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Randomized clinical trial of adapted mindfulness-based stress reduction versus group cognitive behavioral therapy for heterogeneous anxiety disorders

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ABSTRACT

Objective: To compare a mindfulness-based intervention with cognitive behavioral therapy (CBT) for the group treatment of anxiety disorders.
Method: One hundred five veterans (83% male, mean age = 46 years, 30% minority) with one or more DSM-IV anxiety disorders began group treatment following randomization to adapted mindfulness-based stress reduction (MBSR) or CBT.
Results: Both groups showed large and equivalent improvements on principal disorder severity thru 3-month follow up ($ps < .001$, $d = -4.08$ for adapted MBSR; $d = -3.52$ for CBT). CBT outperformed adapted MBSR on anxious arousal outcomes at follow up ($p < .01$, $d = .49$) whereas adapted MBSR reduced worry at a greater rate than CBT ($p < .05$, $d = .64$) and resulted in greater reduction of comorbid emotional disorders ($p < .05$, $d = .49$). The adapted MBSR group evidenced greater mood disorders and worry at Pre, however. Groups showed equivalent treatment credibility, therapist adherence and competency, and reliable improvement.
Conclusions: CBT and adapted MBSR were both effective at reducing principal diagnosis severity and somewhat effective at reducing self-reported anxiety symptoms within a complex sample. CBT was more effective at reducing anxious arousal, whereas adapted MBSR may be more effective at reducing worry and comorbid disorders.

Introduction

Several decades ago, Kabat-Zinn et al. conducted the first investigation of Mindfulness-Based Stress Reduction (MBSR; 1990) for anxiety disorder patients (1992). The small open trial ($n = 22$) demonstrated significant reductions in anxiety, panic, and depressive symptoms, and a subsequent report showed maintenance of treatment gains three years later (Miller, Fletcher, & Kabat-Zinn, 1995). These nascent findings inspired interest in mindfulness-based interventions for anxiety disorders.

Despite its early promise, only two studies have investigated MBSR for anxiety disorders within randomized clinical trial designs. The first one randomized generalized social anxiety disorder patients to MBSR or group cognitive behavioral therapy (GCBT) (Koszycki, Benger, Shlik, & Bradwejn, 2007). Findings supported the general efficacy of both treatments, although GCBT outperformed MBSR on social anxiety outcomes, response and remission rates. The second study compared MBSR to a waitlist control for heterogeneous anxiety disorder patients (Vollestad, Sivertsen, & Nielsen, 2011). Among completers, results showed large effect size improvements in anxiety and depression that endured through 6-month follow up for MBSR relative to the waitlist control group. Several additional studies (Craigie, Rees, Marsh, & Nathan, 2008; Evans et al., 2008; Roemer, Orsillo, & Salters-Pedneault, 2008) have assessed mindfulness-based interventions other than MBSR for a variety of anxiety disorders; results have indicated moderate to

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strong success. A recent meta-analysis (Hofmann, Sawyer, Witt, & Oh, 2010) demonstrated that mindfulness-based interventions, including MBSR, reduced anxiety symptoms across a variety of psychiatric and medical populations (effect size = .63), and especially in the subgroup of patients with anxiety and mood disorders (effect size = .97), supporting the notion that MBSR may be particularly effective at reducing anxiety.

