

THE EFFECTS OF ELECTRICAL STIMULATION ON URINARY INCONTINENCE IN WOMEN WITH MULTIPLE SCLEROSIS: A SYSTEMATIC REVIEW

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ABSTRACT

BACKGROUND AND SIGNIFICANCE: Multiple Sclerosis (MS) is an autoimmune disorder that causes inflammation and demyelination resulting in plaques and lesions of the central nervous system. Involvement of urinary system may occur resulting in urinary incontinence (UI) which is defined as a loss of urine that often impacts activities of daily living. Physical therapy treatment of UI includes education, exercise, and electrical stimulation. When used for treatment of UI, electrical stimulation of the pelvic floor musculature may improve strength and decrease reports of incontinence. The purpose of this study is to determine the effects of electrical stimulation on UI in women with Multiple Sclerosis.

METHODS: A search of PubMed and EMBASE with pertinent terms was completed on November 8, 2018. Inclusion criteria included women diagnosed with MS, urinary incontinence, electrical stimulation as a treatment, studies within the last 10 years, and written in English language.

RESULTS: A total of 113 articles were assessed and after having completed a title screen, duplicate screen, and abstract review, three articles remained for inclusion of this systematic review.

CONCLUSION: In all studies, electrical stimulation of the pelvic floor musculature demonstrated improved strength and function. Also, all of the studies revealed an improvement in quality of life.

Keywords: Multiple Sclerosis, Incontinence, Electrical Stimulation

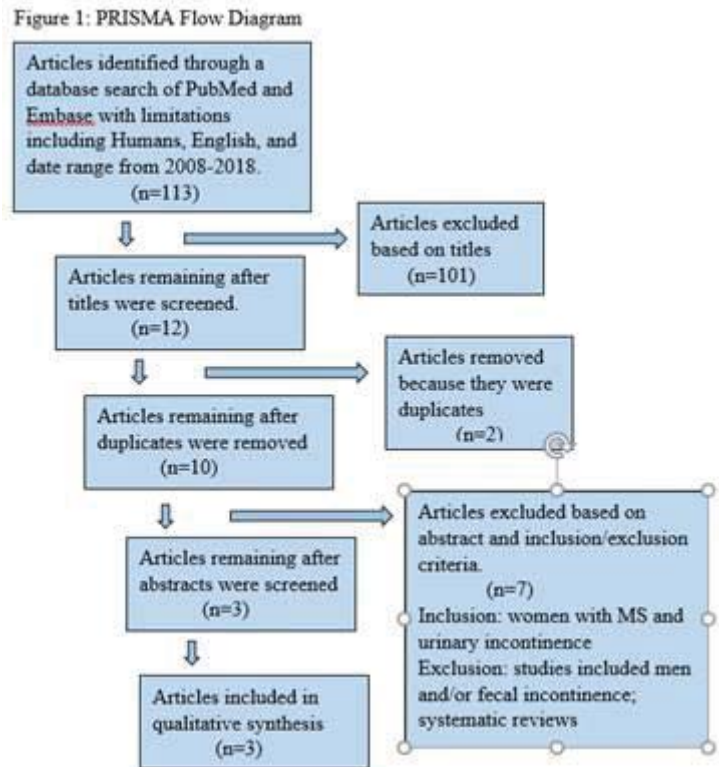
INTRODUCTION

Multiple Sclerosis (MS) is a chronic, autoimmune, inflammatory, and demyelinating disease that causes lesions in the white matter of the central nervous system, and the cause of MS is unknown[1]. Up to 90% of people diagnosed with MS develop some form of dysfunction of the lower urinary tract due to changes in the connection between the brainstem and spinal cord [2]. The process of demyelination affects the lateral corticospinal tract and reticulospinal pathway which makes bladder dysfunction including urinary incontinence common. Urinary incontinence (UI) is defined by the International Continence Society as a “condition in which involuntary loss of urine is a social or hygienic problem and is objectively demonstrable” [3, p. 116]. It is classified as a substantial public health problem for which many people do not seek treatment due to embarrassment and the accompanying social stigma [3]. A conservative treatment options for UI includes pelvic floor muscle training (PFMT), commonly known as Kegel exercises. PFMT consists of active exercises that emphasize the voluntary contraction and control of the pelvic floor muscles. Neuromuscular electrical stimulation (NMES), a passive electrical stimulus that causes involuntary contraction of a muscle, may be effective in the treatment of the UI symptoms [3]. The purpose of this study is to determine if electrical stimulation shows greater improvements than traditional pelvic floor muscle training in the treatment of urinary incontinence in patients diagnosed with MS.

