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Evaluation of Microcurrent Treatment Applied to Acupuncture Points on Pain, PTSD and Sleep Duration in Military Veterans in the Home Setting

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Abstract

Introduction: A widely used approach for the treatment of stress and chronic pain is with the use of both microcurrent, as well as acupuncture. However there remains considerable controversy as to their combined therapeutic value in chronic pain and stress management in the home setting. We aimed to determine the effect and magnitude that direct current (DC) microcurrent therapy has when self-applied to acupuncture points by veterans in the home setting for chronic pain, post-traumatic stress disorder (PTSD), and sleep duration markers.

Methods: This was a cohort study analysis of treatment outcomes pre and post Microcurrent Point Stimulation (MPS) applied to Acupuncture Points on 35 patients with history of non-specific pain and PTSD symptomology. Evaluations entailed a standard protocol baseline of pain (VAS), PTSD, sleep duration, analgesic pill intake, quality of life, frequency of monthly home and VA ancillary visits. Measurements were recorded prior to and after a minimum of 1 month (>=1 month) of home application of microcurrent.

Results: The response of a 35 patient cohort showed a statistically significant change in pre-post comparisons in the following 8 health related markers during home MPS application: there was a post reduction of 52.2% [p=0.00] in mean post pain levels when compared to initial pain levels; there was a reduction of 30.0% [p=0.000] in mean PTSD levels; there was an increase of 39.5% [p=0.000] in mean sleep duration levels; there was a reduction of 56.48% [p=0.000] in number of pain pills taken per day; there was a 73.13% [p=0.000] increase in general health; there was a increase of 69.72% [p=0.000] in mean of quality of life; there was a reduction of 74.54% [p=0.004] in average number of home visits per month; and a reduction of 79.60% [p=0.001] in average number of VA visits.

Conclusion: The positive results in this study will help establish the validity of microcurrent applied to acupuncture points in the home setting for the management of pain, PTSD, sleep duration and quality of life markers by Military veterans.

Keywords: Veterans; Microcurrent; Pain; PTSD; Sleep duration

Abbreviations: PTSD: Post Traumatic Stress Disorder; VHA: Veterans Health Administration; OIF: Operations Iraqi Freedom; OEF: Enduring Freedom; MPS: Microcurrent Point Stimulation

Introduction

Pain, Post Traumatic Stress Disorder (PTSD) and sleep duration can afflict any person who experiences a traumatic event; ex-combat military personnel are especially vulnerable. This problem is enormous, with up to 90.5% of military people with PTSD also experiencing sleep disturbance and/or chronic pain [1]. Sleep disturbances alone occur in 74% of veterans with PTSD [2]. PTSD disrupts the autonomic nervous system, leading to hyperarousal, increased sympathetic tone, and elevated cortisol levels - all of which impair the body's ability to enter and maintain deep, restorative sleep [3-4]. Poor sleep, in turn, worsens PTSD, making trauma symptoms more persistent and more challenging to treat [5].

Chronic pain affects a large percentage of veterans seeking care at Veterans Health Administration (VHA) clinics, ranging from

47% to 78% [6]. Both PTSD and chronic pain share overlapping neurological circuits, which process both emotional threat and physical pain [7]. Inadequate sleep exacerbates pain by increasing inflammation, lowering pain thresholds, and disrupting pain-inhibitory pathways [8]. Both PTSD and chronic pain conditions involve persistent sympathetic nervous system activation [9], reduced parasympathetic tone [10], and changes in cortisol regulation [11]- contributing to a central sensitization state where the nervous system becomes overly responsive to pain and stress. Veterans with both conditions report higher levels of functional disability, depression, and treatment resistance than those with either condition alone [12].

The three conditions-PTSD, chronic pain, and sleep disturbances—form a biopsychosocial feedback loop. PTSD often disrupts sleep through nightmares, insomnia, and heightened arousal, which increases pain sensitivity and emotional dysregulation [4,13,14]. Chronic pain further prevents restorative sleep, amplifying PTSD symptoms like anxiety and hypervigilance [3,14]. Additionally, sleep loss triggers stress activation and inflammation [15] which aggravates both pain and trauma-related symptoms [16], perpetuating the cycle [13,17]. Targeting sleep and pain is therefore essential not just for symptom relief, but for interrupting the biological cycles that perpetuate PTSD in veterans [18].

