure, proper education about the disease and its treatment and the things that the patient should follow can improve the patient's physical function, general health, emotional-psychological and social status and reduce the limitations of maps (10). In patients with MS, drug treatments are often unsuccessful, so tremor management is often complex and often fails (11). Surgical treatments also include thalamotomy and deep brain stimulation, which have their side effects (9). However, it can be said that the basis of tremor treatment in these patients is physiotherapy and occupational therapy (control of muscle contraction, torso stabilization, training of sensory skills, coordination of movements and ataxia prevention techniques, and the use of appropriate assistive devices) (12).

In recent years, non-pharmacological methods have attracted the attention of all patients, including patients with MS (13), among which we can mention self-care

activities. Self-care is one of the most critical aspects in treating MS (14), so if it is designed based on patients' problems and following their level of understanding, its implementation is entirely possible (15). Thus, self-care can be considered a potential approach to controlling the symptoms associated with MS. However, different methods and further research are needed to improve this intervention (16).

Today, the field of e-health is growing rapidly. It includes using communication tools and computers to monitor and maintain patients' health and provide better care by physicians (17). Nowadays, the use of mobile smartphones as part of remote health services has received more and more attention due to its advantages, such as availability, ease of use, proper distribution of resources, and reduction of costs (16).

According to most of the studies, self-care program for patients with MS has been presented in the form of lectures (18), face-to-face training (19), group discussions (20), and the use of booklets, CDs, pamphlets, and educational booklets (21), It has been done that in addition to the need for a lot of workforce, time and money are not easy methods for clients with MS who often have disabilities. Therefore, it is necessary to pay attention to cost-effective and accessible approaches, such as using mobile applications to provide self-care programs. On the other hand, in addition to the fact that so far, few studies have been conducted on the use of mobile applications in neurological disorders such as MS (22), the existing applications are not able to meet the needs and desires of patients with this disease (1). Therefore, this study was conducted to investigate the effect of a self-care program based on the mobile application on gait in people with MS.

Methods

Design

This semi-experimental descriptive study was conducted in 2019.

Participants and setting

The present study is a clinical trial study with an ethics code IR.SKUMS.REC.1397.290 from Shahrekord University of Medical Sciences and with clinical trial code IRCT20190318043087N1 (https://www.irct.ir/trial/38546), which was conducted in 2018-2019. Inclusion criteria include confirmation of the disease by a neurologist, age range between 20 to 50 years, no history of underlying conditions such as orthopedic and cardiovascular disorders according to the patient's medical record, no severe mental disorders such as major depression, having a smartphone and the ability to use it, the Expanded Disability Status Scale (between zero and 4) was the desire to participate in reading and the ability to read and write in Persian. Exclusion criteria also included reluctance to continue participating in the study, creating complications that prevent the patient from continuing to participate, and failure to complete the self-report checklist at least 80% of the study days. In this study, no exclusion criteria were met for any patients.

The sample size was determined according to the findings of similar studies by Masoudi et al. (18) and Kafame et al (10). Using the following formula and considering a 10% loss, 36 people in each group were determined.

$$n = \frac{\left(S_1^2 + S_2^2\right)\left(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta}\right)^2}{d^2}$$

Sampling was performed among patients with MS who are members of the MS Association of Shahrekord (20 patients), Borujen (16 patients), and Lordegan (36 patients) from Chaharmahal and Bakhtiari province by convenience sampling. After obtaining written consent, individuals were included in the study and randomly assigned to the experimental and control groups (36 people each) based on the variables of age groups, gender, and level of education using the blocking method.

Data collection

Data collection tools included the Demographic Information Questionnaire and the Fahn-Tolosa-Marin Tremor Rating Scale. The demographic information questionnaire included questions about age, gender, marital status, level of education, and occupation. Patients' tremors were measured before and two months after the intervention using the Fahn-Tolosa-Marin Tremor Rating Scale. This questionnaire was first published in 1988 and revised in 1993 (23) and consisted of three parts. In this study, a modified version of the questionnaire was used; the main difference between the initial version and the revised version included the evaluation of orthostatic vibration (vibration in the trunk and lower limbs when standing), And investigating of the effect of tremors in social activities and defining severe limb tremor is more than four centimeters instead of more than two centimeters (23).

