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Review Article

Telerehabilitation in People with Multiple Sclerosis: A Scoping Review

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ABSTRACT

Introduction: A new coronavirus, called COVID-19, was discovered in Hubei, China in December 2019. In just one year, COVID-19 has infected more than 81 million people (as of December 29, 2020) worldwide. People with multiple sclerosis (MS) are a particularly vulnerable group during the disease. In such a situation, telerehabilitation approaches provide the main solutions to improve the disorders caused by inactivity in people with MS. This study was conducted to review the studies performed in the field of telerehabilitation in people with MS and to evaluate the effectiveness and feasibility of using this method in the face of the prevalence of COVID-19 for people with MS.

Materials and Methods: Research studies were searched and reviewed in 4 databases, including PubMed, Science-direct, Scopus, and Web of Science in the period 1995-2020. The inclusion criteria included articles using telerehabilitation interventions in people with MS and telehealth interventions in people with MS published between 1995 and 2020. These articles have been published in peer-reviewed journals. Group or single-case intervention research has been used.

Results: A total of 261 articles were found in the initial search based on keywords. In these articles, descriptions of telerehabilitation and telehealth were presented. Initially, after reviewing the searched articles, 223 articles were removed from the study process due to a lack of inclusion criteria. After that, the full texts of the remaining 38 articles were selected, at the end, 16 articles had the inclusion criteria and were included in the study.

Conclusion: Based on our findings on the benefits of using telerehabilitation to improve the cognitive, physical, and quality of life of people with MS, as well as its cost-effectiveness, it is recommended that people with MS under the conditions of the COVID-19 pandemic stay in quarantine. It is a good way to rehabilitate these people to prevent the further progression of the disease and maintain their quality of life. Of course, this approach is growing and due to the low quality of current studies, more research is needed.

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1. Introduction

According to the World Health Organization (WHO), viral diseases are still emerging and are a serious public health issue [1]. COVID-19 is an acute disease that has spread worldwide over the past year and can be fatal at a mortality rate of 2% [2]. Since the COVID-19 virus has become a pandemic, governments around the world are trying to minimize the devastating effects of the virus via reciprocal measures, such as travel restrictions, quarantine, and social distancing [1, 3]. This is done to monitor their symptoms and ensure early diagnosis, and people are asked to stay away from people with flu-like symptoms, such as fever, cough, runny nose, sore throat, and difficulty breathing [4-6].

Multiple sclerosis (MS) is an autoimmune disease that causes cognitive and physical problems for a person [7]. Although for neurological patients, the initial evidence suggests that this group is prone to negative outcomes; people with MS are a particularly vulnerable group during the disease. The combination of an autoimmune neurological disorder, as well as the use of immunosuppressive drugs, increases the risk of this group of people being exposed to the COVID-19 pandemic. Therefore, as a health precaution, international organizations recommend that people with MS follow social distancing as much as possible, as well as quarantine measures to reduce the risk of contracting the virus in this group of people [8, 9].

Major symptoms of MS include fatigue, spasticity, ataxia/tremor, intestinal and bladder dysfunction, pain, motility/balance, and psychosocial activity and dysfunction. The activity limitation of a person with MS can result from a combination of motor dysfunction (muscle weakness and spasm), sensory problems (loss of profound sense, ataxia), fatigue, psychological problems, and vision problems [10-14]. Although protective actions are necessary to prevent infection with the virus, these actions may reduce the quality of life and physical and mental activity of people with MS [9-12, 15]. Activity restriction is associated with increased fatigue, atrophy and muscle weakness, mood instability, and decreased cognitive function, resulting in functional limitations. Inactivity is also associated with an increased risk of diseases, such as hypertension, obesity, type 2 diabetes, cancer, arthritis, and osteoporosis [16, 17].

In such situations, telerehabilitation approaches can be the main strategies to improve immobility problems in people with MS that can be used as an alternative to face-to-face rehabilitation interventions. Therefore, according to the outbreak of the COVID-19 virus and WHO recommendations on social distancing and social constraints, telerehabilitation is one of the methods by which the rehabilitation team can provide services to people with MS [18-20] to provide services more easily during the outbreak of COVID-19.