Managing Pain-PTSD and Sleep in Veterans is Expensive

The total economic burden of PTSD in the US in 2018 was $232.2 billion ($19,630 per individual with PTSD). [19], with Veterans Affairs spending over $3 billion annually to treat PTSD [20]. Despite these high costs, evidence suggests they are only partially successful [21-22] or have high relapse rates [23-26], with healthcare costs for veterans with PTSD being 3.5 times higher than those without the disorder [27]. Veterans are disproportionately affected by chronic pain [28,29]. The prevalence of chronic pain among previously deployed soldiers and veterans is between 44% and 60% [26], compared with 26% in a primary care sample [29]. The overall economic toll of chronic pain is a staggering US$635 billion annually [27], and among veterans, pain is the costliest of all disorders treated in the Veterans Health Administration (VHA) facilities [30]. Chronic pain is widespread among the veterans of Operations Iraqi Freedom (OIF), Enduring Freedom (OEF), and New Dawn [31].

Sleep disturbances also cost the VA a considerable amount annually, with doctor visits, sleep studies, medications, and other therapies used to treat sleep disorders in veterans costing an average of $106.97 in annual medical visit costs per patient for insomnia and $894.79 annually for drug costs [32]. PTSD, chronic pain, and sleep disturbances form a biopsychosocial feedback loop, with each condition exacerbating the others [13-17]. Managing these conditions is costly, with PTSD and chronic pain alone costing billions annually [19-20]. Coexisting conditions increase opioid usage and VA therapy utilization [33-37]. Recent reports emphasize the need for non-pharmaceutical solutions [38,39]. Acupuncture and microcurrent therapy have shown promise in managing these conditions. Acupuncture influences pain, PTSD, and sleep by modulating neurotransmitters, reducing inflammation, and regulating the autonomic nervous system [40-46]. Microcurrent therapy accelerates tissue repair, modulates the autonomic nervous system, influences trauma processing [47], and enhances neurotransmitter regulation [48-51]. Both treatments can improve sleep quantity and quality [46,53,54].

Study Proposal

Although sufficient evidence supports the clinical application of acupuncture and microcurrent for pain, PTSD and sleep duration, there is limited evidence in the literature to support the use of non-invasive microcurrent electro-therapies applied to acupuncture points in the home setting by veteran patients for these conditions. We aimed to determine the effect and magnitude that DC microcurrent therapy has when self-applied to acupuncture points by veterans in the home setting, with the following markers: chronic pain, PTSD, sleep duration, analgesic intake, frequency of VA visits and quality of life on a sample of patients.

Methodology: Subjects

A total of 35 patients were recruited, who were suffering with a diffuse range of neuromyofascial pain syndrome and PTSD (Table 1). Patients were recruited from both USA (n=23) and Canada (n=12) military veterans. There were 7 female and 28 males, with a mean age of 36.51 (SD 22.293) years of pain. Patients were issued home devices from Veterans Affair Canada or VHA Centers USA, and had a questionnaire included with the instructions to return 1 month after use. The participants provided informed consent. The study recruitment period was April 9th 2019 – September 12 2019. The diagnosis of pain, location, severity, sex, previous interventions or surgeries were not considered exclusion criteria and listed in (Table 2).

Methods

Microcurrent Point stimulation (MPS) was self-administered to by military veterans applying Dolphin Neurostim (Center for Pain & Stress research Ltd., Ontario, Canada). This is an FDA-approved non-invasive device that electrically detects acupuncture-trigger points and then applies low frequency, concentrated, microcurrent stimulation (at 10K ohms) for the relief of chronic pain [55]. Dolphin Neurostim is authorized for home use by veterans in both USA and Canada.

Veterans were provided an acupuncture pain protocol manual that illustrates and describes the key neuro-anatomical acupuncture points to apply for a wide variety of pain conditions. Veterans were asked to treat their relating pain points with MPS for 30 seconds per point, with the device set to negative polarity (-). The number of points, frequency of application or length of application time was left up to the veteran's choice. Frequency of application varied but majority of veterans applied MPS daily or bi-daily (Table 3).