In the modified version of this questionnaire, the scoring of the first part is such that the intensity of vibration in the face, tongue, voice, and trunk at rest and a standing position, head, and orthostatic (trunk/legs in an upright position) in a standing position and right hand, left hand, The right foot, and the left foot are evaluated in rest, posture and movement positions. The total score of this part is between zero and 88. In the second part, performance and particular tasks based on specific motor tasks (handwriting, drawing in three stages, and pouring water from one cup to another) are examined separately with the right hand and the left hand, and the total score of this part is between zero and 40. With the addition of the study of the effect of vibration in social activities to the third part, a total of eight daily activities are examined in this part, and the score of this part is between zero and 32. In total, the scores of this questionnaire are calculated by adding the assigned scores for each subset, which is the range of scores between zero and 160. Zero indicates the absence of vibration, and 160 indicates the highest

vibration intensity (24). This questionnaire has been translated and localized by Shoeibi and Olfati, and its validity and reliability have been confirmed (25). Also, in the present study, the scale's reliability using Cronbach's alpha coefficient was 0.79.

Before performing the interventions for both groups, tremor was first measured using the Fahn-Tolosa-Marin Tremor questionnaire by an evaluator who was blind to the type of intervention. Then, for the experimental group, a researcher made a self-care program, the content approved by three faculty members of Shahrekord School of Nursing and Midwifery, two neurologists, and one IT specialist, and installed it on their smartphones. Program highlights included familiarity with MS, symptom management, daily living with MS, nutrition, mobility aids, and exercise. Then, in a session with the experimental group, the benefits of using self-care programs and how to work with the application were taught, and patients' questions and ambiguities were answered. At the end of the session, to ensure the use of research samples from the software during the intervention, a self-report checklist was provided to patients, and they were asked to complete this checklist daily. During these two months, the relationship between the researcher and the participants continued, so the study follow-up was done by attending special days in the NGOs and following up by telephone. At the same time, the researcher gave his Phone number to the research participants to answer the questions. Only routine care was performed for the control group, and the researcher had no role in fulfilling this care. Finally, two months after the intervention, patients' tremors were measured again by another assessor, who was also blind to the type of intervention and independent of the first assessor simultaneously in both groups. And the mean tremor scores before and after the intervention were compared in both groups and between the two groups.

Data analysis

Data were analyzed using descriptive statistics (including frequency, percentage, mean and standard deviation) and analytical statistics (including Chi-square test, independent *t* test, and paired *t* test) with a significance level of less than 0.05 in software (IBM SPSS) version 21.

Results

A total of 72 patients with MS participated in this study. The mean age of subjects in the experimental and control groups was 36.27 ± 8.03 and 36.00 ± 7.89, respectively, but this difference was insignificant ($P < 0.05$). Also, the two groups participating in this study did not have a statistically significant difference in demographic variables of age groups, gender, educational status, marital status, and occupation. The participants' demographic information according to the chi-square test results is given in Tables 1 and 2.

According to the information in Table 3 and based on the independent *t* test, the difference between the mean tremor scores in the test and control groups in the pre-intervention stage was 0.52, which was not statistically significant ($P = 0.768$). While in the post-intervention stage, the difference between the two groups was 3.58, which is statistically significant ($P = 0.022$). Also, based on the paired t-test, the difference between the mean tremor score in the post-intervention stage and the control group's pre-intervention stage was not statistically significant ($P = 0.422$). In contrast, this difference was influential in the experimental group ($P < 0.001$).

Table 1. Age distribution of patients participating in the experimental and control groups

Variable	Group		*P* value
	Experimental Mean ± SD	Control Mean ± SD	
Age (y)	36.27 ± 8.3	36.00 ± 7.89	0.736

Discussion

This study aimed to evaluate the effect of a self-care program based on a mobile application on tremors in people with MS. According to the results of this study, the mean tremor score before the intervention in the two groups was not statistically significant, while this difference was significant after the intervention. Also, the mean tremor score in the experimental group before and after the intervention was statistically significant, while the control group was not significant. Therefore, all these findings can be attributed to the intervention factor.

Most patients with MS are tired of the long-term and sometimes ineffective treatment process and are looking for a new way to reduce their pain, and this is a real need for them. Because there is no definitive cure for the disease, patients should rely on treatments that only reduce the symptoms of the disease. In recent years, the recommendation to exercise due to its beneficial effects has been increasing among patients with MS (26).

In this regard, one of the main components of the present study was exercise. The results of this study were consistent with the study of Sequeira et al (27), Daneshmandi et al (28) and Keogh et al (29) and showed that the need for these programs is a common need that most studies have addressed. If exercise is designed according to the needs and abilities of patients, it will play an irreplaceable role in improving the motor function of patients with neurological disorders.