Other than Koszyski et al. (2007), however, no studies have compared a mindfulness-based intervention for anxiety disorders to another active treatment. Cognitive behavioral therapy (CBT) represents the most evidence-based psychotherapy for anxiety disorders in both individual and group formats (Butler, Chapman, Forman, & Beck, 2006; Hofmann & Smits, 2008; Norton & Price, 2007; Tolin, 2010), and therefore, the gold standard against which to assess the efficacy of an alternative intervention such as MBSR. Directly comparing MBSR and CBT provides an opportunity to investigate different approaches to anxiety-related thoughts (mindfully observing and accepting thoughts in MBSR versus reappraising and modifying thought content in CBT) and emotions (mindfulness observing and making space for emotions in MBSR versus controlling and reducing emotions in CBT). Whereas MBSR encourages moving toward uncomfortable internal experiences by promoting a stance of openness, curiosity and acceptance, it does not utilize formal behavioral exposure procedures, as in CBT. Further, CBT focuses on treating anxiety disorder symptoms whereas MBSR focuses more broadly on redirecting participants' attention toward the present moment and shifting their overarching relationship with thoughts, feelings, and current experience. Thus, MBSR represents a broader set of strategies for dealing with internal experience that might consequently impact broader symptom outcomes (beyond anxiety). Moreover, outside of group CBT, clinicians have few evidence-based group treatments for anxiety disorders from which to choose. If MBSR is effective for anxiety disorders, then clinicians will have more options for evidence-based group treatments.

On these bases, we compared an adapted version of MBSR and group CBT for the treatment of heterogeneous anxiety disorders. We integrated several features of hybrid efficacy-effectiveness study designs to maximize external validity (Chambless & Hollon, 1998) by conducting the study within a real-world treatment clinic and utilizing minimal exclusion criteria. Therefore, our study differed from Koszyski et al.'s (2007) in that we targeted all anxiety disorders rather than social anxiety disorder specifically, and did so within a less narrowly screened, more clinically severe patient sample. For example, in our sample 70% of patients had comorbid psychiatric diagnoses versus 19% in Koszyski et al. sample; further, half of our patients were unemployed or disabled. The real-world context, severe and complex patients, and minimal inclusion criteria make this study strongly relevant to clinicians practicing in community, hospital, and VA settings.

Based on the anxiety-specific focus of CBT[1] versus broader focus of adapted MBSR, we predicted that CBT would reduce reported anxiety symptoms to a greater degree than adapted MBSR, whereas adapted MBSR would reduce broader symptoms (e.g., depression symptoms and co-occurring emotional disorders) to a greater degree than CBT. Given the very few studies in this area, however, these hypotheses were relatively exploratory.

Methods

Participants

Eligible patients (Ps) included 124 veterans referred for treatment to the Anxiety Disorders Clinic at the VA San Diego Healthcare System Medical Center, an outpatient clinic that specializes in the behavioral treatment of anxiety disorders. Study recruitment took place between October 2009 and April 2011; all patients referred to the clinic during this period were assessed for study eligibility and invited to participate if eligible. All Ps who began treatment ($N = 105$) were included in the intent-to-treat (ITT) analyses ($n = 45$ adapted MBSR, $n = 60$ CBT). See Table 1 for demographic and clinical characteristics of the ITT sample and Fig. 1 for patient flow. Nineteen of the original 124 Ps, an equal portion from each group (adapted MBSR versus CBT group difference $\chi^2 = .95$, $p > .9$), did not attend any treatment sessions. Because pre-treatment attrition did not inform treatment response and did not differ by group, we did not analyze these 19 Ps further, except to determine whether they differed from Ps who initiated treatment. Ps who dropped prior to treatment did not significantly differ from Ps who began treatment on pre-treatment severity of the principal anxiety disorder(s) or on any sociodemographic variable from Table 1 with one exception: Ps who did not begin treatment were significantly more likely to be racial/ethnic minorities (52.17%) than Ps who began treatment (29.29%), $\chi^2 = 4.38$, $p = .04$.

Participants were required to be 18–75 years of age, English speaking, and have a principal (or dual principal) DSM-IV diagnosis of panic disorder with or without agoraphobia (PD/A), generalized anxiety disorder (GAD), social anxiety disorder (SAD), specific phobia (SP), obsessive-compulsive disorder (OCD) or civilian post-traumatic stress disorder (PTSD) (e.g., non combat or military sexual trauma related) on the MINI International Neuropsychiatric Interview (MINI) for DSM-IV (Sheehan et al., 1998) (see *Diagnostic Assessment,* below). We excluded patients with principal military-related PTSD because we were required to refer them to a specialized military PTSD clinic for treatment (which is common in many VAs). To maximize external validity, exclusion criteria were limited to active suicidal ideation, active substance use disorders within the past 3 months, or current participation in other CBT or adapted MBSR treatments for anxiety disorders.