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Table 1: Veterans Home use Descriptive Stats.

	N	Minimum	Maximum	Mean	Std. Deviation
Age	35	29	66	36.5143	22.29399
Years suffering	35	0.1	30	7.7971	7.3158
Months using	35	1	30	12.9167	9.01649

Table 2: Breakdown of Pain Location by Veterans and Frequency of usage of MPS Applications.

	Frequency/week	Percent	Valid Percent	Cumulative Percent
Arm	1	2.85	2.85	2.85
Back	5	14.25	14.25	17.1
Back-knee	2	5.7	5.7	22.8
Back-neck	5	14.25	14.25	37.05
Hands	1	2.85	2.85	39.9
Headache	6	17.6	17.6	57.6
Neck	3	8.55	8.55	66.05
Knee	2	5.7	5.7	71.75
Neck shoulder	8	22.8	22.4	94.35
Shoulder	2	5.7	5.7	100
Total	35	100	100	

Table 3: Frequency of Veterans MPS Application.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1x wk	4	11.4	11.4	11.4
	2-4x wk	16	45.7	45.7	57.1
	7x wk	15	42.9	42.9	100
	Total	35	100	100	

Table 4: Questionnaire.

Field #	Question / Data Field	Response Options / Notes
—	Name	Text
—	Age	Number
—	Date Dolphin Device Was Issued	Date
1	Location/Diagnosis of Pain Treated	Lower Back / Headache / Neck / Shoulder / Hip / Knee / Other
2	Duration of Pain Before Dolphin	Years/Months
3	Frequency of Dolphin Use at Home	Once/month or less / 2-4× weekly / Daily
4	Overall, Health BEFORE Dolphin	0-10 (0 = Poor, 10 = Excellent)
5	Overall, Health AFTER Dolphin	0-10 (0 = Poor, 10 = Excellent)
6	Pain Rating BEFORE (0–10)	0-10 (0 = No pain, 10 = Severe)
7	Pain Rating AFTER (0–10)	0-10 (0 = No pain, 10 = Severe)
8	Change in Use of Pain Medication	Yes / No
9	Pain Pills Per Day BEFORE	0-10+
10	Pain Pills Per Day AFTER	0-10+
11	Hours Slept Per Night BEFORE	0-10
12	Hours Slept Per Night AFTER	0-10
13	Quality of Life BEFORE Dolphin	0-10 (0 = Poor, 10 = Good)
14	Quality of Life AFTER Dolphin	0-10 (0 = Poor, 10 = Good)

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15	PTSD BEFORE Dolphin	Yes / No
16	PTSD AFTER Dolphin	Yes / No
17	PTSD Severity BEFORE	0-10
18	PTSD Severity AFTER	0-10
19	Provider Visits BEFORE	Number
20	Provider Visits AFTER	Number
21	Ancillary Visits BEFORE (NP/PT/PA)	Number
22	Ancillary Visits AFTER (NP/PT/PA)	Number
23	Patient Satisfaction After Treatment	0-10 (0 = Poor, 10 = Good)
24	Comparison: At-Home Dolphin vs In-Clinic Treatment	Text response (open-ended)

Table 5: Veterans Home use Outcome Descriptive Stats.

	N	Minimum	Maximum	Mean	Std. Deviation	Percentage Change %	95% CI
Pain pre	35	5	10	8.4286	1.4407		
Pain post	35	0	10	4.0286	2.21606	4.67 points = -54.4%	P=0.000
PTSD pre (0-10)	35	0	10	4.8571	3.85122		
PTSD post (0-10)	35	0	10	3.4	3.14783	1.46 points = -30.00%	P=0.003
Sleep pre(hours)	35	0	8	3.9429	2.01382		
Sleep post (hours)	35	0	10	5.5143	2.52483	1.57 hours = + 39.85%	P=0.003
Pain pills pre	35	0	10	3.0857	2.6051		
Pain pills post	35	0	9	1.3429	2.01382	1.74 Points = -56.48%	P=0.001
Health Rating before (0-10)	35	0	8	3.8286	2.07911		
Health Rating after (0-10)	35	0	10	6.6286	2.3274	2.8 points = +73.13%	P=0.000
Quality life pre (QOL) (0-10)	35	0	8	4.0571	2.02837		
Quality life post (QOL) (0-10)	35	0	10	6.8857	2.42258	2.83 points =69.72%	P=0.000
Home visits pre	35	0	30	7.7429	10.93118		
Home visits post	35	0	10	1.9714	2.41911	5.77 points= -74.54%	P=0.004
VA visit/mo pre	35	0	40	5.7429	7.70158		
VA visit/mo post	35	0	5	1.1714	1.58087	4.57 points= -79.60%	P=0.001