METHODS

An electronic search of the PubMed and Embase databases was conducted on November 8, 2018, using search terms related to multiple sclerosis, incontinence, and electrical stimulation. The terms were searched individually and then combined for the final search. The search was limited to articles involving human subject, written in the English language, and with dates ranging from 2008-2018. The electronic search resulted in 113 articles. A title screen resulted in 12 articles to be considered in the abstract screen. The articles were then screened for duplication between the databases which resulted in 10 articles. The abstracts were screened to ensure the articles met the inclusion/exclusion criteria. After the abstract screen, three articles

remained to be included in the review. Inclusion criteria were women with MS with urinary incontinence. Studies with men or with subjects with fecal incontinence were excluded. Articles that were systematic reviews were also excluded from the review (Figure 1). The articles in this review were scored using Physiotherapy Evidence Database (PEDro) which is an 11-point scale used to evaluate the internal validity of research in physical therapy with a higher score indicating a higher quality study.



RESULTS

In a study by Ferreira *et al.* [4], 24 women with relapsing remitting MS were randomized into two groups. The experimental group participated in PFMT exercises in association with NMES using two electrodes on the S4 dermatome. The participants in this group underwent 48 sessions, completing the sessions twice per week for six months. The control group participated in the same PFMT exercises at home two times per week for six months. Quality of life (QOL) was assessed using the Qualiveen Questionnaire and level of anxiety and depression was assessed using the Hospital Anxiety and Depression questionnaire. The Overactive Bladder Questionnaire (OAB-V8) was used to evaluate how bothersome the symptoms of overactive bladder were for the participant. Lastly, the PERFECT scheme was used to assess pelvic floor muscle strength. Each group demonstrated significant within group improvements in all three of the quality of life assessment measures and in pelvic floor muscle strength (Figures 2-3). The experimental group demonstrated significant improvements over the control group in the “restrictions” category of the Qualiveen Questionnaire and in the OAB-V8 and in pelvic floor muscle strength as measured by the PERFECT scheme. There was not a significant between group difference in the level of anxiety or depression. This study scored 6/10 on the PEDro scale.

Lucio *et al.* [1] studied 30 women diagnosed with relapsing remitting MS. The participants were randomly allocated into one of three groups. All of the groups had PFMT with electromyographic (EMG) biofeedback. In addition to the PFMT with EMG biofeedback, the control group, Group 1, had sham sacral NMES while Group 2 had intravaginal NMES and Group 3 had transcutaneous tibial nerve stimulation (TTNS). Similarly to the study by Ferreira *et al.* [4], this study used the Qualiveen Questionnaire, the OAB-V8, and the PERFECT scheme. The International Consultation on Incontinence Questionnaire Short Form (ICIQ-SF) was also used to assess frequency and severity of urine loss. They also used a 24 hour Pad test and three day bladder diary to quantify urinary leakage and to assess frequency, urgency, urge urinary incontinence, nocturia, hesitancy, and incomplete emptying. In addition, pelvic floor muscle tone, flexibility and relaxation were assessed and urodynamic measures

were taken. All groups demonstrated within group improvements on the OAB-V8 and the ICIQ-SF and group 2 had a significant improvement in one domain of the Qualiveen Questionnaire. Each group demonstrated within group improvements in the 24 hour pad test, urgency episodes, and urge urinary incontinence episodes. In addition, the experimental groups (groups 2 and 3) demonstrated within group improvements in nocturia, hesitancy, and incomplete emptying. Based on the PERFECT scheme, all three groups demonstrated a significant improvement in pelvic floor muscle strength (Figures 2-3), though there were no significant differences between groups. Group 2 had significant within group improvement in pelvic floor muscles tone, flexibility, and relaxation. Group 3 had a significant within group improvement in pelvic floor muscle relaxation. No significant within group differences were found in the urodynamic measures. Besides a significant improvement for group 2 compared to groups 1 and 3 in the OAB-V8 and in pelvic floor muscle tone, flexibility and relaxation, there were no other significant between group differences. This study scored a 5/10 on the PEDro scale.

