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Effectiveness of Therapeutic Massage for Generalized Anxiety Disorder: A Randomized Controlled Trial

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Abstract

Background—Although massage is one of the most popular complementary and alternative medical (CAM) treatments for anxiety, its effectiveness has never been rigorously evaluated for a diagnosed anxiety disorder. This study evaluates the effectiveness of therapeutic massage for persons with generalized anxiety disorder (GAD).

Methods—Sixty-eight persons with GAD were randomized to therapeutic massage (n=23), thermotherapy (n=22) or relaxing room therapy (n=23) for a total of 10 sessions over 12 weeks. Mean reduction in anxiety was measured by the Hamilton Anxiety Rating Scale (HARS). Secondary outcomes included 50% reduction in HARS and symptom resolution of GAD, changes in depressive symptoms (PHQ-8), worry and GAD-related disability. We compared changes in these outcomes in the massage and control groups post-treatment and at 6 months using generalized estimating equation (GEE) regression.

Results—All groups had improved by the end of treatment (adjusted mean change scores for the HARS ranged from −10.0 to −13.0; $p < 0.001$) and maintained their gains at the 26 week follow-up. No differences were seen between groups ($p = 0.39$). Symptom reduction and resolution of GAD, depressive symptoms, worry and disability showed similar patterns.

Conclusions—Massage was not superior to the control treatments, and all showed some clinically important improvements, likely due to some beneficial but generalized relaxation response. Because the relaxing room treatment is substantially less expensive than the other treatments, a similar treatment packaged in a clinically credible manner might be the most cost effective option for persons with GAD who want to try relaxation-oriented CAM therapies.

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Conflict of interest: Peter P. Roy-Byrne reports attending advisory board meetings (Jazz Pharmaceuticals, Solvay Pharmaceuticals). CME-sponsored speaking: CME Education, CMP Media, Imidex, Mass General Academy. In addition, we recieved donations of massage creme from Biotone, Inc., but they had no input into any aspect of the study design

Keywords

massage; therapy; therapeutic use; clinical trials, randomized; generalized anxiety disorder; relaxation; breathing exercises

INTRODUCTION

Anxiety and stress are common and costly problems afflicting American adults and are a leading reason for using complementary and alternative medical (CAM) therapies. In addition, compared to the general population, reported use of CAM therapies is higher among people with both self-described [1–3] and diagnosed psychiatric problems [4]. In fact, in a national survey of CAM use, people with self-defined anxiety or depression reported higher rates of CAM use than those with any other self-defined chronic conditions, except back or neck problems [2]. More than half of these depressed or anxious individuals used one or more CAM therapies. Massage was used by 5.2% of those with anxiety, making it the fourth most commonly used CAM therapy for this problem, after relaxation, imagery, and spiritual healing [5]. “Anxiety or depression” was the patient’s primary complaint in 5% – 9% of consecutive visits to massage therapists in two states [6].

Reduced anxiety symptoms have been reported in over a dozen studies of massage for a host of specific conditions ranging from juvenile arthritis [7] to asthma [8] and depression [9] in children, to hospital workers with substantial job stress [10] and to adults with back pain [11], HIV [12], and multiple sclerosis [13]. While several authors of review papers [14–18] indicate that the literature supports the use of massage to reduce symptoms of anxiety in persons with other conditions (at least in the short term), we could not find any clinical trials for patients with diagnosed generalized anxiety. The characteristic features of Generalized Anxiety Disorder (GAD) make it especially appropriate for such a study. In addition to the putative benefits of massage in reducing “anxiety” in a wide variety of studies [16], community surveys indicate that people with complaints of muscle tension, fatigue, chronic pain, and insomnia, common symptoms in persons with GAD, often use CAM therapies, including massage [3;19]. Furthermore, a substantial fraction of persons with GAD reportedly prefer non-biomedical treatments [20;21].

We therefore conducted a trial comparing the effects of massage on persons with GAD with two other pleasant relaxing treatments, thermotherapy (to control for personalized attention and environment) and a relaxing room (to control for environment). While each treatment group featured distinct components, all treatments shared the same treatment room and included relaxing music and deep breathing. We hypothesized that massage would be superior to the other treatments because it was specifically designed to enhance the function of the parasympathetic nervous system and relieve somatic symptoms of GAD including muscle tension.