San Diego VA primary care and specialty mental health clinic providers (e.g., from PTSD and mood disorder clinics) referred Ps to the Anxiety Disorders Clinic. All assessment and treatment took place onsite at the VA San Diego Healthcare System, Anxiety Disorders Clinic. Free parking was provided. If Ps were receiving government compensation for a military service-related mental health disorder, they received free treatment. If they did not have this service connection, they were charged their regular VA co-payment. Ps received $15 total in gift cards to local stores for completing mid-treatment[2] and FU assessments. The VA San Diego Research Service, and the University of California San Diego, the University of California Los Angeles, and the University of Colorado Boulder human subjects protection committees approved the study. Informed consent was obtained from all participants prior to study entry.

Design

The study followed a 2 × 3 longitudinal research design, with Group (CBT versus adapted MBSR) as the between-subject variable and Time (Pre, Post, FU) as the within-subject variable. A computerized random number generator created all randomization sequences, which were known to the PIs but not the blind assessors. Delays in securing VA approval for community-based MBSR therapists necessitated creating a computerized randomization of 2:1 CBT to adapted MBSR for the first third of the study. For the middle third of the study, the computer returned to assigning on a 1:1 randomization schedule. In attempt to equalize participation in both treatment conditions, for the final third of the study the

[1] Group CBT will hereby be referred to as "CBT".

[2] The mid-treatment questionnaires focused on treatment mediator measures, which will be reported elsewhere.

Table 1
Sample demographic and clinical characteristics.

Characteristic	Total ($n = 105$)[a]	MBSR ($n = 45$)	CBT ($n = 60$)	t value or χ^2	p
Female	17.00% (17/100)	21.43% (9/42)	13.79% (8/58)	1.01	.32
Race/ethnicity					
White/Caucasian	70.00% (70/100)	71.43% (30/42)	68.97% (40/58)	.07	.79[b]
Hispanic/Latino/a	9.00% (9/100)	4.76% (2/42)	12.07% (7/58)		
African-American/Black	6.00% (6/100)	4.76% (2/42)	6.90% (4/58)		
Asian-American/Pacific Islander	8.00% (8/100)	9.52% (4/42)	6.90% (4/58)		
Other	7.00% (7/100)	9.52% (4/42)	5.17% (3/58)		
Age, *in years*	45.91 (13.68) *Range:* 22–78	46.48 (14.45)	45.50 (13.21)	-.35	.73
Education, *in years*	14.06 (1.62) *Range:* 11–18	14.10 (1.78)	14.03 (1.52)	-.18	.86
Professional/white collar	34.74% (33/95)	35.90% (14/39)	33.93% (19/56)	.04	.84
Unemployed or disabled	49.00% (49/100)	40.48% (17/42)	55.17% (32/58)	2.11	.15
Married/Cohabiting	41.00% (41/100)	42.86% (18/42)	39.66% (23/58)	1.32	.25
Children, *average number*	1.10 (1.46)	1.12 (1.63)	1.09 (1.34)	-.11	.91
Principal anxiety disorder[c]					
PD/A	30.39% (31/102)	34.09% (15/44)	29.31% (17/58)	.61	.27
GAD	37.25% (38/102)	34.09% (15/44)	39.66% (23/58)	.33	.57
SAD	15.69% (16/102)	11.36% (5/44)	18.97% (11/58)	1.09	.30
PTSD (civilian)	14.71% (15/102)	18.18% (8/44)	12.07% (7/58)	.75	.39
OCD	4.90% (5/102)	9.09%(4/44)	1.72% (1/58)	2.91	.09
Presence of co-occurring mood disorder	53.92% (55/102)	68.18% (30/44)	43.10% (25/58)	6.33	.01
Presence of co-occurring anxiety disorder	50.00% (51/102)	52.27% (23/44)	48.28% (28/58)	.16	.69
Presence of co-occurring mood or anxiety disorder	67.65% (69/102)	75.00% (33/44)	62.07% (36/58)	1.91	.17
Presence of any psychiatric disorder[d]	69.61% (71/102)	77.27% (34/44)	63.79% (37/58)	2.15	.14
Use of any psychotropic medication (at Pre)[e]	84.62% (88/104)	86.36% (38/44)	83.33% (50/60)	.18	.67
Use of SSRIs (at Pre)[f]	50.00% (52/104)	45.45% (20/44)	53.33% (32/60)	.63	.43
Use of benzodiazepines (at Pre)	35.58% (37/104)	31.82% (14/44)	38.33% (23/60)	.47	.49