Although a systematic review study conducted by Fraykhan (2015) on the efficacy and safety of telerehabilitation interventions in people with MS showed improvement in functional activity, fatigue, and quality of life in people with MS, this study cannot provide a clear picture of the current situation and cannot provide strategic suggestions, therefore it is necessary to review the scope; additionally, the purpose of the scoping review is to define and summarize key methodological indicators in the research field, to classify and organize (charting) the information available in that field, in addition, to systematically draw the path of studies in the intended concept to achieve the vital achievement of research gaps in the field [21].

This study aimed to review the studies conducted in the field of telerehabilitation in people with MS and provide a clear and comprehensive picture of the methodological indicators of studies conducted in this field and finally the feasibility of using the telerehabilitation method during the outbreak of the COVID-19 pandemic in people with MS.

2. Materials and Methods

The purpose of scoping review study used in this study is to identify and summarize key concepts in a specific research field. Unlike a systematic review, in this type of review, the quality of resources is not evaluated. Instead, broader research topics and questions are provided to identify research gaps and provide recommendations for future research.

In the present study, 5 steps proposed by Arksey et al. [22] were used for scoping review, including, identifying the research question, identifying relevant studies, selecting studies, charting the data, and collating, summarizing, and reporting the results.

Identifying the research question

The questions that we answer in this study include the following:

1) What were the characteristics of the participants who participated in the studies?

2) What research design did the researchers use?

3) What are the types of interventions used during telerehabilitation?

And 4) What was the protocol of telerehabilitation interventions in the studied studies?

Identifying relevant studies

Research studies were reviewed in four databases from 1995-2020: PubMed, ScienceDirect, Scopus, and Web of Science (WoS). Finally, the Google Scholar search engine was used to ensure that all articles were reviewed.

The following terms were also used as a search string, Multiple Sclerosis, telehealth, and telerehabilitation. Also, reference lists of relevant articles were reviewed to identify additional intervention studies.

Selecting studies

Based on the inclusion criteria, articles were selected that reported research using telerehabilitation interventions in MS patients, published between 1995 and 2020), published articles in peer-reviewed journals, published arbitration, and published in Persian or English languages.

The exclusion criteria also include interventions presented in different groups of patients other than MS, studies that provided inadequate descriptions of the intervention (e.g., interventions that stated telerehabilitation improves people's cognitive status but did not explain how and with what strategies this happens), studies that merely developed specific tools for performing telerehabilitation interventions, and studies that did not provide interventions.

Study selection steps

After a preliminary search, we first removed duplicate articles and then studies whose titles did not meet our inclusion criteria. In the remaining studies, we reviewed abstracts of articles, and several studies were omitted due to non-compliance with our inclusion criteria. After that, we reviewed the remaining articles in full text in detail, and at the end of the study, we excluded those who did not provide intervention or did not provide a proper description of the implementation of the interventions.

Charting the data

Data extracted from the studies were identified based on the following indicators, including the type of study, sample size, participants, characteristics of study participants (eg age, gender, type of disability, and level of disability), the content of the intervention, measures taken and strategies used and outcomes that examined in studies. Table 1 presents these indicators. Data charting was performed by two researchers and after extracting the data, the authors compared the results, and the disagreement about the extracted data was resolved through dialogue.

Collating, summarizing, and reporting the results

First, we reviewed the titles and abstracts of the articles to determine whether this study evaluated telerehabilitation or telehealth interventions in different patients, especially MS. Therefore, in the introductory search, any articles that evaluated the telerehabilitation or telehealth process were included in the study. Tables 2 and 3 present a summary of the purpose, participants, results, protocol, and type of research evidence in the 16 studies. The initial collection of articles covered a wide range of topics.

3. Results

As shown in Figure 1, in the initial search, 261 articles were found, which included articles on telerehabilitation and telehealth. Duplicate articles were initially removed (n=32). After that, the titles of the articles were reviewed, among which 120 articles were excluded from the study process due to non-compliance with the inclusion criteria (in these studies, the interventions presented in people with MS were examined). After that, the abstracts of 112 articles were studied, of which 74 articles were excluded from the study process due to a lack of inclusion criteria. After that, the full texts of the remaining 38 articles were studied, and at the end of the process, 16 studies were included that met the inclusion criteria.