METHODS

Study Design

This 3-arm randomized trial was conducted at Group Health, a non-profit, integrated healthcare system serving approximately 600,000 enrollees in Washington State and Idaho. The institutional review board at Group Health approved the study protocol. All study participants gave informed oral consent before telephone eligibility screening and informed written consent after study procedures had been explained to them.

Participants/Study Population

Group Health enrollees between 18 and 70 years of age who met the Structured Clinical Interview for DSM-IV (SCID)[22] criteria for a diagnosis of GAD and reported at least moderate anxiety (score of 18 or greater) on the Hamilton Anxiety Rating Scale (HARS)[23] were potentially eligible. We first used electronic records to identify persons with ICD-9 diagnosis codes consistent with GAD, “unspecified anxiety”, or dysthymia. We then used a combination of diagnoses in the medical record and screening interview questions (described in next section) to exclude persons with 1) bipolar disorder, schizophrenia, psychiatric hospitalization or suicide attempt within the last 24 months, 2) “primary depression” (i.e., those who had a PHQ-8 score [24;25] of more than 14), 3) mental retardation, 4) dementia, 5) substantial alcohol use (based on 3 questions from the Alcohol Use Disorders Identification Test (AUDIT)[26;27], 6) characteristics making them inappropriate candidates for massage (i.e., hypersensitivity to touch or loss of sensation; severe cardiovascular compromise, thrombo-phlebitis, or deep vein thrombosis; recent strokes or heart attacks; pregnancy), 7) life threatening conditions that could be associated with anxiety (e.g., cancer, AIDS), 8) characteristics making them unable to complete the study protocol (i.e., unable to speak or read English, plans to move out of town, unwilling to attend treatment sessions), 9) use of massage for anxiety or depression in the prior year (or who intended to do so), or 10) the inability to attend treatment sessions at the Group Health Research Clinic.

Recruitment and Randomization

Recruitment occurred from August 2007 through April 2008. Invitation letters were sent to patients who: 1) had made a visit to a Group Health provider in the previous 12 months that resulted in the diagnosis of GAD, “unspecified anxiety”, or dysthymia, and 2), lacked known exclusion criteria according to electronic records. A study information sheet and a 7-item questionnaire screening for GAD [28] were included with the invitation letter. Persons interested in the study were asked to return their completed GAD questionnaire in a pre-paid envelope as the first step in the eligibility process. Individuals whose scores indicated they were likely to have GAD were then telephoned by study staff and assessed for further eligibility by screening out those with uncontrollable worry, substantial alcohol use, serious medical conditions or recent surgery or use of massage for anxiety or depression in the past year. Those remaining provisionally eligible were asked to come to our research clinic for a final in-person eligibility assessment (to confirm the symptoms of GAD according to the SCID, moderate anxiety as measured by the HARS and no primary depression according to the PHQ-8). Willing eligible persons were administered a baseline questionnaire and then asked to attend their first treatment visit. Randomization occurred immediately after the baseline appointment so that treatment group was not revealed to the study participants until they came for their first treatment visit.

Treatments were assigned using a randomized independent block design programmed with the R statistical package [29]. We randomly generated sequential blocks of three, six, or nine and assigned an equal number of the three treatments within each block. Treatment assignments were then placed in opaque, sequentially numbered envelopes by a researcher not involved in participant recruitment or randomization. These envelopes were stored in a locked filing cabinet until needed.

Study Treatments

Participants in all groups were expected to make 10 hour-long weekly visits to the Group Health Research Clinic within a 12-week period. The treatment room contained a massage table, soft lighting, a CD player and a screen to hide the sink and cabinets. A recording of nature sounds or other relaxing music selected by the participant was played at low volume

in all treatments. All participants continued to have access to their health care as provided by their insurance. Treatments were provided by three female licensed massage therapists who had been in practice for 6, 11, or 21 years. The therapists received extensive training in all three treatment protocols.

Therapeutic Massage—The massage protocol was designed by an osteopathic psychiatrist with extensive experience using manual techniques similar to those commonly employed by massage therapists. The protocol was reviewed and revised by a diverse group of massage practitioners and educators.