A case study was completed by Pereira *et al.* [5] with a 55 year old woman diagnosed with MS and mixed urinary incontinence. She was seen for 15 sessions with evaluation of the patient completed at the first and last sessions. She participated in functional electrical stimulation of the pelvic floor muscles and electrical stimulation of the posterior tibial nerve. Additionally, she completed PFMT exercises with a home exercise program. Outcome measures to assess QOL included Quality of Life Questionnaire for Urinary Incontinence, ICIQ-SF, and OAB-V8. Additionally, the patient completed a bladder diary and assessed loss of urine with the Pad test. Lastly strength of the vaginal floor was completed with manual muscle testing as well as utilization of the PERFECT scheme. At the end of her treatment, she demonstrated improved function with all QOL outcome measures, improved strength of her pelvic floor (Figures 2-3), and less reports of frequency and no nocturia and enuresis. These improvements were sustained at the 5 month follow-up. Inconclusive results were noted with the Pad test secondary to the patient being unable to complete until the end. This study scored a 3/10 on the PEDro scale.

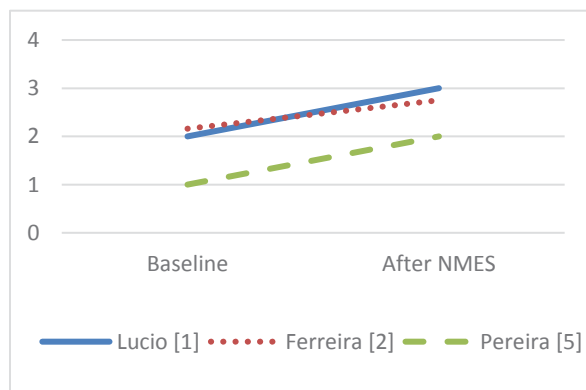


Figure 2: Pelvic Floor Muscle Power in Points

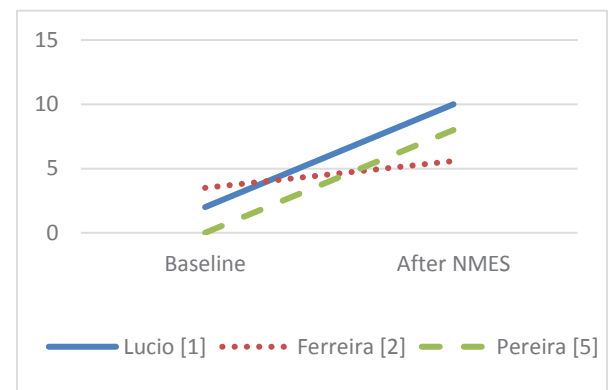


Figure 3: Pelvic Floor Muscle Endurance in Seconds

DISCUSSION

When assessing electrical stimulation and its impact on incontinence, all studies demonstrated improved quality of life and improved pelvic floor muscle strength with NMES. Ferreira, *et al.* [4], noted that NMES in conjunction with PFMT exercises demonstrated significant improvement in QOL as compared to PFMT alone. Lucio, *et al.* [1] found that all groups demonstrated within group improvements; however, the group that received electrical stimulation of the pelvic floor in conjunction with the PFMT exercises was significantly improved in one of the QOL measures and in muscle tone. The patient in the case study by Pereira *et al.* [5] demonstrated improved QOL and muscle strength that was present at the 5 month follow-up. The Ferreira, *et al.* [4] was the highest quality study of the three studies reviewed based on the PEDro score, and it did demonstrate some benefits to adding NMES to PFMT compared to PFMT alone.

CONCLUSIONS

All studies demonstrated improved QOL and muscle strength of the pelvic floor after participating in physical therapy treatment consisting of electrical stimulation and PFMT exercises for incontinence but did not conclusively demonstrate that NEMS with PFMT is more beneficial than PFMT alone.

This improved QOL and muscle strength is important to note due to the fact that MS is a disease that progressively impairs strength and function, thus causing a decline in overall QOL. Findings from this systematic review suggest that electrical stimulation may be beneficial as an activity to improve the lives of those living with MS and incontinence. Due to the limited number of studies available for this systematic review and the lower quality of some of the studies, suggestions for additional research is warranted, especially when assessing NMES in conjunction with PFMT exercises compared to NMES alone.

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DISCLOSURES

The authors do not have any disclosures or conflicts of interest.

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