Participants

Of the participants in the 16 studies, 430 participants had MS.

The number of participants was 5 people more than 20 articles of the reviewed articles and 4 of the reviewed articles were less than 20. Among the articles, the highest number of participants 70 eligible people for the study, and the lowest number of participants was 4.

Participants in these studies were in the age range of 23 to 74 years, and four studies were in the age range of 40 to 60 years. Seven of the 16 reviewed articles were only for people with MS, and the rest were for people with other diagnoses, such as Cerebral palsy (CP), spinal cord injury (SCI), and Alzheimer's disease (AD).

Table 1. Indicators extracted from studies

Indicators	Variables
Participant	Sample size
	Condition
	Age range
	Gender
Intervention characteristic	Length of intervention
	Number of interventions (in a week)
	Protocol
Study design	RCT
	NonRCT
	Case-report
Outcome (Based on ICF Level)	Body function and body structure
	Activity
	Participation

ICF: International classification of functioning; RCT: Randomized control trials.

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Level of evidence

In terms of the level of evidence, a randomized controlled clinical trial was used in 6 studies, while a randomized controlled clinical trial was used in 8 studies; also, one study was a case report and one was a systematic review.

Objectives

Objectives in the studied studies included the effectiveness and safety of telerehabilitation intervention and determining the effectiveness of implementing telerehabilitation programs in combination with cognitive interventions in people with MS. Therefore, the crucial goal of the study was to determine the effectiveness of telerehabilitation services in people with MS.

Table 2. Overall characteristics of the 16 research sample and research design

Variable	Description	
Sample size	n≥20	9 study
	n<20	4 study
	Highest sample size	70
	Lowest sample size	4
Age	Age range	23-74 y
	Age range of 4 studies	40-60 y
Gender	Female	70
	Male	30
Condition	MS	7 study
	MS+other conditions	9 study
Research design	RCT	6 study
	Non-RCT	8 study
	Case-report	1 study
	Systematic review	1 study

MS: Multiple sclerosis; RCT: Randomized control trials.

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Table 3. A Summary of the research findings of the 16 samples examined

Authors	Design	Intervention	Participants	Conclusion
Thirumalai et al. (2018) [23]	Non-RCT, the double iterative design	Sports programs and content	n=21, 10 participants with MS	The advancement of exercise through self-regulated telerehabilitation requires a stakeholder-driven approach to app development.
Mercier et al. (2015) [24]	Non-RCT, secondary analysis from a pilot controlled clinical trial	An interactive telephone intervention	n=142, 106 participants with SCI and 36 participants with MS	The intervention was effective in decreasing depression in wheelchair users with either MS or SCI and in enhancing accessibility to the health care system and physical independence for those with a diagnosis of MS.
Turner et al. (2013) [25]	Non-RCT, the single group repeated measurement design	Home telehealth monitoring	n=41, MS	Home telehealth monitoring is a hopeful approach to managing chronic disorder.
Wood & Finkelstein (2017) [26]	Non-RCT, pretest-posttest study	Telerehabilitation support of individualized multipronged exercise programs	n=10, 55 ± 10 yaer old, MS	The resulting system needs a definitive systematic assessment in RCT to demonstrate its clinical impact.
Khan et al. (2015) [27]	Systematic review	Telerehabilitation	Nine relevant RCTs covering 531 participants, MS	The methodological quality of the included investigations is low and varied among the studies.
Malik et al. (2020) [28]	Non-RCT, pretest-posttest study	A program of daily manual dexterity training delivered at home via telerehabilitation	n=70, MS	An intervention is feasible for individuals with progressive MS despite advanced disability, cognitive impairment, and older age.
Gutierrez et al. (2013) [29]	RCT	A telerehabilitation program by virtual reality-video games	n=50, MS	Telerehabilitation might serve as an optimal therapeutic choice in situations in which conventional therapy is not available.
Best et al. (2019) [30]	Survey study	Telerehabilitation	n=52, MS	Findings strongly support the use of telerehabilitation for clinical and research visits.
Burns et al. (1998) [31]	Case-report	Telerehabilitation using telecommunications technology	n=4, 1 case with MS	Telerehabilitation can be examined in more detail.
Burton et al. (2018) [32]	Single-subject	Telehealth videoconferencing cognitive rehabilitation	n=6, 4 cases with SCI, 1 MS, 1 dementia	This study support developing goal-oriented cognitive rehabilitation delivered both in-person and by expanding the accessibility of this intervention by adapting it to videoconferencing.
Charvet et al. (2018) [33]	RCT	Telerehabilitation using Adaptive Cognitive Remediation (ACR) program	n=135, MS	Adaptive, computer-based cognitive remediation accessed from home can improve cognitive functioning in MS.
Egner et al. (2003) [34]	RCT	Telerehabilitation with structured in-home education and counseling sessions Rehabilitation	n= 27, MS	Such interventions may be beneficial, although the results need affirmation through larger samples.

