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## Original Article

## The Relaxation Response Resiliency Program (3RP) in Patients with Headache and Musculoskeletal Pain: A Retrospective Analysis of Clinical Data

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## ABSTRACT

**Background:** Headache and musculoskeletal pain are associated with both physical and mental health symptoms, which together are mutually reinforcing. Addressing mental and physical health symptoms (including pain) concomitantly may provide an effective and efficient way to improve outcomes in this population. We tested an evidence-based, eight-session multimodal group program, the Relaxation Response Resiliency Program (3RP), in patients with headache and musculoskeletal pain. A total of 109 adults (30 with headaches, 79 with musculoskeletal pain).

**Methods:** Participant were 109 adults (30 with headaches, 79 with musculoskeletal pain) referred by their medical doctor, who completed a battery of questionnaires before and after completion of the 3RP. **Results:** On average, patients with headache and musculoskeletal pain had higher pretreatment scores for anxiety, depression, and somatization symptoms than the nonpatient normative sample for the Symptom Checklist 90—Revised. Significant improvements were identified from pre- to post-treatment in all mental health symptoms (moderate to large effects) and frequency of pain and co-occurring physical health symptoms (small to moderate effects). Patients also reported significant decreases in degree of discomfort and life interference, which were relatively more modest in the musculoskeletal pain group compared with the headache group.

**Conclusions:** Overall, results of this study suggest that the 3RP may be an effective treatment for reducing pain and psychological symptoms in patients with headaches and musculoskeletal pain. Future work is needed to evaluate the 3RP via a randomized clinical trial in these patient populations.

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Pain is a ubiquitous human experience affecting 20% of the world's population and up to one third of Americans (Goldberg & McGee, 2011). In the United States, pain is the number one reason patients seek medical care (DeTorres, Marques, Leal, & Rocha-Filho, 2015), and pain relievers are the second most commonly prescribed medication (Schappert & Burt, 2006). Despite its high prevalence, pain is recognized as one of the most underestimated and undertreated global health problems (IASP, 2013).

Individuals with pain often experience comorbid psychological symptoms such as anxiety and depression (Gatchel, 2004). For

example, nearly 35% of people with chronic pain have comorbid depression, and 17%–35% have comorbid anxiety (Bromley Milton et al., 2013). Further, when psychiatric symptoms and pain co-occur, the severity of both types of symptoms is greater (Betrus, Elmore, & Hamilton, 1995; Leo, 2005; Ohayon & Schatzberg, 2003; Von Korff, Ormel, Katon, & Lin, 1992; Wells, Golding, & Burnam, 1989). Therefore, treatments that simultaneously target both pain and psychological symptoms may be useful and cost efficient (Bair, Robinson, Katon, & Kroenke, 2003).

Mind-body treatments may be particularly helpful for individuals with pain conditions and co-occurring mental health symptoms (Lee, Crawford, & Hickey, 2014). These interventions consist of skills intended to target the cognitive, behavioral, and biological processes that contribute to the experience and maintenance of both pain and psychiatric illness. Specific skills include

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meditation, relaxation training, guided imagery, and cognitive-behavioral techniques (e.g., cognitive restructuring) (Astin, Shapiro, Eisenberg, & Forys, 2003). A large body of research indicates that mind-body therapy is effective in treating various pain conditions such as arthritis and back pain (Fouladbakhsh, 2012; Henschke et al., 2010; Prusak, Prusak, & Mahoney, 2014).

The present study sought to evaluate a mind-body group treatment called the Relaxation Response Resiliency Program (3RP) (Park et al., 2013) among patients who presented for treatment with headaches and musculoskeletal pain as primary health concerns. The 3RP is a comprehensive multimodal stress reduction intervention aimed at improving both mental and physical health symptoms (see program description later). Previous work has found that this treatment reduces mental and physical health symptoms (Samuelson et al., 2010; Vranceanu et al., 2013; Vranceanu, Merker, Plotkin, & Park, 2014). However, no study to date has evaluated whether the 3RP is effective in improving both physical and mental health symptoms in patients with pain conditions. We hypothesized that patients with headaches and musculoskeletal pain participating in the 3RP would experience pre- to post-treatment improvements in mental health (e.g., anxiety, depression, and somatization symptoms) and physical health (e.g., frequency, degree of discomfort, and degree of interference from pain and co-occurring physical symptoms such as insomnia and fatigue).

