Xi'an ShiyouDaxueXuebao (ZiranKexue Ban)/
Journal of Xi'an Shiyou University, Natural Sciences Edition
ISSN:1673-064X
E-Publication:Online Open Access
Vol: 66 Issue 01 | 2023
DOI 10.17605/OSF.IO/73692

EFFECT OF PROGRESSIVE MUSCLE RELAXATION TECHNIQUE ON PAIN AND FATIGUE IN PATIENTS WITH MULTIPLE SCLEROSIS

AHMED MOHAMED ABOZEID
Assistant lecturer at Medical Surgical Nursing, Faculty of Nursing, Ain Shams University, Egypt. Corresponding author Email: ahmed.abozeid@nursing.asu.edu.eg

OLA ABD ELATY AHMED
Professor of Medical Surgical Nursing, Faculty of Nursing, Ain Shams University, Egypt.

JACKLEEN FAHEEM GENDY
Assistant professor of Medical Surgical Nursing, Faculty of Nursing, Ain Shams University, Egypt.

ARZAK MOHAMED KHALIFA
Assistant professor of Medical Surgical Nursing, Faculty of Nursing, Ain Shams University, Egypt.

Abstract:

Introduction: Pain and fatigue are very common symptoms in patients diagnosed with multiple sclerosis (MS) and have the greatest effect on their activities of daily living. Aim: This study aimed to evaluate the effect of progressive muscle relaxation technique (PMRT) on pain and fatigue in patients with MS. Methods: A quasi-experimental research with a pre-test post-test design was conducted on 80 patients with MS in a selected hospital in Cairo, Egypt from September 2021 to June 2022. Data were collected using the Patient Characteristics Questionnaire, Pain Effects Scale (PES) and Modified Fatigue Impact Scale (MFIS). The obtained data were analyzed in SPSS using the Paired t-test and Pearson's correlation analysis. Results: There was a statistically significant reduction in PES and MFIS scores from pre- to post-intervention ($p < 0.001$), indicating a decrease in the effect of pain and fatigue on patients with MS after applying PMRT. Conclusions: These findings show that PMRT can be used as safe, convenient, inexpensive and effective method for decreasing pain and fatigue severity in patients with MS. PMRT is also recommended in the care and rehabilitation process of patients with MS.

Keywords: Progressive Muscle Relaxation Technique; Pain; Fatigue; Multiple Sclerosis.

INTRODUCTION

Multiple sclerosis (MS) is a common non-traumatic and disabling disease of the central nervous system marked by inflammatory lesions, demyelinating plaques and irreversible axonal injury. This disorder is a diverse, complex and immune- mediated disease influenced by both genetic and environmental aspects (Dobson & Giovannoni, 2019; Lamb, 2020). Around the world, there are 5 to 300 cases of MS for every 100,000 persons most of them are young adults at age 20 to 50 years. Females are twice as likely to have MS as males (McGinley et al., 2021).

Multiple sclerosis can present clinically in one of two ways: relapsing or progressive. A relapsing form of MS, which manifests as brief episodes of neurological impairment followed by partial, complete or no remission, is the most frequent type of MS at onset. Less than 10% of patients with MS experience progression from the time of diagnosis; this group is known as primary progressive MS (Hauser & Cree, 2020; Klineova & Lublin,

Xi'an ShiyouDaxueXuebao (ZiranKexue Ban)/
Journal of Xi'an Shiyou University, Natural Sciences Edition
ISSN:1673-064X
E-Publication:Online Open Access
Vol: 66 Issue 01 | 2023
DOI 10.17605/OSF.IO/73692

2018). Multiple sclerosis has a high prevalence of clinically significant symptoms, with estimated rates of 29–86% for pain (Aboud & Schuster, 2019) and 80% for fatigue (Capone et al., 2020). Patients' daily living activities are significantly impacted by these symptoms. Patients with MS report that pain affects their ability to sleep, work and enjoy leisure activities. Fatigue which many people describe as their most incapacitating symptom, relates to difficulties associated with physical or intellectual function and reduces social participation (Valentine et al., 2022). Remarkably, pain and fatigue often occur together, with combinations of these symptoms having effects for functioning and effective symptom management (Kratz et al., 2017).

