Using Mindfulness Meditation to Improve Pain Management in Combat Veterans with Traumatic Brain Injury

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INTRODUCTION

- Pain conditions are the most frequently reported health concern in Veterans who served in Afghanistan (OEF) or Iraq (OIF) (1,2) and are highly comorbid with traumatic brain injury (TBI) (3). However, availability of specialized pain care is limited and few treatment options have been found to be effective for long-term management of chronic pain (4). This pilot study examined the effectiveness of mindfulness meditation (MM) for managing chronic pain in OEF/OIF Veterans who sustained a TBI during deployment.
- Integrative Restoration Yoga Nidra (iRest®) is a type of MM that promotes deep relaxation through breathing, guided imagery, and progressive relaxation. iRest is provided at Veterans Affairs (VA) hospitals nationwide, but little data exists to support the health benefits. This is the first study to research iRest for chronic pain after TBI.
- This study examined whether iRest relieved chronic pain more effectively than standard care alone. Based on prior research on the benefits of MM for chronic pain (6,7), we hypothesized that iRest would lower perceived pain by >20% and ameliorate pain-related symptoms as indicated by reports of 'somewhat' to 'completely' improved' for specific symptoms and 'moderately better' to a 'definite improvement' for quality of life.

METHODS

- Study participants were recruited at the Veterans Affairs Medical Center (DC VAMC). IRB approval was granted by DC VAMC and American University. Inclusion criteria included 20-60 years old, male, deployment to OEF/OIF, and self-reported pain $\geq$ 5 out of 10. Exclusion criteria were alcohol consumption > 3oz/day, illicit substance use, or prescription medications that could influence pain perception (over the counter analgesics were permitted).
- Self-report metrics included the following:
  1) Visual Analog Scale (VAS) to measure intensity from '*no pain*' (0mm) to '*worst pain imaginable*' (100mm)
  2) Defense and Veterans Pain Rating Scale to assess:
     a) pain intensity from '*no pain*' [0] to '*as bad as it could be*' [10] and
     b) interference of pain with activity, sleep, mood, stress from '*does not*' [0] to '*completely*' [10] interferes
  3) Patient Global Impression of Change (PGIC) to evaluate changes in pain-related:
     a) activity limitations and overall quality of life from '*no change*' [1] to '*a great deal better*' [7]
     b) symptoms (see Figures 4-5) from '*no*' to '*yes somewhat*' to '*yes completely*' or '*don't have this problem*'
- Veterans were randomly assigned to 8 weeks of iRest (n=4) or standard care alone (n=5). Measures were given at baseline (B), endpoint (E) and 4-week follow-up (F). A 20% reduction in pain was deemed clinically important, according to the Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials (IMMPACT) (5).

RESULTS

- Veterans in the iRest group reported decreased pain intensity on the VAS (22.5-42.4%; Figure 1) and DVPRS (26.9%; Figure 2), and lowered pain interference (34.2-41.1%; Figure 3), and was greater than for the control group across all measures. Significant decreases were found in VAS pain intensity from B-F (p=.041) and pain interference from B-E and B-F (p=.013; p=.032). No significant differences were seen among controls (Table 1).
- Large effect sizes were observed for pain interference within the iRest group from B-E (d_1=1.21) and B-F (d_1=1.09; Table 1). In contrast, changes in DVPRS pain intensity were smaller in size (d_1=0.77–0.88). Effect sizes between groups were primarily medium for intensity (d_2=0.42–0.68) and small for interference (d_2=0.41–0.42).

Table 1. **Paired t-test Results**

Measure	Time	Group	*n*	*M*	*SD*	*t*	*df*	*p*	d_1	d_2
Visual Analogue Scale	B-E	CASE	4	28.75	25.68	2.24	3	.111	1.19†	0.62
		CONTROL	5	11.00	19.14	1.29	4	.268		
	B-F	CASE	4	15.25	8.85	3.45	3	.041*	0.77	0.68
		CONTROL	5	1.20	9.09	0.295	4	.783		
DVPRS Intensity	B-E	CASE	4	1.75	1.50	2.33	3	.102	0.77	0.68
		CONTROL	5	0.40	1.14	0.78	4	.477		
	B-F	CASE	4	1.75	1.71	2.05	3	.133	0.88†	0.42
		CONTROL	5	-0.70	0.67	-2.33	4	.080		
DVPRS Interference	B-E	CASE	4	3.00	1.14	5.28	3	.013*	1.21†	0.41
		CONTROL	5	0.45	1.59	.631	4	.562		
	B-F	CASE	4	2.50	1.32	3.78	3	.032*	1.09†	0.42
		CONTROL	5	-0.20	1.46	-.306	4	.775		

Note. B-E = Baseline to Endpoint. B-F = Baseline to Follow-up. *M*=mean difference, *SD*=standard deviation of the mean difference, *df*=degrees of freedom, *t*=*T*-value (two-tailed at significance level p<0.05), *d*=Cohen's d. d_1 is the effect size of the pre-post difference within the case group only. d_2 is the effect size of the difference between case group and control group at endpoint or follow-up.*p<.05; † = large effect size ($d \geq 0.80$).