## Material and Methods

### Sample

Participants were 109 adults who previously completed the 3RP at the Massachusetts General Hospital Benson Henry Institute for Mind Body Medicine and self-reported headaches or musculoskeletal pain as a primary health concern. All patients were referred to the program by a medical provider for stress management skills. Inclusion criteria included being 18 years of age or older, English speaking, and free of active substance abuse problems. Data were collected for clinical purposes and quality metrics. Institutional review board approval was received for secondary use of the clinical data for the present study.

### The Relaxation Response Resiliency Program

The 3RP is a comprehensive group program based on the principles and practice of mind-body medicine. Its main goal is increased resiliency through improved ability to cope with daily stress and medical symptoms. This structured, manualized program consists of eight weekly 2-hour sessions led by experienced mind-body clinicians. The crux of the clinical program is the elicitation of the relaxation response at the beginning of each session using a variety of methods, including breath awareness, single-pointed meditation, imagery, mindful awareness, contemplation, and yoga. The program incorporates educational information about the mind-body connection, training to develop mind-body awareness and connectedness to oneself and others, cognitive and behavioral skills (e.g., cognitive restructuring), and positive psychology skills (e.g., cultivation of positive emotions, use of humor and empathy) (Park et al., 2013).

### Measures

Participants completed a demographic questionnaire (e.g., age, sex, race/ethnicity) and measures assessing mood, anxiety, and somatic symptoms; pain; and physical health concerns before and after the eight group sessions. Participants were also asked to identify and describe the top three health problems they hoped to

target through their participation in the 3RP. The present study only included individuals who reported headaches or musculoskeletal pain as primary health problems.

### The Medical Symptom Checklist

The Medical Symptom Checklist (Leserman & Dorrington, 1987) assesses the frequency and the degree of discomfort and interference of 23 somatic symptoms. Individuals rate the frequency for each symptom on an 8-point Likert-type scale (0 = never/almost never, 1 = <1 time/month, 2 = 1-2 times/month, 3 = 1 time/week, 4 = 2-3 times/week, 5 = 4-5 times/week, 6 = 1 time/day, 7 = >1 time/day, 8 = constantly). For each symptom endorsed, the degree of discomfort and interference is rated on an 11-point Likert-type scale (0 = none to 10 = severe). A pain discomfort score  $\geq 4$  out of 10 was considered clinically meaningful (Butt et al., 2008).

### The Symptom Checklist-90-R

The Symptom Checklist-90-R (Derogatis, 1992) is a 90-item self-report measure that assesses symptoms of psychiatric disorders across nine domains and yields a global severity index (GSI) as a measure of general distress. Individuals rate on a 5-point scale how much a particular item describes their behavior in the past week (0 = not at all to 4 = extremely). The measure has excellent psychometric properties, both for reliability and validity ( $\alpha$  coefficients ranging from .77 to .90 (Derogatis, 1992; Derogatis & Fitzpatrick, 2004). Standardized nonpatient T scores for the anxiety, depression, and somatization symptom domains and the GSI were used for the current analyses.

### Data Analyses

All analyses were conducted with SPSS (Version 22). Descriptive statistics were used to summarize demographic data. We examined changes in the frequency, degree of discomfort, and degree of interference in pain and co-occurring physical symptoms that were endorsed within each group as occurring on average at least monthly (mean symptom frequency  $\geq 2$ ). Main analyses were conducted with paired samples *t* tests for each participant group (headache or musculoskeletal pain) and Cohen's *d* effect sizes were calculated.

## Results

Demographic characteristics for participants reporting headaches ( $n = 30$ ) and musculoskeletal pain ( $n = 79$ ) are presented by group in Table 1. On average, participants attended 7.2 sessions (standard deviation [SD] = 1.1). Participants presenting with headaches were on average 39 years old ( $SD = 10.9$ ), and those with musculoskeletal pain were 46 years old ( $SD = 13.0$ ). The majority of participants in the headache group were female (83.3%), white (76.6%), married or with a partner (80%), and employed (60%). Similarly, the majority of participants presenting with musculoskeletal pain were female (68.4%), white (92.4%), married or with a partner (73.4%), and employed (72.2%).

### Mental Health Symptoms

On average, pretreatment scores for anxiety, depression, and somatization symptom domains and the GSI in the headache and musculoskeletal pain groups were within the clinical range relative to standardized scores for nonpatients (Table 2). Significant improvements were identified from pre- to post-treatment in all mental health symptom domains and the GSI in both groups with moderate to large effects sizes (Cohen's *d* range = .47-.92; see Table 2).