[a] Demographic data was missing for 5 patients (10 for job information); MINIs at Pre were missing for 3 patients.
[b] The analysis for race/ethnicity compared the portion of white versus minority Ps. Small cell sizes precluded group comparisons for other race/ethnicity categories.
[c] Four patients had dual principal anxiety disorders (defined as two anxiety disorders with equivalent CSR ratings), and thus were included twice, as follows: dual principal GAD plus SAD (1), PD (1), OCD (1), or PTSD (1).
[d] Of the psychiatric disorders assessed on the MINI.
[e] This classification reflects use of *any* psychotropic medication, including those not individually reported here due to their low *n*'s (e.g., beta-blockers, tricyclic antidepressants, mood stabilizers, etc.).
[f] Use of SSRIs and benzodiazepines overlapped, that is, some Ps used both.

computer randomized Ps 1:2 CBT to adapted MBSR. A greater number of Ps enrolled in the first than the final third of the study, however. Therefore, more Ps were randomized to CBT than adapted MBSR, see Fig. 1. We did not include a no-treatment control group because it has been argued that comparing a newer to a well-established treatment does not require a no-treatment or waitlist control group and is more ethical without one (Kazdin, 2002). We did not include a treatment-as-usual (TAU) group because the Anxiety Disorders Clinic had previously offered non-manualized CBT as their standard group treatment and desired (per VA mandate) to move toward manualized CBT for consistent delivery and training purposes. Moreover, the study did not aim to compare manualized to non-manualized CBT but rather, to compare two active and distinct manualized treatments.

Procedure

Formal clinical assessments took place at baseline (Pre), post-treatment (Post), and 3-month follow up (FU, i.e., 3 months after Post), and consisted of the MINI diagnostic interview and standardized questionnaires (see below). A cognitive task and measures of purported mediators, the results of which will be reported elsewhere, were administered as well. If Ps dropped out of treatment prior to completing the 10 group sessions, an assessment was scheduled within 2–3 weeks following attrition, the results of which were substituted for the Post assessment.

Treatments

Following the baseline MINI and questionnaire completion, Ps were randomly assigned to CBT or adapted MBSR. Ps were informed of their assigned condition and given a brochure that briefly described the treatment approach. Each group met weekly for 90 min over the course of 10 weeks (10 sessions), with the exception of a single 3-h onsite mindfulness retreat in week 7 of adapted MBSR that served as the treatment session for that week. Due to the retreat, adapted MBSR offered 1.5 additional treatment hours than CBT, although there were no group differences in completed treatment hours (see *Results*). To minimize bias in P's satisfaction for scheduling reasons, CBT and adapted MBSR groups generally were scheduled in tandem such that they met at the same time and location (e.g., different rooms in the same clinic). Groups averaged 9 Ps each.