The massage therapist performed brief assessment techniques (e.g., active, passive and resistive range of motion, soft tissue palpation) to permit customization of the protocol to each participant's needs. The treatment consisted of 9 core “releases” of specific body regions or muscle groups, performed using indirect myofascial release and designed to both mediate autonomic nervous system drive (sympathetic and parasympathetic) and release fascia and associated muscular restrictions in the shoulder area, cervical spine (C2 through C7), atlanto-occipital joint and sternocleidomastoid muscles and muscles in the thoracic and lumbar spine (T1 through L2) and sacral regions. Swedish massage techniques were also used for transitions between techniques and to extend the feeling of relaxation to the arms and hands. The core protocol was designed to take approximately 35 minutes, so the massage therapist could spend additional time in areas of greatest tension. Participants were taught deep breathing during the massage, and encouraged to use it as appropriate in the sessions. A handout on deep breathing was given to patients for daily practice at home.

Thermotherapy Control Group—The thermotherapy protocol was designed by a massage therapist to provide a pleasant experience of warmth and cool in a setting where the massage practitioner could provide customized attention to the participant.

The massage therapist performed brief assessment techniques to mimic the assessment prior to the massage treatment. The participant then received warmth delivered via heating pads and warm towels (full body and feet), which were laid slowly on various parts of the body to maximize the interaction between the massage therapist and the participant. The participant began the treatment in the supine position, but was also treated in the prone position. The massage therapist ensured that participants were comfortably positioned on the table throughout the treatment and applied the warmth to the body per protocol. Participants also had periods in the treatment when the towels were removed, so they could feel a cool contrast. Throughout the treatment, the massage therapist interacted with the participants in a warm and friendly manner but kept the amount of touching to an absolute minimum. Participants in this group were taught deep breathing as part of the treatment and the same handout used in the massage group was given to facilitate daily practice at home.

Relaxing Room Control Group—Those assigned to the relaxing room control group were helped to find a comfortable position lying on the massage table and listened to the CDs they had chosen. The massage therapist made sure that participants knew how to use the bolsters and blankets to make themselves comfortable, turned on the CD player and informed them when the session was over, but otherwise had no interaction with the participants. Participants in this group were given the same handout on deep breathing techniques given the other groups that instructed them on how to practice these techniques both during the clinic visit and daily at home.

Outcome Measures

Outcomes were measured at baseline and 12 and 26 weeks after randomization by in-person (baseline and some 12 week) or telephone interviewers (most 12 week and all 26 week) masked to treatment group. In addition to assessing the primary and secondary outcomes, the baseline in-person interview asked about sociodemographic characteristics, history of depression and anxiety and other mental health co-morbidities, and current GAD symptoms.

Our primary outcome measure was the Hamilton Anxiety Rating Scale (HARS), a 14-item semi-structured clinician rating scale designed to assess the severity of anxiety symptoms commonly used in medication and psychotherapy trials [30;31]. It contains two subscales assessing psychological (e.g., anxious apprehension) and somatic symptoms.

Worry was assessed by the Penn State Worry Questionnaire [32]. We used the somatic symptoms sub-scale of the Hamilton Anxiety Rating Scale to measure somatic symptoms. Depression was measured with the Patient Health Questionnaire (PHQ-8) [24;25]. GAD-related disability was measured with the Sheehan Disability Scale [33]. In addition, participants in the massage and thermotherapy groups were asked about therapist alliance using a modification of the Working Alliance Inventory – Patient Version {Horvarth, 1989 #3088}. At the end of the 12 week interview, we used an open ended question asking about the effect, if any, their treatment had on their thoughts, feelings, reactions or activities.

Finally, participants were asked about adverse experiences at each visit and during the 12 and 26-week follow-up questionnaires.