**Table 1**  
Demographic Characteristics

Demographic Variables	Headache Pain, n = 30	Musculoskeletal Pain, n = 79
Age M (SD)	39.3 (10.9)	46.3 (13.0)
Gender		
Men	5 (16.7%)	25 (31.6%)
Women	25 (83.3%)	54 (68.4%)
Race		
White	23 (76.7%)	73 (92.4%)
Nonwhite	7 (23.3%)	3 (3.8%)
Missing	0	3 (3.8%)
Marital status		
Partnered	24 (80%)	58 (73.4%)
Unpartnered	6 (20%)	21 (26.6%)
Work status		
Full-time/part-time	18 (60%)	57 (72.2%)
Not working	11 (36.7%)	22 (27.8%)
Missing	1 (3.3%)	0

M = mean; SD = standard deviation.

### Pain and Physical Health Symptoms

#### Headache Group

Symptoms occurring at least monthly pretreatment included headaches, fatigue, insomnia, and backache (Table 3). The most commonly occurring symptom reported was headaches, occurring an average of 2–3 times per week at baseline. The average degree of discomfort from headaches ( $M = 6.1$ ,  $SD = 2.1$ ) was greater than the clinically meaningful cutoff ( $\geq 4/10$ ) for pain (Butt et al., 2008) with a mild degree of interference ( $M = 4.4$ ,  $SD = 2.8$ ). Fatigue occurred on average once per week, and insomnia and backache occurred on average 1–2 times per month. There was a significant decrease in the frequency of headaches from pre- to post-treatment ( $p < .01$ ; Cohen's  $d = .42$ ). There were small effect sizes for changes in the frequency of fatigue, insomnia, and backache (Cohen's  $d$  range = .22–.33). There were significant decreases in the degree of discomfort related to headaches ( $p < .001$ ; Cohen's  $d = .93$ ), fatigue ( $p < .01$ ; Cohen's  $d = .35$ ), insomnia ( $p < .05$ ; Cohen's  $d = .26$ ), and backache ( $p < .01$ ; Cohen's  $d = .063$ ). There were significant decreases in the degree of interference related to headaches ( $p < .05$ ; Cohen's  $d = .44$ ), insomnia ( $p < .01$ ; Cohen's  $d = .34$ ), and backache ( $p < .05$ ; Cohen's  $d = .42$ ) but not fatigue (Cohen's  $d = .27$ ).

#### Musculoskeletal Pain Group

Symptoms occurring at least monthly pretreatment included backache, fatigue, muscle ache, joint ache, insomnia, headaches, and abdominal pain (see Table 3). The most commonly occurring symptom reported was backache, occurring on average two to three times per week. The average degree of discomfort from backache ( $M = 4.2$ ,  $SD = 3.5$ ) was greater than the clinically

meaningful cutoff for pain (Butt et al., 2008) with a mild degree of interference ( $M = 3.5$ ,  $SD = 3.5$ ). Fatigue, muscle ache, joint ache, and insomnia occurred on average once per week, and headaches and abdominal pain occurred on average one to two times per month. There were significant pre- to post-treatment decreases in the frequency of backache ( $p < .05$ ; Cohen's  $d = .26$ ), fatigue ( $p < .001$ ; Cohen's  $d = .38$ ), muscle ache ( $p < .05$ ; Cohen's  $d = .22$ ), headaches ( $p < .05$ ; Cohen's  $d = .27$ ), and abdominal pain ( $p < .05$ ; Cohen's  $d = .26$ ). There were small effect sizes for changes in the frequency of joint ache and insomnia (Cohen's  $d = .10$  and  $.17$ , respectively). There were significant decreases in the degree of discomfort related to backache ( $p < .001$ ; Cohen's  $d = .39$ ), muscle ache ( $p < .05$ ; Cohen's  $d = .24$ ), headaches ( $p < .05$ ; Cohen's  $d = .21$ ), and abdominal pain ( $p < .01$ ; Cohen's  $d = .32$ ). There were small effect sizes for changes in the degree of discomfort related to fatigue, joint ache, and insomnia (Cohen's  $d = .21$ ,  $.10$ , and  $.10$ , respectively). There were significant decreases in the degree of interference related to backache ( $p < .001$ ; Cohen's  $d = .43$ ), fatigue ( $p < .001$ ; Cohen's  $d = .39$ ), insomnia ( $p < .05$ ; Cohen's  $d = .28$ ), and abdominal pain ( $p < .01$ ; Cohen's  $d = .33$ ). There were small effect sizes for changes in the degree of interference related to muscle ache, joint ache, and headaches (Cohen's  $d = .16$ ,  $.14$ , and  $-.4$ , respectively).