Therapist assignment was based on background and training; we required a minimum of three years experience in a particular type of therapy to serve as a therapist in a given condition. No therapists treated patients in both conditions and at most two groups per condition were active at any given time point. CBT therapists included one doctoral intern and two doctoral fellows in clinical psychology with a minimum of three years experience in behavioral therapy, including CBT. MBSR study therapists included two non-VA clinical psychologists and a VA psychiatric nurse; each had a minimum of three years experience leading MBSR groups and training within the University of Massachusetts Center for Mindfulness MBSR training program. The MBSR therapists, however, had more general clinical experience than the CBT therapists. Despite this, no significant differences in therapist competency ratings emerged (see *Results*). Weekly hour-long group supervision for study therapists in each treatment condition was led separately by the first two authors of this study and by Steve Hickman, Psy.D., a licensed clinical psychologist and experienced MBSR instructor who served as the main MBSR supervisor. Both treatments utilized

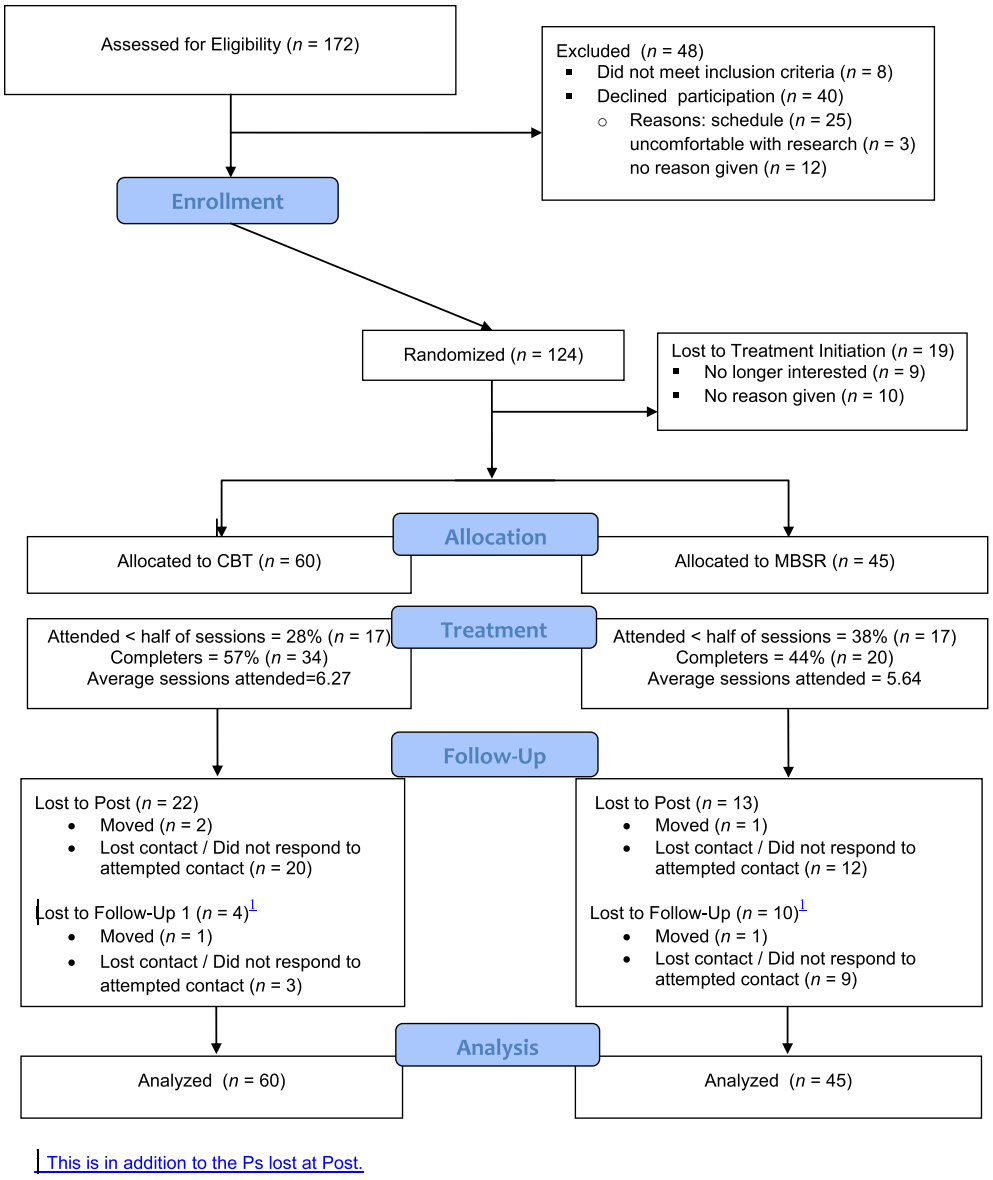


Fig. 1. Patient flow.

patient workbooks with didactic handouts, homework, and in-session exercises.

Group cognitive behavioral therapy (CBT)

CBT for anxiety disorders followed a manualized protocol originally authored by Craske (2005) and used successfully in previous clinical trials (Arch et al., 2012); co-authors A.B., C.A., and Raphael Rose, Ph.D., of UCLA subsequently modified the protocol for use in a group treatment setting. Since the groups treated Ps with heterogeneous anxiety disorders, the CBT manual employed a branching mechanism that listed cognitive restructuring and behavioral exposure content for each anxiety disorder, using the methodology developed by Craske, Rauch, et al. (2009), Craske, Rose, et al. (2009) and Craske et al. (2011) for treating anxiety disorders in primary care. We did not utilize a trans-diagnostic CBT manual because disorder-specific approaches possessed a stronger evidence base at this time. Based on evidence that a single-disorder CBT focus for PD was more effective than the simultaneous implementation of separate CBT modules for PD and comorbid disorders (Craske et al., 2007), Ps were encouraged to focus treatment on their