Veterans Home Use Questionnaire

Pain (VAS), PTSD, sleep duration, analgesic pill intake, quality of life, general health and frequency of monthly home (need details of how/what methods were used to evaluate these) and VA ancillary visits were used to evaluate the patient's overall health on a 11-point scale from 0-10 with 0 being the least and 10 being the most. The patient selects a value that is most in line with the intensity of the marker prior to MPS application and after a minimum 1-month (>=1 month) MPS home usage.

The Study questionnaire is detailed in (Table 4), and questions were selected to determine whether Microcurrent Point Stimulation:

1) can modulate chronic pain, PTSD and quality of life markers in this cohort of patients, when self-applied to military veterans in the home setting.

2) is a valid option for the non-pharmacological pain management of pain and stress related conditions in the home setting.

Results

The response of a 35 patient cohort showed a statistically significant change in pre-post comparisons in the following 8 health related markers during home MPS application (Table 5): there was a post reduction of 52.2% [p=0.00] in mean post pain levels when compared to initial pain levels; there a reduction of 30.0% [p=0.000] in mean PTSD levels; there an increase of 39.5% [p=0.000] in mean sleep duration levels; there a reduction of 56.48% [p=0.000] in number of pain pills taken per day; there was a 73.13% [p=0.000] increase in general health; there an increase of 69.72% [p=0.000] in mean of quality of life; there was a reduction of 74.54% [p=0.004] in average number of home visits per month; and a reduction of 79.60% [p=0.001] in average number of VA visits.

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Discussion

The findings from this study offer compelling evidence that microcurrent point stimulation (MPS) applied to acupuncture points in a home-based setting may significantly improve health outcomes among military veterans suffering from chronic pain, PTSD, and sleep disturbances. Pain is a significant symptom that afflicts these veterans and is a major cause for visits to the VA facilities. Veterans often suffer from chronic pain due to combat injuries, overuse syndromes, or stress-related musculoskeletal dysfunction. Pain interferes with sleep by causing micro-awakenings, which prevent the progression into deep non-REM and REM sleep [56].

The statistically significant reduction of 52.2% in mean pain levels (p=0.000) highlights the strong analgesic potential of MPS therapy applied in the home setting. While this degree of improvement is lower than outcomes reported in professionally administered treatments-75% reduction in back pain [57]and 80% reduction in neck pain [58] - this difference likely reflects several essential factors: practitioner expertise in acupoint selection and protocol optimization, individualized treatment adjustments, and adherence oversight. Nonetheless, the home-based results surpass the efficacy of numerous professional modalities, underscoring the accessibility and scalability of MPS therapy for chronic pain self-management. Sleep disturbances are a key symptom of and often present as insomnia, nightmares, and frequent awakenings. Poor sleep, in turn, worsens PTSD by impairing emotional regulation, memory processing, and fear extinction, making trauma symptoms more persistent and more challenging to treat [5]. PTSD and sleep disturbances are deeply interconnected, creating a cycle that worsens both physical and emotional health. PTSD often disrupts sleep through nightmares, insomnia, and heightened arousal, which increases pain sensitivity and emotional dysregulation [4,13,14].

Together, sleep deprivation and chronic pain act as compounding stressors, reinforcing the neurological and hormonal imbalances associated with PTSD - including elevated cortisol, reduced heart rate variability, and overactivation of the amygdala. Veterans suffering from sleep disorders-such as insomnia or obstructive sleep apnea - are more likely to be prescribed opioids, often at increased dosages, placing them at higher risk for misuse and overdose. There was an increase of 39.5% [p=0.000] in mean sleep duration levels. Autonomic nervous system regulation after microcurrent application has been reported in literature [59-60], which is further supported by this increase in sleep duration. This increase in sleep is theorized to influence general well-being, reduce pain and PTSD symptomology, which then had a direct impact on quality of life and cost reduction for pharmacological medications and hospital visits.