Studies on pain and fatigue have gradually gained importance due to the high incidence of pain and fatigue in MS patients as well as the negative impact on general health and quality of life (Kesik et al., 2022). Progressive muscle relaxation technique (PMRT) is one of the complementary treatment methods developed in 1920s by Jacobson based on a classic muscle relaxation program. PMRT is a type of exercise that involves voluntary contraction and relaxation of the main muscle groups (Çetinkaya & Karabulut, 2022).

PMRT has recently become an essential part of chronic disease care because of its positive outcome such as reducing pain, fatigue, anxiety, muscle strain and contractions and improving sleep (Maloh et al., 2022). This technique is a non-invasive, simple-to-learn nursing intervention that can be used in a clinical setting. Among the benefits of this technique are cost savings, no need for specific facilities and ease of patient performance (Javdan et al., 2021). Previous research has demonstrated the positive effects of PMRT on pain and fatigue in patients with MS (Kesik et al., 2022; Maloh et al., 2022).

In self-management approach, patients need education and recommendations from health team to be able to deal with pain and fatigue in an appropriate manner. It is evident that nurses in this health team play an essential role in assisting patients deal with pain and fatigue (Dayapoğlu & Tan, 2012). There are numerous studies in literature that involve PMRT; however, the number of studies in which PMRT is performed for patients with MS is very limited in Egypt.

MATERIALS AND METHODS

Aim of the study

To evaluate the effect of PMRT on pain and fatigue in patients with MS

Research design

This study used a quasi‑experimental research with pre‑test post‑test design.

Setting

The study was performed between September 2021 to June 2022 in the Multiple Sclerosis Clinic of Ain Shams University Hospital in Cairo, Egypt. A purposive sample of 80 patients were selected based on inclusion criteria: diagnosed with MS; aged 18 ≤ 65 years old;

Xi'an ShiyouDaxueXuebao (ZiranKexue Ban)/
Journal of Xi'an Shiyou University, Natural Sciences Edition
ISSN:1673-064X
E-Publication:Online Open Access
Vol: 66 Issue 01 | 2023
DOI 10.17605/OSF.IO/73692

both genders; and able to communicate and comprehend instructions. Exclusion criteria included no participation in any other research involving the variables of the current study.

Sample

G*Power (version 3.1.9.4) was used to estimate the required sample size based on significance level of 0.05, effect size of 0.50 and a power of 95%. Accordingly, the calculated required minimum sample size for this study was 80.

Tools for data collection

Data collection was conducted through (1) Patient's characteristics questionnaire, (2) PES for measuring pain effects and (3) MFIS for evaluating fatigue.

1-Patient's characteristics questionnaire

The patient characteristics questionnaire developed by the researchers based on the literature review. It consisted of two parts; Part one was used to assess demographic data consisting of 6 questions on age, gender, education level, occupation, residence and monthly income. Part two was related to the condition of the disease and consisted of 3 questions on disease duration, type of clinical pattern of MS and history of relapses.

2-Pain Effects Scale

The 6‑items PES was used to assess the effects of pain on behaviour and mood during the past month (Fischer et al., 1999). The responses rate on a three‑point scale from never (1), sometimes (2) and always (3) with an overall score ranging from 6 to 18. Higher total scores indicated a greater impact of pain on a patient's mood and behaviour. The reliability of the PES was obtained using Cronbach's alpha coefficient (α =0.93) and the correlation of its items is from 0.58 to 0.83.

3-Modified Fatigue Impact Scale

The MFIS was developed by Fischer et al., (1999) to assess the perceived impact of fatigue on a variety of daily activities during the past month. The 21 items of the MFIS were grouped under three subscales; physical 9 items, cognitive 10 items and psychosocial 2 items. The responses rate on a three‑point scale from never (1), sometimes (2) and always (3) with an overall score ranging from 21 to 63. Higher total scores indicated a greater impact of fatigue on the patient's physical, cognitive, and psychosocial functions. All MFIS scores were reported to have "excellent" internal consistency with the following Cronbach's alpha values: total, 0.95; physical, 0.93; cognitive, 0.91; and psychosocial, 0.90.

Finally, the face validity and content validity of the tools were evaluated and confirmed by five professors from Medical Surgical Nursing Department at the Faculty of Nursing, Ain Shams University in Cairo, Egypt.