Authors	Design	Intervention	Participants	Conclusion
Plaw et al. (2012) [35]	RCT, a randomly-allocated, three-parallel group, time-series design	Teleconference fatigue management plus physical activity intervention	n=189, MS	The teleconference intervention is shown to be effective.
Finkelstein et al. (2008) [36]	Non-RCT, single group pretest-post test pilot study	Home-based physical telerehabilitation	n=12, MS	Patients were highly satisfied with the service. Home-based physical telerehabilitation can improve functional outcomes significantly.
Finkelstein& Liu (2018) [37]	Non-RCT, single group pretest-posttest study	Telerehabilitation system supporting multipronged exercise	n=10, MS	The approach used in people with MS was effective.
Fjeldstad-Pardo et al. (2016) [38]	Non-RCT, tree groups non randomized control clinical trial	Telerehabilitation program	n=30, MS	No significant differences were observed between the TR and the conventional PT groups for a variety of outcome measures.

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RCT: Randomized controlled clinical trial; MS: Multiple sclerosis; SCI: Spinal cord injury; TR: Trunk restraint; PT: Peak torque.

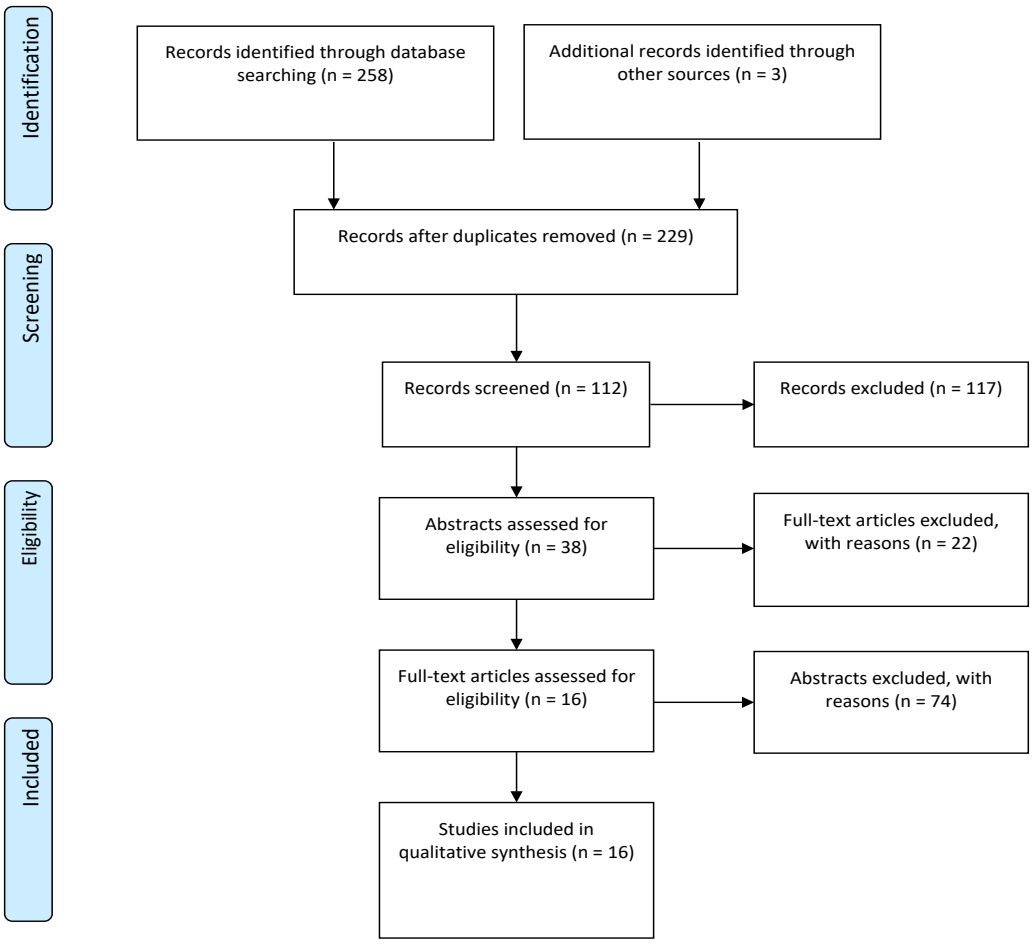

Figure 1. Distribution of studies based on the level of evidence

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Interventions

Interventions delivered to clients in the form of training programs included aerobic and exercise training, cognitive rehabilitation, and cognitive-behavioral therapy (CBT) based on video conferencing sessions, virtual reality, or telephone calls. In terms of intervention schedule, these interventions are carried out in 3 sessions per week (30 to 40 minutes per session) for 8 to 12 weeks.

Outcomes (dependent variables)

After reviewing all studies, we found that outcomes, such as physical independence, fatigue, depression, pain, muscle strength, endurance, spasticity, functional activities, quality of life, balance and postural control, stress, and cognitive function were used as dependent variables in the studies.

4. Discussion

In various studies, evidence indicates significant barriers to rehabilitation treatment and home care services among people with MS during the COVID-19 pandemic [39, 40]. These findings are also consistent with reports of healthcare disruptions for other non-communicable diseases. Discontinuation of these services can affect the symptoms of MS and the quality of life of a person with MS [40].

