



## Effectiveness of Super Inductive System in the Field of Electrotherapy for Various Conditions - A Review of Literature

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### Abstract

**Background:** Super Inductive system/Repetitive pulsed magnetic stimulation is the extremely inventive method. Because the technique creates a powerful and intense electromagnetic field in the applicator coil, it is beneficial to human tissue. The treatment is based on the way the high-intensity electromagnetic field interacts with the human body. Muscle contraction happens after the electromagnetic field (EMF) produced by a coil placed within the applicator has depolarized the neuromuscular tissue. The aim of this study is to evaluate the evidence of effectiveness of Repetitive pulsed Magnetic Stimulation/Super Inductive system used for various conditions in the field of electrotherapy.

**Keywords:** Super Inductive System; Electro Magnetic Field; Repetitive Pulsed Magnetic Stimulation; Depolarization

### Abbreviations

RPMS: Repetitive pulsed Magnetic Stimulation; SIS: Super Inductive System; EMF: Electromagnetic Field; ADL: Activities of Daily Living; TG: Treatment Groups; CG: Control Group; VAS: Visual Analog Scale; PFAQ: Patient Functional Assessment Questionnaire

### Introduction

Numerous medical specialties have demonstrated the therapeutic benefits of repetitive peripheral magnetic stimulation (rPMS) for the treatment of pain. In contrast to the adverse effects of medication, rPMS is a non-invasive therapy method that may be able to reduce pain [1,2]. Electric currents that interact with neuromuscular tissue are produced by a magnetic field with induction from a Tesla [4]. Muscle contraction results from the depolarization of the neural cells.

Myostimulation, circulation-enhancing, swelling-relieving, trophic maintenance of the afflicted area, tissue-elasticity-enhancing, and pain-relieving are some of the therapeutic outcomes [4]. However, the aim of this study is to evaluate the evidence of effectiveness of Repetitive pulsed magnetic therapy/super inductive therapy for various multiple conditions in the field of electrotherapy.

### Need of the Study

- To evaluate the effectiveness of Repetitive peripheral Magnetic Stimulation/Super Inductive System/Functional Magnetic Stimulation used in the field of electrotherapy for different multiple conditions.
- As per my knowledge not much research and literature has been found on this topic so far, hence there is a need for more research.

## Aim and Objectives

- This study aimed to conduct the literature review to evaluate the effectiveness of Repetitive peripheral Magnetic Stimulation/ Super Inductive System/high-intensity electromagnetic stimulation/Functional Magnetic Stimulation used in the field of electrotherapy for various multiple conditions.

## Material and Method

### Study Design

Review of literature.

### Methodology

The database used in this study taken from Google Scholar, Pubmed, Cochrane library, Medline, Science Direct, scopus, physical therapy korea, Research Gate, science.gov. All the articles were free, it was available in full length in English language. Total 18 articles had been searched in that 9 articles were selected and 9 studies had been rejected because either the study was found in different language, only abstract were available full length articles were not available, some articles were purchased articles.

### Inclusion Criteria

- Full text free articles
- Articles included only in English language
- Articles which involved Super inductive system/functional magnetic stimulation/Repetitive pulsed Magnetic Stimulation used for various conditions.
- Age group 18 years to 75 years
- Both males and females

### Exclusion criteria

- Articles which were not available in full text
- Articles found in different languages
- Thesis and dissertations
- Age group which is below 18 years

## Review of literature

Dragana Zarkovic., *et al*, (2016) did a pilot study entitled "REPETITIVE PERIPHERAL MAGNETIC STIMULATION AS PAIN MANAGEMENT SOLUTION IN MUSCULOSKELETAL AND NEUROLOGICAL DISORDERS" in which 40 patients were included

(n = 23 women, n = 17 males) who had both acute and chronic pain and difficulty performing activities of daily living (ADLs) due to musculoskeletal or neurological diseases. RPMS was used to treat every patient. The parameters of the therapy were modified based on the state of the patient. Five patients with acute discomfort received daily therapy. Ten chronic pain patients received treatment three times a week. A 10-point Visual Analog Scale (VAS) was used to assess the presence of pain. The Patient Functional Assessment Questionnaire (PFAQ) for ADL was used to assess ADL performance difficulties. Results showed that 87.33% of decrease in pain and 41.33% of the people showed enhancement in ADL activities. This study suggested that When musculoskeletal and neurological diseases coexist with painful conditions that impede ADLs, RPMS therapy can be employed as a non-invasive and effective treatment [1].

A controlled randomized study done by Efthimios J. Kouloulas (2016) on "PERIPHERAL APPLICATION OF REPETITIVE PULSE MAGNETIC STIMULATION ON JOINT CONTRACTURE FOR MOBILITY RESTORATION" This study included 30 participants with knee joint contracture, who were split into two groups: the Treatment group and the Control group. RPMS therapy was given to the treatment group and ultrasound gave for the control group. The study outcome measures were [1]. The Patient Functional Assessment Questionnaire (PFAQ) were used for assessing the performance in Activities of Daily Living (ADL), goniometry (ROM in degrees during flexion) were used to measure mobility [2]. Pain assessment was assessed by using the 10-point Visual Analog Scale (VAS). The results showed better improvement in the treatment group as compare to control group. Hence this study concluded in the case of joint contractures, RPMS is a safe, efficient, and non-invasive technique for restoring mobility and reducing pain [3].

Ondrej Prouza., *et al*. conducted a study (2018) on "HIGH-INTENSITY ELECTROMAGNETIC STIMULATION CAN REDUCE SPASTICITY IN POST-STROKE PATIENTS" in this study post stroke 30 patients were divided into two groups randomly. 10 treatments using high-intensity electromagnetic stimulation were administered to the treatment group (TG) to treat spastic muscles. In another control group 10 electrotherapy treatments combined with kinesiotherapy were administered (CG) in the area of the spastic muscles. To assess the degree of spasticity, the Modified Ashworth Scale (MAS) was employed as the main outcome measure.