Xi'an ShiyouDaxueXuebao (ZiranKexue Ban)/
Journal of Xi'an Shiyou University, Natural Sciences Edition
ISSN:1673-064X
E-Publication:Online Open Access
Vol: 66 Issue 01 | 2023
DOI 10.17605/OSF.IO/73692

Ethical considerations

Ethical approval was gained from the Ethics Committee of Faculty of Nursing, Ain Shams University to perform the study. Full consent was obtained from the patients after the aim and methods had been explained. The patients were informed that they could withdraw from the study any time they wished, that study data would be strictly controlled and anonymity would be preserved.

Intervention

The actual field work of the data collection process was done in a period of nine months; started from the September 2021 to June 2022. In the pre-intervention stage, after explaining the aim of the research, every patient who agreed to participate in the research and fulfil the study criteria was interviewed individually to collect the necessary data using the tools of data collection.

PMRT is based on tense and release of the muscle groups (arms, forehead, neck, shoulders, abdomen, thighs, legs and feet) and deep breathing (Merakou et al., 2019). PMRT was given through a video on compact disc (CD) and booklet (including information about how to perform relaxation, progressive relaxation exercises and breathing control). Patients were initially educated about PMRT in a private and quiet environment in the Multiple Sclerosis Clinic before being allowed to watch a video on relaxation technique. After the researcher had performed the exercises, the patients were instructed to perform these exercises. Each patient was given individual training once to help them learn, understand and perform the exercises correctly.

After education, each patient was given a CD and booklet on PMRT. They were instructed to watch the CD and perform the exercises at home once daily for 10 minutes each time for 6 weeks. Patients were asked to fill out a daily record sheet to confirm their adherence to PMRT. Additionally, patients' phone numbers were obtained and they were followed up in performing the exercises that were given to them.

In the post- intervention stage, patients were asked to attend to the Multiple Sclerosis Clinic 6 weeks after completing their education and the researcher assessed them again with the PES and MFIS.

Data analysis

Computerized and statistical analysis of data were done by using the Statistical Package for the Social Sciences version 25.0. Descriptive statistics (frequency, percentage, mean and standard deviation) were used for the data presentation. Paired t-test was used to detect the difference between patients' mean scores obtained from pain and fatigue scales before and after PMRT. Pearson correlation test was used to the determine correlation between pain and fatigue scales. Reliability of the study tools was done using Cronbach's Alpha test.

Xi'an ShiyouDaxueXuebao (ZiranKexue Ban)/
Journal of Xi'an Shiyou University, Natural Sciences Edition
ISSN:1673-064X
E-Publication:Online Open Access
Vol: 66 Issue 01 | 2023
DOI 10.17605/OSF.IO/73692

RESULTS

Table 1: Characteristics of the studied patients (N=80)

Variables	N	%
Age (years)		
20-< 30	10	12.5
30-< 40	48	60.0
≥ 40	22	27.5
Mean ± SD 36.75 ± 5.63		
Gender		
Male	25	31.2
Female	55	68.8
Education level		
Illiterate	4	5.0
Read & write	19	23.8
Secondary education	40	50.0
High education	17	21.2
Occupation		
Employed	33	41.2
Unemployed	47	58.8
Residence		
Rural	29	36.3
Urban	51	63.7
Monthly income		
Sufficient for medical expenses	19	23.8
Insufficient for medical expenses	61	76.2
Duration of diagnosis / Years		
<5	11	13.8
5-<10	41	51.2
≥ 10	28	35.0
Mean ± SD 7.66 ± 3.50		
Type of clinical pattern of MS		
Relapsing–remitting MS	65	81.3
Secondary progressive MS	10	12.5
Primary progressive MS	3	3.7
Progressive relapsing MS	2	2.5
History of relapses		
Yes	73	91.3
No	7	8.7

N: number; SD: Standard Deviation; MS: Multiple Sclerosis.

Table 1 shows that the mean age was 36.75 ± 5.63 years, 68.8% of them were females, 50.0% of them had secondary education, 41.2% of them were employed. Also, 63.7% of them live in urban areas, 76.2% of them stated that their monthly income was insufficient to cover medical expenses. Moreover, 51.2% of patients had a disease period of 5-10 years ago with mean ± SD 7.66 ± 3.50 years. Relapsing–remitting MS was more prevalent and constituted 81.3% of the studied patients, 91.3% of them had previous relapses.