### Discussion

The primary aim of this paper was to provide an initial effectiveness assessment of the 3RP, a comprehensive mind-body intervention, for improving pain and relevant co-occurring mental and physical health symptoms in individuals presenting with headaches and musculoskeletal pain at an outpatient academic medical center. As expected, attendees in both groups reported moderate to large pre- to post-treatment improvements in depression, anxiety, somatization symptoms, and global symptom severity. On average, gains were slightly smaller for the musculoskeletal pain compared with the headache group.

Individuals in both the headache and musculoskeletal pain group had significant pre- to post-symptom improvements in the frequency of pain and co-occurring physical health symptoms. The improvements in symptom frequencies were generally small to moderate for both groups. As expected, declines in headache frequency were most pronounced in the headache group. Attendees in the musculoskeletal group reported declines in the frequency of fatigue, headaches, backache, abdominal pain, and muscle aches. Individuals in both groups also had significant improvements in degree of discomfort and life interference. Improvements in discomfort and life interference were relatively more modest in the musculoskeletal pain compared with the headache group. Attendees in the headache group reported a decrease in discomfort

**Table 2**  
Pre- and Post-treatment Changes in Mental Health Symptoms

SCL-90-R, Symptom Scales	Headache Group n = 28				Musculoskeletal Pain Group n = 69			
	Pretreatment, M (SD)	Post-Treatment, M (SD)	t*	d <sup>  </sup>	Pretreatment, M (SD)	Post-Treatment, M (SD)	t	d <sup>  </sup>
Anxiety	62.6 (9.6)	55.2 (12.1)	3.7 <sup>†</sup>	.69	61.1 (11.4)	56.0 (10.3)	4.1 <sup>‡</sup>	0.47
Depression	63.9 (8.9)	56.8 (10.1)	5.5 <sup>†</sup>	.76	63.7 (9.1)	58.5 (9.5)	4.9 <sup>‡</sup>	0.56
Somatization	60.9 (10.9)	56.0 (7.9)	2.7 <sup>§</sup>	.52	63.3 (8.2)	57.9 (9.3)	5.7 <sup>‡</sup>	.62
Global Severity Index	63.6 (7.5)	55.7 (9.9)	5.6 <sup>†</sup>	.92	62.7 (8.5)	57.7 (8.7)	5.9 <sup>‡</sup>	.59

M = mean; SD = standard deviation; SCL-90-R = Symptom Checklist-90-R.

\* Paired-sample  $t$  test.

<sup>†</sup>  $p < .01$ .

<sup>‡</sup>  $p < .001$ .

<sup>§</sup>  $p < .05$ .

<sup>||</sup> Cohen's  $d$  effect size.

**Table 3**

Pre- and Post-Treatment Changes in Physical Health Symptoms in Patients with Headaches (n = 30) and Musculoskeletal Pain (n = 79)

MSCL Symptoms*	Frequency of Symptom				Degree of Discomfort				Degree of Interference			
	Pretreatment, M (SD)	Post-Treatment, M (SD)	t <sup>†</sup>	d <sup>‡</sup>	Pretreatment, M (SD)	Post-Treatment, M (SD)	t	d <sup>‡</sup>	Pretreatment, M (SD)	Post-Treatment, M (SD)	t	d <sup>‡</sup>
Headaches (N = 30)												
Headaches	4.2 (1.7)	3.5 (1.7)	30.0 <sup>‡</sup>	.42	6.1 (2.1)	3.9 (2.7)	50.0 <sup>§</sup>	.93	4.4 (2.8)	3.2 (2.7)	20.3 <sup>  </sup>	0.44
Fatigue	2.8 (2.9)	2.2 (2.5)	10.8	.23	2.9 (3.2)	1.9 (2.6)	20.9 <sup>‡</sup>	.35	2.7 (3.3)	1.9 (2.7)	20.0	0.27
Insomnia	2.4 (2.5)	1.9 (2.2)	10.9	.22	2.3 (2.9)	1.6 (2.5)	20.2 <sup>  </sup>	.26	2.7 (3.2)	1.7 (2.7)	30.2 <sup>‡</sup>	.34
Backache	2.0 (1.9)	1.4 (1.8)	10.9	.33	2.8 (2.7)	1.4 (1.7)	30.2 <sup>‡</sup>	.63	2.0 (2.6)	1.1 (1.6)	20.2 <sup>  </sup>	.42
Musculoskeletal Pain (N = 79)												
Backache	4.0 (3.2)	3.2 (3.1)	20.6 <sup>  </sup>	.26	4.2 (3.5)	2.9 (3.2)	30.5 <sup>§</sup>	.39	3.5 (3.5)	2.1 (3.0)	40.3 <sup>‡</sup>	.43
Fatigue	3.6 (3.1)	2.5 (2.7)	40.1 <sup>‡</sup>	.38	3.2 (3.5)	2.5 (3.2)	10.9	.21	3.8 (3.6)	2.5 (3.1)	40.3 <sup>‡</sup>	.39
Muscle ache	3.1 (3.4)	2.4 (3.0)	20.1 <sup>  </sup>	.22	3.1 (3.7)	2.3 (3.0)	20.3 <sup>  </sup>	.24	2.6 (3.5)	2.1 (2.8)	10.6	.16
Joint ache	2.9 (3.3)	2.6 (3.0)	10.3	.10	2.7 (3.2)	2.4 (2.9)	10.1	.10	2.4 (3.1)	2.0 (2.7)	10.2	.14
Insomnia	2.4 (2.5)	2.0 (2.3)	10.7	.17	2.5 (3.3)	2.2 (2.9)	.7	.10	2.9 (3.6)	2.0 (2.8)	20.5 <sup>  </sup>	.28