The patient's quality of life was assessed using the Barthel Index of Activities of Daily Living (ADL), a secondary outcome measure. Following the one-month follow-up visit, the evaluation revealed a higher reduction in spasticity in the TG (66% vs. 31%) than in the CG. According to the results, high-intensity electromagnetic stimulation is a very effective method for managing spasticity in stroke survivors [4].

Daniele Morfino conducted a study on "The Super Inductive System - A New Approach in Treatment of Denervated Muscle" 30 patients were randomly assigned to the control and treatment groups. RPMS therapy was administered to the treatment group. Electrotherapy was administered to the control group. Both before and after therapy, the Patient Functional Assessment Questionnaire (PFAQ) and Manual Muscle Testing (MMT) were used as a outcomes measures. According to the MMT evaluation, the treatment group showed a 67% improvement, whereas the control group showed a 47% improvement. The Carry/Move/Handle items domain showed the largest improvement for the Treatment group 35.22%, while the Control group's corresponding value was 23.33%. This study concluded that RRPMS is a non-invasive and efficient technique that can be given for the denervated muscles [5].

Victor Bustamante, *et al.* conducted a Randomized controlled clinical trial study (2009) on "Muscle training with repetitive magnetic stimulation of the quadriceps in severe COPD patients" Quadriceps muscular function, effort capacity (measured by the six-minute walk distance, or 6MWD), and quality of life were the outcomes to be evaluated. A magnetic stimulation training regimen was randomly allocated to 18 patients with severe COPD. Two groups of patients were formed: one for RMS treatment (n = 10), and another for control (n = 8). Three times a week for eight weeks, participants received 15 minutes of stimulation on each quadriceps femoris. Prior to and following the training period, the stimulated and control subjects underwent a six-minute walking test, quality-of-life questionnaires (SF36, SGRQ), and quadriceps muscle strength and endurance assessments. Every patient showed a notable improvement in voluntary quadriceps strength (17.5% of the baseline value) and exercise capacity had also increased in the six-minute walking test, with the mean increase was 23 meters. This study concluded that Magnetic neuromuscular stimulation of the quadriceps shown beneficial effects on muscle function, effort capacity, and perception areas in patients with COPD who are limited by dyspnea [6].

Hoda Serag, *et al.* (2014) conducted a study on "Effects of para spinal repetitive magnetic stimulation on multiple sclerosis related to spasticity". The participants were divided into 2 groups group 1 and group 2. Group 1 had 18 participants who received 6 sessions of 1 Hz RPMS on both the sides of the para vertebral muscles. Group 2 had 8 participants who received sham treatment. The outcome measures of this study were modified ashworth scale which was used for the spasticity, self reported frequency of spasm and amount of pain, 25 feet walking test, body pain. The study concluded that RPMS can reduce muscular spasms and spasticity associated with multiple sclerosis but additional research is required to examine how this improvement affects the patients everyday activities and quality of life [7].

Vernon W.H. Lin, *et al.* conducted a prospective before-after trial study (1998) on "Functional Magnetic Stimulation for Restoring Cough in Patients With Tetraplegia". The study took a total of 13 male participants who suffered from chronic spinal cord injury at the level of C4 to C7. The maximum expired pressure (MEP), expiratory reserve volume (ERV), and forced expiratory flow rate (FEF) by FMS in comparison to voluntary maximum attempts were the outcome measurements, optimal MC placement was the another outcome measure. The treatment was given by magnetic stimulator at the intensity of 70%, frequency of 20Hz and burst length of 2 second end of the inspiration. The results and conclusion of this study showed that FMS is a useful technique for helping tetraplegic people regain their cough [8].

Žarković D., conducted (2016) a case study on "Repetitive Peripheral Inductive Stimulation In Comprehensive Physiotherapeutic Approach" the study took a 29 years old male who had a severe injuries in a car accident when he was a little boy. He used to still suffers from a musculoskeletal and posttraumatic respiratory condition as an adult as a result of the accident. The outcome measures of this study were spirometry and kinesiology assessment. This study divided the therapy into phase preparatory phase and active phase. For 4-week complete rehabilitation program, a combination of manual approaches and the BTL-6000 Super Inductive System were given to the patient and assessment was done before and after the treatment. The result showed both the musculoskeletal system of the patient and spirometric measurements notable improvement [9].

Štastný E., *et al.* conducted a pilot study (2016) entitled Clinical Study of Applied High-induction

Electromagnetic Field on Painful Conditions. This study aimed to evaluate the analgesic efficacy of the super inductive stimulator technology with various diagnoses. The study outcome measures were Visual Analog Scale (VAS) and the Verbal Numerical Rating Scale (VNRS) in order to assess the analgesic impact. In this study randomly 57 patients were chosen with both acute and chronic musculoskeletal pain who underwent the therapy. According to the chosen regimen, patients had six sessions on an average, per week one to two times and treatment was given for 10 -15 minutes. The results showed that there was a decreased in pain by 37.5%, around 46 patients got the relief in pain. This study showed that, the Super Inductive System technology has a analgesic effects. For every diagnosis, there was a decrease in both acute and chronic pain [10].

## Conclusion

This review of literature concluded that one of the useful and non-invasive treatment option is Super inductive therapy/RPMS therapy. Super inductive system/rpms is a non-invasive, safe, and effective method for reducing pain and restoring mobility in cases of joint contractures, to treat denervated muscles. For stroke survivors, high-intensity electromagnetic stimulation is a particularly useful treatment for spasticity. However, to determine the efficacy more research is necessary.

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