Xi'an ShiyouDaxueXuebao (ZiranKexue Ban)/
Journal of Xi'an Shiyou University, Natural Sciences Edition
ISSN:1673-064X
E-Publication:Online Open Access
Vol: 66 Issue 01 | 2023
DOI 10.17605/OSF.IO/73692

Table 2: Comparison of the mean scores of pain effects scale at pre-intervention / post- intervention (N=80)

Scale	Pre-intervention Mean ± SD	Post-intervention Mean ± SD	t	p-value
Mood	2.42 ± 0.67	1.30 ± 0.58	12.314	0.000**
Ability to walk or move around	2.41 ± 0.69	1.31 ± 0.61	11.614	0.000**
Sleep	2.43 ± 0.71	1.23 ± 0.56	12.825	0.000**
Normal work (both outside home and at home)	2.41 ± 0.71	1.31 ± 0.63	11.000	0.000**
Recreational activities	2.40 ± 0.67	1.20 ± 0.46	13.129	0.000**
Enjoyment of life	2.37 ± 0.72	1.35 ± 0.61	9.885	0.000**
Total PES	14.44 ± 3.49	7.70 ± 3.02	14.136	0.000**

PES: Pain Effects Scale; SD: Standard Deviation; t: t value paired t-test; ** highly significant at p <0 .001.

Table 2 presents that, there was a statistically significant reduction in the total PES score after applying PMRT (P<0.001), where the mean of total PES decreased from 14.44 ± 3.49 to 7.70 ± 3.02 after the intervention.

Table 3: Comparison of the mean scores of modified fatigue impact scale at pre-intervention / post- intervention (N=80)

Scale	Pre-intervention Mean ± SD	Post-intervention Mean ± SD	t	p-value
Physical	21.26 ± 4.60	12.51 ± 4.44	13.365	0.000**
Cognitive	20.32 ± 5.79	13.16 ± 4.48	9.965	0.000**
Psychosocial	4.75 ± 1.44	2.80 ± 1.23	9.731	0.000**
Total MFIS	46.33 ± 10.55	28.47 ± 9.24	13.054	0.000**

MFIS: Modified Fatigue Impact Scale; SD: Standard Deviation; t: t value paired t-test; ** highly significant at p <0 .001.

Table 3 reveals that, there was a statistically significant reduction in the physical, cognitive, psychosocial subscales and the total MFIS score after applying PMRT (P<0.001), where the mean of total pre-intervention scores of physical, cognitive, psychosocial subscales and the total MFIS score were 21.26 ± 4.60, 20.32 ± 5.79, 4.75 ± 1.44 and 46.33 ± 10.55, respectively and after the intervention, it decreased to 12.51 ± 4.44, 13.16 ± 4.48, 2.80 ± 1.23 and 28.47 ± 9.24, respectively.

Table 4. Correlation between total pain effects scale scores and modified fatigue impact scale scores at pre-intervention / post- intervention

Scales	Total MFIS			
	Pre-intervention		Post-intervention	
	r	Sig. (2-tailed)	r	Sig. (2-tailed)
Total PES	0.653**	0.000	0.883**	0.000

Xi'an ShiyouDaxueXuebao (ZiranKexue Ban)/
Journal of Xi'an Shiyou University, Natural Sciences Edition
ISSN:1673-064X
E-Publication:Online Open Access
Vol: 66 Issue 01 | 2023
DOI 10.17605/OSF.IO/73692

PES: Pain Effects Scale; MFIS: Modified Fatigue Impact Scale; r: Pearson correlation test; **. Correlation is significant at the 0.01 level (2-tailed).

Table 4 indicates that, there was a statistically significant positive correlation between total PES score and total MFIS score before applying PMRT ($r = 0.653$, $p < 0.001$) and after applying PMRT ($r = 0.883$, $p < 0.001$).