Telerehabilitation is a low-cost and cost-effective way to provide in-home rehabilitation services for patients and counseling services for their caregivers. Telerehabilitation gives health professionals, and especially the rehabilitation team, the opportunity to provide interventions tailored to the individual's needs and interactions tailored to their contextual environment. This has been shown not only to improve quality of life but also to reduce the time required for therapy to achieve predetermined goals [41]. In addition, telerehabilitation allows for continuous monitoring of client development. For people with MS, telerehabilitation is a practical, convenient, and effective tool to improve or maintain performance [18, 42].

Although it is essential to protect people with MS from the threat of the virus, it can damage their physical and mental health, including reduced physical activity, due to their advanced disease process [43]. Another challenge of implementing quarantine in this population can be the unintended deprivation of rehabilitation services, which paves the way for the loss of capabilities. In such a situation, telerehabilitation approaches provide the main solutions to improve the disorders caused by inactivity in people with MS. The purpose of this study was to review the studies performed in the field of telerehabilitation in MS patients and to evaluate the feasibility of using this method in the prevalence of COVID-19 in people with MS.

According to the findings of this study, most studies conducted in the field of telerehabilitation in people with MS are between the ages of 40-60 years, which is probably due to the frequency and accessibility of people with MS at these ages [44]. At younger ages, in the age range of 20 to 40 years, the number of studies was very small. Also, in older ages (60-80), no study was found that suggests more studies in the age range of 20-40 and 60-80 years.

The participants studied in most research had relapsing-remitting MS, and a small number of the participants had progressive MS type. It could be due to the higher incidence of people with relapsing-remitting MS (most people with MS [about 80 %] are initially diagnosed with the relapsing-remitting type of the disease) [7]. In this regard, it is suggested to conduct more studies on people diagnosed with progressive MS.

The participants studied in different research were mostly women (more than 70%). Research has consistently shown that the prevalence of MS is two to three times higher in women than in men [45]; thus, this result suggests that more studies should be done on men with MS. In addition, the sample sizes of most studies were small (less than 20). Therefore, it is suggested that future studies be conducted with a larger sample size to achieve better validity.

