

## Introduction

Electromagnetic field (EMF) has been used and studied as a therapeutic intervention for many years. Over the past decade, there have been an increase in published research on EMF therapy. Currently there is a wide recognition of EMF therapy being an alternative therapy compared to conventional therapeutic modalities like interferential current and ultrasound. Pulsed electromagnetic field (PEMF), unlike static EMF, has a special signal format that produces a number of different frequency and intensity levels for health benefits. In February 2017, a PEMF device known as Bio-Electro-Magnetic-Energy-Regulation (BEMER) was given a class 2 approval by the FDA for treating musculoskeletal issues. BEMER originated from Liechtenstein, Germany. It utilizes a patented PEMF signal. The results of this inimitable signal is a significant increase in the vasomotion of micro vessels, arteriovenous pO2 difference, number of open capillaries, arteriolar and venular flow volume, and flow rate of red blood cells is observed in a specific microcirculatory area. It is proposed that BEMER PEMF will assist the body with pain reduction, reduced inflammation, and improved blood flow. The objective of the study was to have a preliminary data collection of the effects of BEMER vascular therapy and physical therapy on pain reduction, recovery, and functional status of the patient during and after the course of treatment. In other words, could adding BEMER to treating musculoskeletal patients improve utilization and functional outcomes?

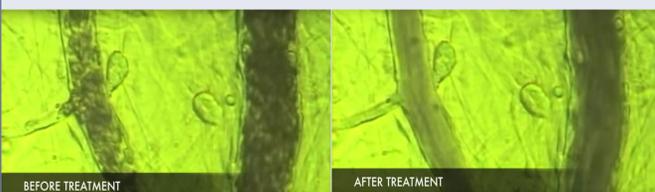


Figure 1 Before and after image of microcirculation after the use of BEMER

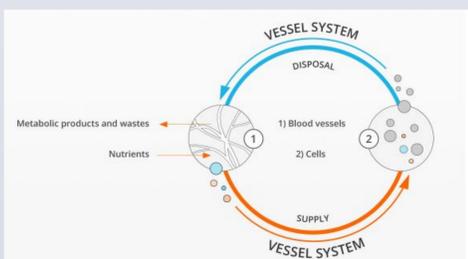


Figure 2 The process of exchanging metabolic products and waste through microcirculation

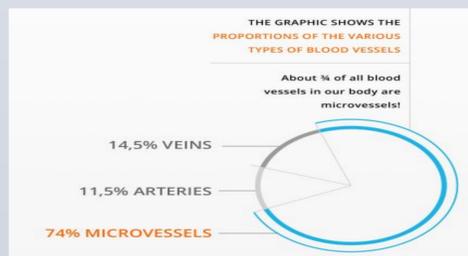


Figure 3 The different circulatory components that makes up the human anatomy

## Materials and Methods

Both new and current patients were required to take Focus On Therapeutic Outcomes (FOTO - <https://www.fotoinc.com/>) survey. This survey

quantifies the patients' functionality status through a CAT, Computer Adaptive Testing. This program accounted both physical and mental functionality of an individual. FOTO was repeatedly given to patients in a five-day interval. Current patients were already in separate groups, but new patients were randomly assigned into two groups: physical therapist treatment and BEMER plus physical therapist treatment. The split was evenly distributed for comparison. The BEMER group all started with the same level of intensity before or after physical therapy intervention, but it was based on the patient's condition for the level intensity they received and where they received to treatment. The time frame of the treatment range from 8-20 minutes, and the rehab sessions are approximately 45 minutes each visit.



Figure 4 Randomly assigned BEMER patients with various types of musculoskeletal issues



Figure 5 Randomly assigned control group patients receiving modalities

## Results

### Practice, patient, and provider characteristics

There were 31 patients in the FOTO network recorded for the study with various musculoskeletal adversities. Table 1 showed the diverse injury localities. There were 19 females and 12 males documented. The average age of the patients was 57.4 years old with a range of 19 to 83. The average Body Mass Index, BMI, was 27.7, as seen in Figure 6. The average number of visits was 7.2, as seen in Figure 6. All outpatients completed a minimum of 2 FOTO surveys: initial FOTO and recent FOTO. There were only 5 patients who completed their rehab plan of care. The outpatients received orthopedic physical therapy treatment from either a physical therapist (PT), Shawn Tucker, or a physical therapist assistant (PTA), Patty Workman; they both work full-time at Brentwood Center of Health. The PT had 28 of years of practice, and the PTA had 4 years of practice.