Statistical Analysis

We used an intent-to-treat approach to all analyses, i.e. individuals were analyzed by treatment assignment regardless of whether they attended any treatment sessions. Our primary outcome was the total score at post-treatment on the HARS. As secondary outcomes, we also examined the proportion of people in each group who were “treatment responders”, as defined by a reduction of 50% or more in the baseline value of the HARS [34], and the proportion whose symptoms resolved, as defined by a score of 7 or less on the HARS [34]. Other secondary outcomes included mean changes in the scores described in the previous section. For continuous outcomes, we used linear regression models, while for binary outcomes, we used logistic regression. All models were fit using generalized estimating equations (GEE;[35]) to take into account possible correlation within individuals over time. All P-values were based on two-tailed Wald Statistics, unless otherwise specified. Statistical significance was defined using an alpha = 0.05 and all confidence intervals are 95% confidence intervals. Adjusted models controlled for baseline values of the outcome variable, gender, age, and income. We also conducted sensitivity analyses adjusting for all baseline variables that were statistically different across treatment groups. Because 10 of 68 participants lacked baseline data on duration of current symptoms of GAD we recoded missing values as having durations of one year or longer in the sensitivity analyses.

RESULTS

Patient Recruitment and Follow-up

We evaluated 667 potential participants for eligibility using a multi-step screening process: 69 (10%) were eligible and randomized (Figure 1). Among those not randomized, 79.9% (n=478) were ineligible at some point in the screening process, with the majority found ineligible by the GAD screener (n=214) or the telephone screen (n=165). The eligibility status of all 86 persons who refused to continue the screening process was unknown. Thirty-four persons were never screened for eligibility because the recruitment period had ended.

One participant was excluded after randomization, but before receiving treatment, after we learned this individual's anxiety may have been caused by a recently diagnosed serious health condition.

Our analysis included 68 participants randomized to therapeutic massage (n=23), thermotherapy (n=22), or the relaxing room (n=23). Follow-up rates were 85% and 94% at 12 and 26-weeks, respectively, and were similar across groups. These numbers include four persons later discovered to have had PHQ scores exceeding our inclusion threshold of 14 by 1 to 3 points (two were randomized to massage, one to thermotherapy and one to the relaxing room treatment).

Baseline Characteristics

The study population was primarily married white women in their 40's who were college educated and had incomes over \$45,000 per year (Table 1). Nearly half reported their first symptoms of anxiety occurred before the age of 18 and over half reported their current symptoms had lasted more than a year.

Study Treatments

Sixty-six of the 68 participants attended at least one treatment session. Both non-attenders were in the thermotherapy group. The percentages of participants in the three groups attending at least 8 of 10 treatments (83% in massage, 77% in thermotherapy, and 61% in the relaxing room), were not significantly different (Fisher exact test, $p=0.28$). The median number of treatments attended was 10 in all groups.

Non-study Treatments

At baseline, 52 to 61% of persons were taking medications for their mental health concerns – primarily anti-depressants or anti-anxiety medications (Table 1), and there was little change at 12 weeks (Table 2). Only 4 individuals used herbal products at baseline and even fewer reported use later in the study. Less than one-quarter of the participants were seeing mental health professionals (Table 1), with similar increases in all groups between baseline and 26 weeks (Table 2). Fewer than 10% of participants in all 3 groups reported having had massage after the treatment period.

Improvement on the HARS

Over the 12 week treatment period, study participants in all groups experienced significant reductions in anxiety, as measured by the mean values of the HARS, with improvements still evident at the 26 week follow-up. (Table 3; Figure 2; $p<0.001$). Similar improvements were noted in all groups for the other HARS measures--the percentage improving by at least 50% (responders) and the percentage whose symptoms had diminished to a HARS score of less than 8 (resolved)(Table 3). However, there were no significant differences in improvement among the groups at either 12 or 26 weeks for any of these measures. Nor did adjustment for baseline values, gender, age or income or the adjusted sensitivity analyses influence any of the results.

Other Treatment Outcomes

Mean scores on the HARS Somatic subscale, the Penn State Worry Questionnaire, the PHQ-8, and the Sheehan Disability Scale decreased significantly in all groups between baseline and the end of treatment ($P<0.001$ for all outcomes), but none showed significant differences between treatment groups (Table 3). By 26 weeks, these changes from baseline remained (HARS Somatic subscale, Penn State Worry Questionnaire, Sheehan Disability

Scale) or decreased slightly (PHQ-8) (Table 3). Adjustment for baseline values, gender, age or income did not alter these findings.

Adverse Experiences

One participant in the thermotherapy group with a history of panic attacks reported a panic attack during one treatment session.