M = mean; SD = standard deviation; MSCL = Medical Symptoms Checklist.

\* Only symptoms occurring at least monthly were evaluated.

† Paired-sample t test.

‡ p &lt; .01.

§ p &lt; .001.

|| p &lt; .05.

¶ Cohen's d effect size.

and life interference related to fatigue, insomnia, and backache even though there were no significant changes in the frequency of these symptoms.

#### Implications for Practice

We can draw two implications from these results. First, results suggest that the 3RP may aid in improving resilience and adaptation to pain and associated symptoms. This manualized treatment may be easily implemented into hospital units and outpatient settings to bolster pain management efforts. Second, reduced interference as a result of pain and other physical symptoms may be secondary to significant improvement in mental health symptoms or both. The 3RP may be ideal to target the complex nature of pain experiences including both physical and mental health-related symptoms. Evidence supports both implications drawn (Feldman, Downey, & Schaffer-Neitz, 1999; Karoly & Ruehlman, 2006; Zautra, Johnson, & Davis, 2005). Future work should evaluate specific explanatory mechanisms associated with improvements in the frequency of pain symptoms and the distress and interference related to these symptoms.

#### Limitations

There are several limitations to the present study. First, this was an uncontrolled single-arm study. The lack of a comparison condition and random assignment does not permit conclusions regarding the efficacy of the 3RP for treatment of pain and comorbid symptoms. Future work is needed to evaluate the 3RP using a randomized controlled design and a credible comparison treatment for patients experiencing pain conditions. Second, the sample was demographically homogenous in terms of race and ethnicity and socioeconomic status. Third, patients self-reported their primary health concerns, and symptom duration was not assessed. Future work is needed to evaluate the 3RP among patients with clinician-confirmed pain conditions. In addition, it would be useful to ascertain information regarding the duration of pain experiences to examine treatment response based on symptom chronicity. Fourth, the 3RP treatment protocol was not adapted specifically for patients with pain and did not contain education or techniques specifically regarding pain management. Although significant

changes were identified in this open trial of the general 3RP treatment protocol in patients with musculoskeletal and headache pain, future work would benefit from investigating specific adaptations that might serve to enhance the treatment effects for pain management. Last, it is unknown whether patients participating in the 3RP who have immediate improvement in pain experiences are able to sustain these gains over time. Longer-term follow-up data are needed to evaluate the maintenance of treatment gains.

#### Conclusions

Overall, the results of this study suggest that the 3RP may be effective for simultaneously addressing both pain experiences and psychological symptoms in a clinical practice setting. These findings are consistent with other mind-body intervention studies reporting improvements to psychological and physical symptoms in people with various pain conditions (Gustavsson & von Koch, 2006; Mehling, Hamel, Acree, Byl, & Hecht, 2005; Prusak et al., 2014; Wolsko, Eisenberg, Davis, & Phillips, 2004). Therefore, a multimodal group 3RP treatment has the potential to efficiently and effectively improve mental and physical health symptoms in patients with headache and musculoskeletal pain and may generalize to other pain conditions. Clinical and research efforts with these patients should include ongoing assessments of functioning and quality of life outcomes to better characterize the broader implications for this mind-body intervention.

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