Figure 1. **Mean Pain Intensity (VAS)**

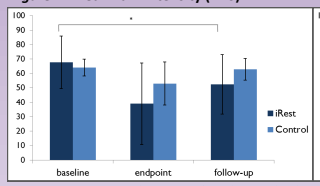
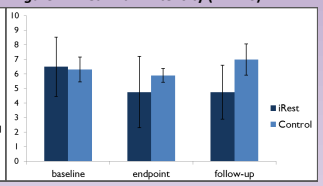
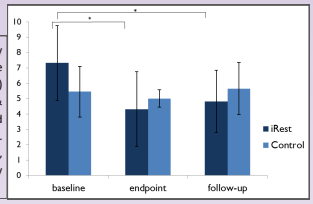


Figure 2. **Mean Pain Intensity (DVPRS)**



Note. Error bars depict the 95% Confidence Intervals. * = significant result (p<.05)

Figure 3. **Mean Pain Interference (DVPRS)**



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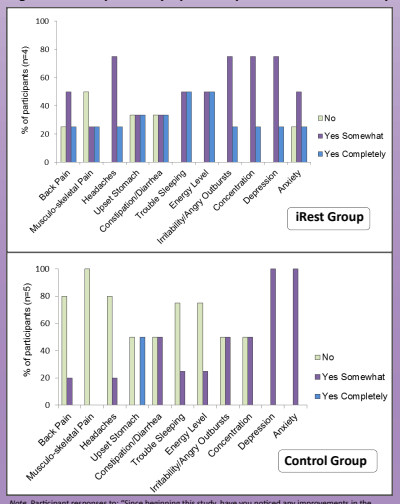
RESULTS (continued)

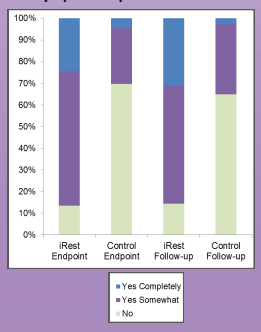
- The iRest group reported on average a '5' ('moderately better') to '6' ('a definite improvement') at E (M=5.50, SD=0.58) and F (M=5.50, SD=0.58) compared to control group responses of a '2' ('hardly any change at all') at E (M=2.20, SD=1.30) and F (M=2.00, SD=1.00). Between group differences were significant at E, $t(7) = 4.66$, p=.002 and F, $t(7) = 6.17$, p=.000.
- iRest participants reported a number of symptoms improved 'somewhat' or 'completely' from B-F including headaches, trouble sleeping, energy level, irritability/angry outbursts, concentration, and depression (Figure 4). In contrast, a larger proportion of controls responded 'no' improvement on most symptoms except for depression and anxiety (Figure 5).
- A greater percentage of iRest participants (~85%) responded 'yes completely' or 'yes somewhat' when all symptoms were combined vs. the control group (~30%) at both E and F (Figure 6). Symptom improvement was associated with group membership (iRest, control) at E, $X2(2, N=80) = 26.25$, $p=.00$, V=.573, and F, $X2(2, N=79) = 24.32$, $p=.00$, V=.555.

Figures 4-5. **Reported Symptom Improvement at Follow-up**



Note. Participant responses to: "Since beginning this study, have you noticed any improvements in the following symptoms?"

Figure 6. **Overall Reported Symptom Improvement**



CONCLUSION

- This pilot study offers preliminary support for the health benefits of iRest for chronic pain. iRest achieved clinically important reductions (>20%) in pain intensity and interference (22.5-42.4%). Effect sizes within the iRest group were generally larger for interference and medium for intensity. Those receiving iRest reported a discernable improvement in activity limitations, symptoms, and quality of life at E and at F, a finding which was not evident among controls.
- Study limitations include the small sample size and low statistical power, which challenges the validity of the results. Since the iRest group began the study with elevated pain interference (Figure 3), regression to the mean could explain the observed improvements. These findings may not be generalizable to chronic pain patients a) receiving care outside VA hospitals, b) without comorbidities such as TBI, and c) of female gender. This study focused on male veterans because increased resources would have been needed to control for gender-specific variability in pain perception.
- Despite these limitations, this study provides initial support for the therapeutic potential of iRest for those living with chronic pain after TBI. Self-management of pain should be emphasized by disseminating techniques such as iRest to help patients cope with and reduce pain-related symptoms (4). Self-management fosters self-efficacy by enabling chronic pain patients to acquire cognitive, behavioral, and emotional skills (8) that develop a sense of empowerment and a belief they can control their experience of pain under many circumstances (9).
- iRest is a promising, multi-faceted self-management approach well-suited to empower chronic pain patients to apply the skills and techniques learned to proactively manage their condition and improve overall quality of life. Further research is warranted on larger samples to confirm the effectiveness of iRest for managing chronic pain.

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