DISCUSSION

Massage was not found to be clinically or statistically superior to either the thermotherapy or relaxing room treatment at 12 or 26 weeks. Because this study lacked a no-treatment control group, we do not know if all treatments were equally effective or ineffective. A recent review of 19 trials of medications for GAD, with mean baseline HARS scores of 24.4, and a reported mean change score of -12.0 (range was -9.2 to -17.0) between baseline and the end of treatment in the treated groups compared with -7.7 (range was -2.3 to -10.2) in the placebo groups (Hidalgo (2007) [36]). The mean HARS change scores in our 12-week trial ranged between -10.0 and -13.0 , comparable to the average improvement found in the medication trials.

Furthermore, the anxiety effect sizes for pre-treatment to post-treatment changes in our trial were 1.73 (massage), 1.98 (relaxing room) and 1.99 (thermotherapy) and the depression effect sizes were 1.27 (relaxing room), 1.46 (massage) and 1.65 (thermotherapy). These effect sizes are substantially larger than the mean effect sizes for pretest to posttest comparisons in 11 trials of cognitive behavioral therapy for GAD: 0.92 for anxiety and 0.89 for depression [37]. Thus, the effects of the three treatments in our trial appear to be of clinically important magnitude.

However, remission rates for all treatments in our study were quite low. This could reflect a group that was refractory to treatment, as suggested by the high mean HARS scores at baseline. Alternatively, all three of the treatments may have value in reducing the symptoms of anxiety and worry in persons with GAD, but are not as robust as psychotherapy and medications.

The failure to find differences in outcomes among these treatments indicates that treatment effects could not be attributed to hands-on treatment or attention from a warm and caring provider, as we had expected when we designed our control interventions. However, the finding that participants in all groups improved by clinically meaningful amounts suggests that elements common to all the treatment groups (offering a safe and attractive environment, the opportunity to take time out of life, relaxing music, and instruction and encouragement to practice deep breathing), were responsible for a least some fraction of the observed therapeutic effects.

Because the thermotherapy and relaxation room treatments were developed only for the study and are not already available in the community, massage by a licensed practitioner would be the most credible and available of these treatments. However, given the comparable effects of the three treatments, a less costly way of providing symptom relief to persons with GAD would be to make treatments that mimic our relaxing room available. The challenge would be to design and package such treatments so they appear to be reasonable and appealing treatment options. For example, one could imagine a series of relaxing treatment rooms simultaneously monitored by a single practitioner-coach.

Our study had some limitations. As a small randomized trial, several imbalances among groups in possible prognostic factors at baseline occurred by chance, and we had limited

ability to fully control for such imbalances to achieve the most precise estimates of effect size. However, the sensitivity analyses indicated that the observed imbalances were unlikely to have substantially affected our results. Even though the three treatment groups had differences in their numbers of non-study treatments, the magnitude of these differences and the absence of any association with outcomes after 12 weeks make it unlikely they explained our findings. We lack detailed information on medication usage, psychotherapy, and co-morbid medical and psychiatric conditions. Thus, we cannot assess whether differences between groups in these co-interventions might have explained some of our findings. Because the optimal dose of massage for anxiety is unknown, conceivably we provided an inadequate dose of massage.

Our findings suggest a number of fruitful areas for future research. These include investigation of whether the relaxing treatments used in this trial would enhance the beneficial effects of traditional treatments, whether there are identifiable subsets of persons with GAD who would do better with a specific treatment, and whether using these techniques can promote self-care, initially by providing patients an environment that reduces anxiety and then providing the tools and support for managing future episodes of anxiety through self-care activities.

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Figure 1.
Participant Trial Flow

Figure 2. Mean Hamilton Anxiety Rating Scale (HARS) score by treatment group and time since randomization: unadjusted (top panel) and adjusted for baseline HARS score, gender, age, and income (bottom panel).