DISCUSSION

The aim of this study was to evaluate the effect of PMRT on pain and fatigue in patients with MS. The results revealed that a significant difference in the mean score of total PES experienced by patients after PMRT. In other words, the pain experienced by the patients' using the PMRT had been reduced. In the study by, Bikmoradi et al. (2014) PMRT was performed for 8 weeks in patients with MS, which led to a significant reduction in pain severity. Also, Nazari et al. (2016) found that applying relaxation exercises to 75 patients with MS twice a week for four weeks markedly decreased their pain levels.

Multiple sclerosis causes many challenges in patients' lives due to its disabling, chronic and unpredictable properties. Fatigue is commonly seen with pain in patients with MS, so most patients complain of this symptom and describe it as the most common and worrisome problem (Manjaly et al., 2019; Valentine et al., 2022).

The present study findings showed that PMRT significantly decreased the mean score of physical, cognitive, psychosocial subscales and the total MFIS score in patients with MS. Studies presented that PMRT was shown to decrease fatigue in patients receiving haemodialysis treatment (Serin et al., 2020) and fibromyalgia syndrome (Yoo et al., 2022) both are chronic conditions that have significant negative effects on an individual's health and well-being in a similar way to MS. Also, the reduction in fatigue in patients with MS may be due to the impact of exercises on the motor and cognitive systems (Seifi et al., 2018).

Most studies stated that PMRT is effective in reducing fatigue in patients with MS (Javdan et al., 2021; Mirhosseini et al., 2019; Maloh et al., 2022). Also, Nazari et al. (2015) showed that patients with MS reported a significant decrease in fatigue after PMRT in 8 sessions of 40 minutes twice per week. A study by Alzaghmouri et al. (2021) on 95 patients diagnosed with MS revealed that PMRT plays an effective role in fatigue reduction. Some researchers believe that muscles relaxation promotes physiological changes, such as improving peripheral circulation and reducing the fatigue by releasing hormones and other chemicals into the body (Seifi et al., 2018; Toussaint et al., 2021). Routine and light exercises improve agility, strengthens the bones and muscles of patients with MS and making them feel happier, relaxed and less stressed (Grazioli et al., 2019).

Regarding the correlation between the patients' pain and fatigue severity at pre and post PMRT, there was a statistically significant positive correlation between the mean of PES and the mean of MFIS at pre and post PMRT. As pain increased in people with MS, the

ISSN:1673-064X
E-Publication:Online Open Access
Vol: 66 Issue 01 | 2023
DOI 10.17605/OSF.IO/73692

fatigue increased. Similarly, Dehkordi et al. (2016) and Kesik et al. (2022) found a significant relationship between pain and fatigue in patients with MS after PMRT.

IMPLICATIONS AND LIMITATIONS

This study supports the evidence of an alternative safe nursing intervention that can be used in the patient therapy programs to improve self-management. Nurses could implement the PMRT to help patients increase their self-management, especially in relation to pain and fatigue management. The current study is successful in examining the effect of PMRT on reducing the impact of pain and fatigue on patients with MS; however, some limitations are warranted. This study had a small sample size and didn't use randomization when selecting and assigning participants. Despite the limitations, the results obtained from the study can be generalized to the patients enrolled in the Multiple Sclerosis Clinic of Ain Shams University Hospital in Cairo, Egypt. Also, larger samples should be used in future studies.

CONCLUSIONS

Based on our findings, it can be concluded that the PMRT is a significant and safe intervention approach for decreasing pain and fatigue levels in patients with MS and can be utilized as a practical, safe, easy and effective method for pain and fatigue management. In accordance with the study findings, applied PMRT into standard patient care in clinical applications for nurses may be recommended.

Acknowledgments

The authors would like to thank all patients who participated in the study despite their health conditions and all those who contributed to the study.

Authors contribution

All authors (AMA, OAA, JFG, AMK) contributed to the study conception, design, data analysis, preparation and revision of the manuscript.

Conflict of interest

The authors declare no conflicts of interest.

Funding

This study was self-funded without any external sources.