On the other hand, due to the progressive nature of MS and the side effects of medication, more than medication use and periodic follow-up alone is required. Instead, patients should become familiar with the non-pharmacological methods that help them (30), one of which is self-care. In this regard, Demaille-Wlodyka et al, in their study entitled self-care programs and MS, stated that since patients with MS need to adapt to each symptom, self-care programs are an integral part of disease management. They should be started early in the disease, although the number of studies performed in this

Table 2. Distribution of age groups, gender, educational status, marriage, and occupation in the experimental and control groups

Variable		Group				Total		df	χ^2	*P* value
		Experimental		Control						
		Number	Percent	Number	Percent	Number	Percent			
Age groups	20-29	10	27.8	9	25	19	26.4	2	0.093	0.995
	30-39	12	33.3	13	36.1	25	34.7			
	40-50	14	38.9	14	38.9	28	38.9			
Gender	Male	5	13.9	4	11.1	9	12.5	1	0.127	0.772
	Female	31	86.1	32	88.9	63	87.5			
Education status	Under diploma	16	44.4	15	41.7	31	43.1	2	0.257	0.880
	Diploma	14	38.9	16	44.4	30	41.7			
	University education	6	16.7	5	13.9	11	15.3			
Marital status	Single	8	22.2	5	13.9	13	18.1	1	0.845	0.358
	Married	28	77.8	31	86.1	59	81.9			
Job	Unemployed	23	63.9	30	83.3	53	73.6	2	0.525	0.172
	Freelancer	7	19.4	3	8.3	10	13.9			
	Employee	6	16.7	3	8.3	9	12.5			

Table 3. Intra-group and inter-group comparison of mean and tremor score changes before and after intervention in test and control groups

Variable	Stage	Groups		Differences between groups	*P* (differences between groups)
		Experimental Mean ± SD	Control Mean ± SD		
Tremor	Pre-test	15.47 ± 7.80	16.00 ± 7.27	0.52	0.768
	Post-test	15.88 ± 7.26	12.30 ± 5.53	3.58	0.022
	Intergroup *P*	0.422	0.000		

area is limited (31). If self-care programs are compatible with the symptoms of patients with MS and pay attention to all aspects of their care, they can improve these people's symptoms. On the other hand, more studies should be done in this field.

Today, mobile phones are a new tool for providing healthcare services due to their large number of users, portability, and ability to process and run various applications. Mobile health can be a simple and inexpensive solution for managing chronic diseases and realizing a person-centered health system (32). In this regard, Abbasi et al, in their study, which was conducted to assess the readiness of patients with MS to use health technology via mobile phones, stated that more than 57% of patients needed more information about mobile health technology. More than 98% of patients said they would be interested in using the technology if it was free. And about 96% of patients agreed to use this technology to remember their medical instructions (33). It seems that the ease of access and proper design of applications, visual representations, and extraction of the content of self-care programs from reliable and trustworthy sources that experts approve in this field are essential factors for the acceptance of these programs by patients with dementia.

Due to the many benefits of mobile health technologies and, on the other hand, sufficient interest and readiness of patients with MS to use them, the implementation of self-care programs in this format is recommended.

Conclusion

The findings of this study showed that the implementation of self-care programs based on the mobile application could be used as a non-invasive, safe, and accessible method to improve the tremor of people with MS. On the other hand, there have been few studies on using mobile applications in neurological disorders such as MS. Therefore, it is suggested that managers and planners in the health field, with proper planning and allocation of sufficient budget, pay special attention to this area. Interested researchers are also advised to study the effect of mobile applications on other neurological disorders and chronic diseases to sensitize and encourage people with the disease and motivate them to use them more. One of the limitations of this study is the possibility of using other self-care programs by the participants during the study period, which the research team needed help to control. Also, tremors in people with MS may be intermittent and change over time, so more is required to observe and evaluate the occurrence of earthquakes once. Therefore, assessing the norm with more samples and several times in future studies is recommended.

Applying the findings in clinical practice

The results of the present study can help nurses and healthcare personnel to provide better and more specialized services to patients and provide an opportunity to encourage different groups in the community to use mobile health software to control and improve their

health status.

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Competing Interests

None.

Ethical Approval

Ethical considerations in this study included obtaining permission from the Ethics Committee of Shahrekord University Of medical sciences (Ethical IR.SKUMS.Rec.290) and obtaining written consent to participate in the study from the participants.

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