Table 1

Baseline Demographics of study participants

	Relaxing Room		Thermotherapy		Massage
TOTAL, N	23		22		23
DEMOGRAPHICS					
Women, N (%)	21 (91.3)		14 (63.6)		17 (73.9)
Age, mean (SD)	41.3 (13.0)		42.0 (9.5)		45.6 (11.5)
Non-white, N (%)	2 (9.1)		2 (8.7)		0 (0.0)
Hispanic, N (%)	1 (4.5)		1 (4.6)		0 (0.0)
Attended some college, N (%)	22 (95.7)		21 (95.5)		22 (95.7)
Married, N (%)	14 (60.9)		11 (50.0)		14 (60.9)
Income, N (%)					
<\$45,000	1 (4.5)		9 (40.9)		8 (36.4)
≥\$45,000	21 (95.5)		13 (59.1)		14 (63.6)
Missing	1		0		1
MENTAL HEALTH HISTORY					
<18 at first anxiety, N (%)	9 (40.9)		9 (45.0)		13 (56.5)
Missing	1		2		0
Ever had 4+ panic attacks in one month, N (%)	9 (32.1)		10 (35.7)		9 (32.1)
Missing	3		4		2
Duration of Current GAD symptoms, N (%)					
<1 yr	3 (16.7)		10 (52.6)		3 (14.3)
≥1 yr	15 (83.3)		9 (47.4)		18 (85.7)
Missing	5		3		2
Current use of Medications, N (%)					
No	9 (39.1)		10 (47.6)		11 (47.8)
Yes	14 (60.9)		11 (52.4)		12 (52.2)
Missing	0		1		0
Current use of Anti-depressant, N (%)					

	Relaxing Room	Thermotherapy	Massage
No	14 (60.9)	15 (68.2)	14 (60.9)
Yes	9 (39.1)	7 (31.8)	9 (39.1)
Current use of anti-anxiety medication, N (%)			
No	19 (82.6)	15 (68.2)	17 (73.9)
Yes	4 (17.4)	7 (31.8)	6 (26.1)
Currently seeing a mental health professional, N (%)	4 (17.4)	5 (22.7)	7 (30.4)
BASELINE OUTCOME MEASURES			
HARS, mean (SD)	26.2 (5.5)	27.4 (7.0)	24.8 (5.7)
HARS somatic subscale, mean (SD)	11.4 (4.0)	11.5 (5.4)	9.8 (4.5)
Penn State Worry, mean (SD)	67.6 (7.5)	64.8 (7.7)	66.4 (7.9)
PHQ-8, mean (SD)	11.3 (3.1)	11.1 (3.0)	11.6 (2.5)
Sheehan Disability Scale, mean (SD)	14.5 (6.5)	18.2 (5.4)	15.6 (5.1)
Impairment of work, N (%)	8 (34.8)	13.0 (61.9)	9 (39.1)
<i>Missing</i>		<i>I</i>	
Disruption of Social Life, N (%)	13 (56.5)	14 (63.6)	14 (60.9)
Disruption of Home Life, N (%)	14 (60.9)	14 (63.6)	11 (47.8)
"Very satisfied" with care for stress or worry, N (%)	4 (17.4)	3 (14.3)	5 (21.7)
<i>Missing</i>		<i>I</i>	

Table 2

Other treatments used by CALM study participants

	Relaxing Room	Thermotherapy	Massage
TOTAL, N	23	22	23
CURRENT USE OF MEDICATIONS, N (%)			
Baseline – N*	23	22	23
No	9 (39.1)	10 (47.6)	11 (47.8)
Yes	14 (60.9)	11 (52.4)	12 (52.2)
12 weeks – N	19	20	19
No	8 (42.1)	10 (50.0)	8 (42.1)
Yes	11 (57.9)	10 (50.0)	11 (57.9)
26 weeks – N	21	21	22
No	12 (57.1)	10 (47.6)	8 (36.4)
Yes	9 (42.9)	11 (52.4)	14 (63.6)
CURRENT USE OF ANTI-DEPRESSANTS, N (%)			
Baseline – N	23	22	23
No	14 (60.9)	15 (68.2)	14 (60.9)
Yes	9 (39.1)	7 (31.8)	9 (39.1)
12 weeks – N	19	20	19
No	12 (63.2)	15 (75.0)	11 (57.9)
Yes	7 (36.8)	5 (25.0)	8 (42.1)
26 weeks – N	21	21	22
No	15 (71.4)	12 (57.1)	12 (54.6)
Yes	6 (28.6)	9 (42.9)	10 (45.5)
CURRENT USE OF ANTI-ANXIETY MEDICATIONS, N (%)			
Baseline – N	23	22	23
No	19 (82.6)	15 (68.2)	17 (73.9)
Yes	4 (17.4)	7 (31.8)	6 (26.1)