References

1. Aboud T & Schuster, NM (2019). Pain management in multiple sclerosis: a review of available treatment options. Current Treatment Options in Neurology, 21(12), 1-15. https://doi.org/10.1007/s11940-019-0601-2
2. Alzaghmouri AH, Masa'Deh R, Al Jaberi M, Masadeh O, Al Smadi A, & Alshawabkeh GA. (2021). The effect of Benson relaxation technique on fatigue of patients diagnosed with multiple sclerosis. Journal of Health Sciences, 11(3), 154-159. https://doi.org/10.17532/jhsci.2021.1229

ISSN:1673-064X
E-Publication:Online Open Access
Vol: 66 Issue 01 | 2023
DOI 10.17605/OSF.IO/73692

3. Bikmoradi A, Zafari A, Oshvandi K, Mazdeh M, & Roshanaei G. (2014). Effect of progressive muscle relaxation on severity of pain in patients with multiple sclerosis: a Randomized Controlled Trial. Hayat, 20(1), 26-37.
4. Capone F, Collorone S, Cortese R, Di Lazzaro V, & Moccia M. (2020). Fatigue in multiple sclerosis: the role of thalamus. Multiple Sclerosis Journal, 26(1), 6-16. https://doi.org/10.1177/13524585198512
5. Çetinkaya F & Karabulut N. (2022). The effect of progressive muscle relaxation technique on sleep quality in total hip arthroplasty patients. Central European Journal of Nursing and Midwifery, 13(2), 657-663. https://doi.org/10.15452/CEJNM.2022.13.0002
6. Dayapoğlu N & Tan M. (2012). Evaluation of the effect of progressive relaxation exercises on fatigue and sleep quality in patients with multiple sclerosis. The Journal of Alternative and Complementary Medicine, 18(10), 983-987. https://doi.org/10.1089/acm.2011.0390
7. Dehkordi AH. (2016). Influence of yoga and aerobics exercise on fatigue, pain and psychosocial status in patients with multiple sclerosis: a randomized trial. J Sports Med Phys Fitness. 2016 Nov; 56(11):1417-1422. Epub 2015 Jul 29. PMID: 26223004.
8. Dobson R & Giovannoni G. (2019). Multiple sclerosis–a review. European journal of neurology, 26(1), 27-40. https://doi.org/10.1111/ene.13819
9. Fischer JS, LaRocca NG, Miller DM, Ritvo P, Andrews H, & Paty D. (1999). Recent developments in the assessment of quality of life in multiple sclerosis (MS). Multiple Sclerosis Journal, 5(4), 251-259. https://doi.org/10.1177/13524585990050041
10. Grazioli E, Tranchita E, Borriello G, Cerulli C, Minganti C, & Parisi A. (2019). The effects of concurrent resistance and aerobic exercise training on functional status in patients with multiple sclerosis. Current Sports Medicine Reports, 18(12), 452-457. https://doi.org/10.1249/JSR.0000000000000661
11. Hauser SL & Cree BA. (2020). Treatment of multiple sclerosis: a review. The American journal of medicine, 133(12), 1380-1390. https://doi.org/10.1016/j.amjmed.2020.05.049
12. Javdan T, Imani E, Negahi AA, & Teshnizi SH. (2021). Evaluation the effect of progressive muscle relaxation technique on fatigue and daily living activities in patients with multiple sclerosis. Pakistan J Medical Health Sci, 15, 1773-1777. https://doi.org/10.53350/pjmhs211561773
13. Kesik G, Ozdemir L, & Ozturk SM. (2022). The effects of relaxation techniques on pain, fatigue, and kinesiophobia in multiple sclerosis patients: A 3-Arm Randomized Trial. Journal of Neuroscience Nursing, 54(2), 86-91. https://doi.org/10.1097/JNN.0000000000000620
14. Klineova S, & Lublin FD (2018). Clinical course of multiple sclerosis. Cold Spring Harbor perspectives in medicine, 8(9), a028928. https://doi.org/10.1101/cshperspect.a028928
15. Kratz AL, Murphy SL, & Braley TJ (2017). Pain, fatigue, and cognitive symptoms are temporally associated within but not across days in multiple sclerosis. Archives of physical medicine and rehabilitation, 98(11), 2151-2159. https://doi.org/10.1016/j.apmr.2017.07.003
16. Lamb YN (2022). Ocrelizumab: A review in multiple sclerosis. Drugs, 1-12. https://doi.org/10.1007/s40265-022-01672-9
17. Maloh DI, AlNahar H, AlRahahleh W, Al Oran HJ, & Maloh HI (2022). The effectiveness of jacobson's progressive muscle relaxation technique on fatigue among jordanian patients with multiple sclerosis during corona epidemic. Clinical Schizophrenia & Related Psychoses. https://doi.org/10.3371/CSRP.IDAH.032822
18. Manjaly ZM, Harrison NA, Critchley HD, Do CT, Stefanics G, Wenderoth N, et al. (2019). Pathophysiological and cognitive mechanisms of fatigue in multiple sclerosis. Journal of Neurology, Neurosurgery & Psychiatry, 90(6), 642-651. http://dx.doi.org/10.1136/jnnp-2018-320050