The numbers of RCT studies were lower than non-randomized control trials (RCT) studies, which indicate a need for stronger evidence on the impact of telerehabilitation on people with MS. Level 3 studies, which include descriptive and single-subject design studies, were also very rare. In general, the number of level 1 studies is less than level 2, hence it is suggested to conduct more RCT studies.

Most studies were conducted to investigate the effect of telerehabilitation on people with MS, and in most research, general objectives were considered, and in any study, the effect of telerehabilitation on specific areas, such as memory and executive functions were examined. According to the findings, it is suggested that in future studies, the impact of telerehabilitation to be compared with other forms of services, such as clinic-based or home-based rehabilitation. In addition, more specialized and accurate outcomes in studies should be selected as dependent variables.

One of the limitations of the studies was the short-term follow-up time or lack of follow-up of findings. In most studies after the intervention, the outcomes were evaluated and reported, and the persistence of the outcomes was not examined. Due to the chronic, progressive and degenerative nature of MS disorder, a follow-up study can be useful to evaluate the persistence of the results of the interventions.

In most studies conducted in the field of telerehabilitation, MS exercise programs are used as an intervention, which is probably due to more attention to physical issues in MS [46] and a small number of interventions focused on educational programs and cognitive interventions, and none of them studied behavioral counseling and rehabilitation counseling for caregivers. Also, effective interventions for the rehabilitation of people with MS, such as aerobics [47], virtual reality [48], and energy conservation [49] have not been used in telerehabilitation programs in any of the studies. It is suggested that further studies be conducted in the field of telerehabilitation on cognitive rehabilitation and tele-counseling to caregivers of people with MS. Also, effective approaches, such as aerobics, virtual reality, and energy conservation should be used as telerehabilitation programs in future studies.

In terms of levels of function based on ICF, in most studies, functions related to the level of body functions and structures have been used as dependent variables (outcomes), and in a few studies, functions related to levels of activities and participation have been used as outcomes. However, the levels of the activity and participation are critical for the quality of life, and due to their nature, may be better targeted for telerehabilitation intervention. Therefore, it is suggested that in future studies, functions related to activities and participation levels should be considered as dependent variables of research.

In most studies, no unique treatment plan existed tailored to each individual. However, in most research, a comprehensive and the same program are implemented for a group of participants through telerehabilitation. In fact, according to this, specific conditions, treatment goals, priorities, and treatment exercises of a person were not considered. It is recommended to conduct studies considering the therapeutic goals and therapeutic exercises specific to each participant.

Finally, it is worth noting that the evidence for telerehabilitation is still preliminary, and more studies are needed focusing on the validity, reliability, effectiveness, and efficiency of this method. In this regard, two systematic review studies have been conducted, both of which emphasized this issue [18, 27]. However, this is a growing approach and more research is needed due to the low quality of current studies and the lack of evidence on the effectiveness of various remote rehabilitation methods.

Considering the importance of staying at home during the COVID-19 pandemic, it is essential to use telerehabilitation strategies. In addition, applying telerehabilitation approaches to daily life activities can improve the quality of life, which needs more research. Addressing the above issues may lead to a wider application of telerehabilitation. In fact, due to the limited benefits of pharmacological methods in improving the performance of people with MS [50, 51], telerehabilitation can be an effective method, especially in the context of the COVID-19 pandemic [18, 27].

5. Conclusion

Based on the findings of this study, in the telerehabilitation studies of people with MS, the number of RCT studies was not enough, all types of MS disorders were not considered, not all problems of people with MS were considered, some effective treatment approaches in MS were not examined based on telerehabilitation services, and the functions related to the activity and participation levels were not examined as a dependent variable except in limited cases. Therefore, it is suggested that in future studies, the mentioned cases should be considered for maximum use of telerehabilitation in people with MS, especially in the conditions of the COVID-19 pandemic.

Ethical Considerations

Compliance with ethical guidelines

There were no ethical considerations to be considered in this research.

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Authors' contributions

All authors equally contributed to preparing this article.

Conflict of interest

The authors declared no conflicts of interest.

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