	Relaxing Room	Thermotherapy	Massage
12 weeks – N	19	20	19
No	15 (79.0)	16 (80.0)	15 (79.0)
Yes	4 (21.1)	4 (20.0)	4 (21.1)
26 weeks – N	19	20	19
No	18 (85.7)	16 (76.2)	15 (68.2)
Yes	3 (14.3)	5 (23.8)	7 (31.8)
RECEIVING CARE FROM MENTAL HEALTH PROFESSIONAL, N (%)			
Baseline	4 (17.4)	5 (22.7)	7 (30.4)
12 weeks	1 (5.3)	4 (20.0)	5 (26.3)
26 weeks	5 (23.8)	4 (19.1)	8 (36.4)

* 1 participant in the Thermotherapy group did not answer this question at baseline

Table 3

Primary and Secondary Outcomes by Treatment Group

	Relaxing Room	Thermotherapy	Massage	P- value*
TOTAL, N	23	22	23	
12-week Outcomes				
Hamilton Anxiety Rating Scale (HARS)				
mean (95 % CI)	15.3 (11.8, 18.9)	13.5 (10.5, 16.4)	14.9 (11.8, 18.0)	0.69
Adjusted mean (95% CI) [‡]	14.8 (11.4, 18.2)	13.3 (10.4, 16.2)	15.9 (12.8, 19.0)	0.49
Adjusted Mean Change Score (95% CI) [‡]	-11.1 (-14.5, -7.7)	-13.0 (-16.0, -10.1)	-10.0 (-13.1, -6.9)	0.39
HARS 50% Improvement, % (95% CI)				
Yes/No	47.4 (26.8, 68.9)	55.0 (33.6, 74.7)	36.8 (18.7, 59.7)	0.52
Adjusted HARS 50% Improvement, OR (95% CI)				
Yes/No	1	1.06 (0.29, 3.85)	0.51 (0.13, 2.07)	0.49
HARS Symptoms Resolved, % (95% CI)				
Yes/No	10.5 (2.6, 33.7)	20.0 (7.71, 42.79)	15.8 (10.9, 39.2)	0.70
Adjusted HARS Symptoms Resolved, OR (95% CI)				
Yes/No	1	2.32 (0.37, 14.7)	1.28 (0.17, 9.5)	0.65
HARS Somatic Subscale				
Mean (95 % CI)	5.9 (3.7, 8.2)	4.4 (3.1, 5.7)	4.9 (3.4, 6.5)	0.52
Adjusted mean (95% CI) [‡]	5.6 (3.5, 7.7)	4.3 (3.1, 5.5)	5.5 (4.0, 7.0)	0.43
Adjusted Mean Change Score (95% CI) [‡]	-5.3 (-7.4, -3.2)	-6.6 (-7.8, -5.4)	-5.4 (-6.9, -3.9)	0.43
Penn State Worry Questionnaire				
mean (95 % CI)	57.3 (52.4, 62.3)	49.9 (44.7, 55.0)	54.2 (49.8, 58.5)	0.15
Adjusted mean (95% CI) [‡]	54.9 (50.0, 59.9)	51.1 (47.5, 54.8)	55.0 (51.1, 58.9)	0.34
Adjusted Mean Change Score (95% CI) [‡]	-11.4 (-16.3, -6.4)	-15.1 (-18.8, -11.4)	-11.3 (-15.2, -7.3)	0.34
PHQ-8				
mean (95 % CI)	7.4 (5.1, 9.7)	6.2 (4.6, 7.7)	8.0 (5.8, 10.1)	0.38
Adjusted mean (95% CI) [‡]	6.8 (4.7, 9.0)	6.6 (5.1, 8.1)	8.0 (5.8, 10.2)	0.58