ISSN:1673-064X
E-Publication:Online Open Access
Vol: 66 Issue 01 | 2023
DOI 10.17605/OSF.IO/73692

19. Masoudi R, Sharifi Faradonbeh A, Mobasheri M, & Moghadasi J (2013). Evaluating the effectiveness of using a progressive muscle relaxation technique in reducing the pain of multiple sclerosis patients. Journal of Musculoskeletal Pain, 21(4), 350-357. https://doi.org/10.3109/10582452.2013.852150
20. McGinley MP, Goldschmidt CH, & Rae-Grant AD (2021). Diagnosis and treatment of multiple sclerosis: a review. Jama, 325(8), 765-779. https://doi.org/10.1001/jama.2020.26858
21. Merakou K, Tsoukas K, Stavrinos G, Amanaki E, Daleziou A, Kourmousi N, et al. (2019). The effect of progressive muscle relaxation on emotional competence: Depression–anxiety–stress, sense of coherence, health-related quality of life, and well-being of unemployed people in Greece: An intervention study. Explore, 15(1), 38-46. https://doi.org/10.1016/j.explore.2018.08.001
22. Mirhosseini S, Mohammadi A, Rezaei M, & Mirbagher Ajorpaz N (2019). The effect of Benson relaxation technique on the fatigue severity of patients with MS. Journal of Client-Centered Nursing Care, 5(3), 175-182. https://doi.org/10.32598/JCCNC.5.3.175
23. Nazari F, Shahreza MS, Shaygannejad V, & Valiani M (2015). Comparing the effects of reflexology and relaxation on fatigue in women with multiple sclerosis. Iranian journal of nursing and midwifery research, 20(2), 200. PMID: 25878696; PMCID: PMC4387643.
24. Nazari F, Soheili M, Hosseini S, & Shaygannejad V (2016). A comparison of the effects of reflexology and relaxation on pain in women with multiple sclerosis. Journal of Complementary and Integrative Medicine, 13(1), 65-71. https://doi.org/10.1515/jcim-2015-0046
25. Seifi L, Najafi Ghezeljeh T, & Haghani H (2018). Comparison of the effects of Benson muscle relaxation and nature sounds on the fatigue in patients with heart failure. Holistic Nursing Practice, 32(1), 27-34. https://doi.org/10.1097/HNP.0000000000000242
26. Serin EK, Ovayolu N, & Ovayolu Ö (2020). The effect of progressive relaxation exercises on pain, fatigue, and quality of life in dialysis patients. Holistic Nursing Practice, 34(2), 121-128. https://doi.org/10.1097/HNP.0000000000000347
27. Toussaint L, Nguyen QA, Roettger C, Dixon K, Offenbächer M, Kohls N, et al. (2021). Effectiveness of progressive muscle relaxation, deep breathing, and guided imagery in promoting psychological and physiological states of relaxation. Evidence-Based Complementary and Alternative Medicine, 2021, Article ID 5924040, 8 pages. https://doi.org/10.1155/2021/5924040
28. Valentine TR, Alschuler KN, Ehde DM, & Kratz AL (2022). Prevalence, co-occurrence, and trajectories of pain, fatigue, depression, and anxiety in the year following multiple sclerosis diagnosis. Multiple Sclerosis Journal, 28(4), 620-631. https://doi.org/10.1177/13524585211023352
29. Yoo SA, Kim CY, Kim HD, & Kim SW (2022). Effects of progressive muscle relaxation therapy with home exercise on pain, fatigue, and stress in subjects with fibromyalgia syndrome: A pilot randomized controlled trial. Journal of Back and Musculoskeletal Rehabilitation, 35(2), 289-299. https://doi.org/10.3233/BMR-191703