PTSD. Studies have shown that veterans with PTSD are more likely to receive higher-dose and long-term opioid prescriptions than those with pain alone; veterans with PTSD were more likely to be prescribed high-dose opioids, to receive multiple concurrent opioids, and to be co-prescribed benzodiazepines or gabapentinoids=all of which raise the risk of misuse, overdose, and adverse events [33]. Additionally, comorbid PTSD often leads to off-label prescribing of sedatives and sleep medications. In that respect, our study showed a notably significant 30.0% reduction in PTSD symptoms (p=0.000), suggesting that MPS influences autonomic regulation and enhances vagal tone, both of which are imbalanced in trauma-related patients.

The interplay of PTSD, pain, and disrupted sleep dramatically affects veterans' daily functioning and their quality of life. PTSD exacerbates pain perception through central nervous system sensitization, which then amplifies sleep disturbances, further increasing pain sensitivity and contributing to emotional distress. A study of combat veterans found that sleep quality was a stronger predictor of quality of life than pain interference, highlighting the critical role of sleep in overall recovery [16]. The interconnection between PTSD, chronic pain, and sleep. Disturbances form a powerful biopsychosocial feedback loop that intensifies suffering while driving increased opioid use and fueling the current crisis among U.S. veterans. PTSD-induced hyperarousal disrupts sleep and heightens pain sensitivity, contributing to the ongoing crisis of opioid use disorder among U.S. veterans [16].

This cycle and interplay of PTSD, pain and sleep disturbance create a negative feedback loop. Veterans living with PTSD often face a vicious triad of compounding issues: PTSD heightens pain sensitivity; pain disrupts restorative sleep, and sleep deficits further drain emotional and physical resilience and diminish quality of life. This negative feedback loop amplifies suffering, frequently driving increased reliance on opioids and escalating healthcare utilization. Over time, this cycle leads to heightened pain sensitivity from PTSD, disruption of sleep from pain, Sleep deficits further deplete emotional and physical resilience, resulting in greater opioid reliance and escalating healthcare use (Vicious Triad Loop), which finally leads to diminishing the quality of Life (QOL).

Functional and healthcare-related outcomes. Equally significant was the 56.48% reduction in pain pill usage per day (p=0.000), suggesting that MPS therapy may serve as a viable non-pharmaceutical strategy in mitigating opioid dependency, a significant concern in the veteran population. The 73.13% improvement in general health and the 69.72% increase in quality of life (both $p < 0.000$) demonstrate not only symptom relief but also enhanced overall well-being. Additionally, the observed reductions in monthly home visits (74.54%, $p = 0.004$) and VA visits (79.60%, $p = 0.001$) suggest a downstream impact on healthcare utilization, implying potential cost savings and benefits from resource reallocation.

Taken together, these outcomes indicate that MPS therapy, when self-administered at home, is both practical and scalable. While these results are promising, further randomized controlled

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trials with larger sample sizes and more extended follow-up periods are warranted to validate these findings and explore underlying mechanisms. Nevertheless, this study offers a strong foundation for integrating non-invasive, home-based electrotherapeutic strategies into veteran care, particularly for addressing the interconnected challenges of chronic pain, PTSD, and sleep disruption. Non-pharmaceutical stress-reducing interventions - such as microcurrent therapy, vagus nerve stimulation, acupuncture, and trauma-informed bodywork - offer promising, integrative solutions to break this loop. These approaches can reduce pain, improve sleep architecture, regulate stress responses, and restore a sense of agency, helping veterans heal without the harmful side effects or dependency risks associated with opioid-based care.

In conclusion, PTSD and Chronic pain can limit quality of life, restrict work and social engagement, and often lead to the development of drug dependency in various forms. Our patient sample of active-duty military personnel and veterans with symptoms of military-related traumatic stress and pain self-applying MPS to acupuncture points and scars in the home setting showed robust improvements in pain reduction, PTSD symptoms, sleep duration, and quality of life markers with no adverse events. This study is the first to show the successful self-application of a known stress-reducing modality by military personnel or veterans with PTSD in the home setting.

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