	Relaxing Room	Thermotherapy	Massage	P- value*
Adjusted Mean Change Score (95% CI) [‡]	-4.4 (-6.6, -2.3)	-4.7 (-6.2, -3.2)	-3.2 (-5.4, -1.0)	0.58
Sheehan Disability Scale				
mean (95 % CI)	10.9 (7.7, 14.2)	10.0 (7.4, 12.6)	9.9 (7.2, 12.7)	0.88
Adjusted mean (95% CI) [‡]	11.3 (8.6, 13.9)	9.5 (7.3, 11.8)	10.4 (7.4, 13.4)	0.60
Adjusted Mean Change Score (95% CI) [‡]	-4.8 (-7.4, -2.1)	-6.5 (-8.8, -4.3)	-5.7 (-8.7, -2.6)	0.60
26-week Outcomes				
Hamilton Anxiety Rating Scale (HARS)				
mean (95 % CI)	12.9 (10.1, 15.6)	13.7 (11.4, 16.1)	12.6 (9.6, 15.6)	0.83
Adjusted mean (95% CI) [‡]	12.5 (9.9, 15.1)	13.6 (11.1, 16.0)	13.4 (10.9, 15.9)	0.84
Adjusted Mean Change Score (95% CI) [‡]	-13.5 (-16.0, -11.0)	-12.8 (-15.3, -10.4)	-12.5 (-15.0, -10.0)	0.86
HARS 50% Improvement, % (95% CI)				
Yes/No	61.9 (40.2, 79.7)	57.1 (36.0, 76.0)	59.1 (38.2, 77.2)	0.95
Adjusted HARS 50% Improvement, OR (95% CI)				
Yes/No	1	1.17 (0.31, 4.31)	1.32 (0.38, 4.66)	0.78
HARS Symptoms Resolved, % (95% CI)				
Yes/No	23.8 (10.3, 46.0)	14.3 (4.68, 36.14)	22.7 (9.8, 44.4)	0.67
Adjusted HARS Symptoms Resolved, OR (95% CI)				
Yes/No	1	1.54 (0.22, 10.74)	2.08 (0.34, 12.91)	0.65
HARS Somatic Subscale				
mean (95 % CI)	4.9 (3.2, 6.5)	4.8 (3.6, 6.0)	3.9 (2.1, 5.7)	0.68
Adjusted mean (95% CI) [‡]	4.7 (3.3, 6.1)	4.7 (3.5, 6.0)	4.4 (2.9, 5.9)	0.93
Adjusted Mean Change Score (95% CI) [‡]	-6.2 (-7.6, -4.8)	-6.2 (-7.4, -4.9)	-6.5 (-8.0, -5.0)	0.93
Penn State Worry Questionnaire				
mean (95 % CI)	56.5 (52.8, 60.2)	49.9 (45.6, 54.2)	50.9 (46.6, 55.1)	0.06
Adjusted mean (95% CI) [‡]	54.5 (50.6, 58.4)	51.6 (48.9, 54.4)	51.5 (48.1, 54.8)	0.45
Adjusted Mean Change Score (95% CI) [‡]	-11.8 (-15.6, -7.9)	-14.7 (-17.4, -11.9)	-14.8 (-18.1, -11.5)	0.45
PHQ-8				
Mean (95 % CI)	5.9 (4.1, 7.7)	6.3 (5.0, 7.7)	6.3 (4.6, 8.0)	0.93

	Relaxing Room	Thermotherapy	Massage	P-value*
Adjusted mean (95% CI) [‡]	5.5 (4.0, 7.0)	6.7 (5.3, 8.1)	6.3 (4.7, 7.9)	0.50
Adjusted Mean Change Score (95% CI) [‡]	-5.8 (-7.2, -4.3)	-4.5 (-5.9, -3.1)	-5.0 (-6.6, -3.4)	0.50
Sheehan Disability Scale mean (95 % CI)	9.6 (7.0, 12.1)	10.1 (7.2, 13.1)	9.2 (6.8, 11.6)	0.89
Adjusted mean (95% CI) [‡]	9.8 (8.0, 11.6)	9.7 (7.0, 12.4)	9.8 (7.9, 11.7)	1.00
Adjusted Mean Change Score (95% CI) [‡]	-6.3 (-8.1, -4.5)	-6.4 (-9.1, -3.7)	-6.3 (-8.2, -4.4)	1.00

* P-value is from a Score test comparing a difference between any of the treatment groups at a given time point

[‡] adjusted mean refers to the results for the given outcome in a linear regression model with robust standard errors adjusted for baseline outcome value, gender, age, and income. We assume the average values for all covariables in the adjusted calculations

[‡] Adjusted mean change score refers to the change in outcome score from baseline using a linear regression model with robust standard errors adjusted for baseline outcome value, gender, age, and income