Injury Location	Outpatients n=31	BEMER	Control
Shoulder	5	1	4
Knee	8	6	2
Neck	2	0	2
Hip	2	2	0
Foot	2	1	1
Upper Leg	1	1	0
Elbow	1	1	0
Spine	10	4	6

Table 1 The various orthopedic issues in both groups

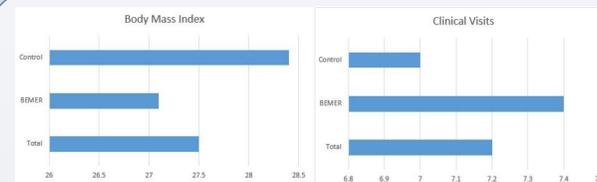


Figure 6 Average body mass index (left) and average clinical visits (right)

### Treatment

Patients were treated with equal amount of time, 45 minutes each session. Both BEMER and Control group received some form of treatment: electrical stimulation (interferential and micro current), thermotherapy, cryotherapy, ultrasound therapy, therapeutic exercises (strengthening, flexibility, and endurance), manual therapy, neuromuscular re-education, Kinesio taping, and self-care education. Only those in the BEMER group received BEMER treatments with a various intensity and program levels applied to the injury location. The duration of the BEMER treatment ranged from 8-20 minutes. Figure 7 shows each patient in the control group, and it displays the difference in FOTO scores. The horizontal line shows what the average FOTO among all of studied. Figure 8 delineates each patient in the BEMER group, and it displays the difference in FOTO scores. The horizontal line shows what the average FOTO among all of participants.

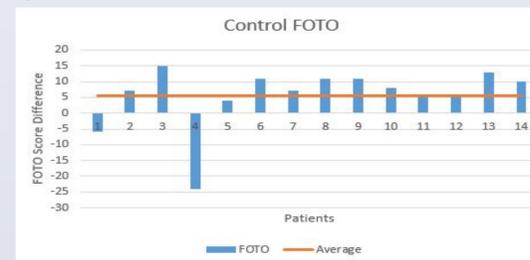


Figure 7 FOTO difference of orthopedic physical therapy intervention

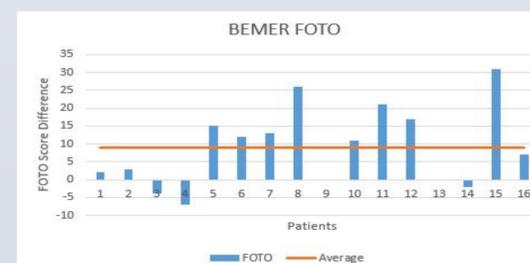


Figure 8 FOTO difference of orthopedic physical therapy intervention/BEMER

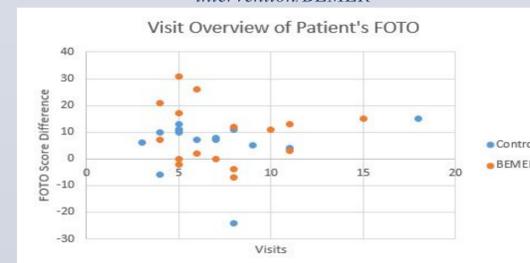


Figure 9 Amount of visits in relation to FOTO outcomes

## Conclusions

The findings from the recorded data revealed that patient orthopedic physical therapy intervention does increase the FOTO results by an average of 5.87, but the integration of the BEMER and orthopedic physical therapy intervention increase the FOTO outcomes by an average of 9.06.

BEMER produce greater functionality scores in shorter amount of visits, as seen in Figure 9. It can be concluded that orthopedic physical therapy intervention played an important role in FOTO outcome, but the integration with BEMER improved the duration and functional outcomes. Future research are forthcoming pending for more results of discharges.

## Limitations

- The absence of initial categorization and selective musculoskeletal issues influenced the study by making it not comparable and understandable of the effects of BEMER on specific kinds of musculoskeletal adversities.
- There was 8-weeks of research in the study. There was an inability to capture the closing episode FOTO of most patients in the study. This resulted in an insignificant sample size to analyze results upon discharge from care.
- There was an ambiguity of the Fear Avoidance section. The resulted in a wide variety of outcomes that are questionable.

## Additional Findings

- There are two diabetic patients who suffers from peripheral neuropathy bilaterally in the foot. The patients were treated systemically and targeted at the foot with the B.Pad set at a high level intensity. Both reported regaining feelings in their foot. Patient 1 had an ulcer that was not healing. After few treatments, the patient reported recovery of it. Further treatments are forthcoming pending for more results.
- A chronic BEMER user had been treated systemically and targeted at the head with the B.Pad at a specific program. The patient is being treated for minor memory loss. Further treatments are forthcoming pending for more research. (Figure 10)



Figure 10 BEMER treatment on the head

## Literature Citations

- Franciska Gyulai, Katalin Raba, Ildiko Baranyai, Enicko Berkes and Tamas Bender. (2015 May 5) BEMER Therapy Combined with Physiotherapy in Patients with Musculoskeletal Diseases: A Randomised, Controlled Double Blind Follow-Up Pilot Study. National Center for Biotechnology Information.

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