principal anxiety disorder. Ps with dual principal anxiety disorders were encouraged to select one for focus. Exposures were individually tailored as much as possible such that group members were often focusing on different exposures. Session 1 consisted of psychoeducation on the nature of fear and anxiety, identifying the anxiety disorder to target in treatment, and self-monitoring. Session 2 introduced breathing retraining and cognitive restructuring. Sessions 3–4 reinforced breathing retraining, self-monitoring, and cognitive restructuring skills. At the end of Session 4, Ps constructed an in-vivo exposure hierarchy. Sessions 5–9 centered on conducting in-session exposures to feared situations, sensations, and images via in-vivo, interoceptive, and imaginal exposures appropriate to each P. Session 10 focused on relapse prevention strategies and planning. Homework was assigned throughout treatment, and included self-monitoring, cognitive restructuring, behavioral experiments, and behavioral exposure exercises.

Group mindfulness-based stress reduction (MBSR)

Adapted MBSR for anxiety disorders followed a manualized protocol[3] written primarily by the first author (J.J.A.) in collaboration with three experienced MBSR instructors. The manual largely reflected MBSR protocols from the University of Massachusetts Center for Mindfulness (Kabat-Zinn, 1990). In contrast to official MBSR, however, our adapted MBSR manual reflected patient and provider concerns from previous MBSR groups at the San Diego VA that group sessions, the retreat, and homework were too long to sustain veterans' attention,[4] a concern reflected in previous data showing that few veterans practiced meditation between sessions (Ramel, Goldin, Carmona, & McQuaid, 2004). We also needed to match the length of MBSR groups to our CBT groups to prevent participants from favoring one treatment over another for duration reasons. Therefore, our adapted MBSR groups ran for 90 min over 10 sessions and the retreat ran for 3 h to approximate the duration of the CBT groups (instead of 2.5 h per week over 8 weeks and a full day retreat in official MBSR). To increase feasibility, we also shortened our homework practice meditations to 20–30 min rather than 45 min. Further, because we wanted to focus on differences between adapted MBSR versus CBT in dealing with difficult cognition and behavior rather than differences in anxiety-related information access, our adapted MBSR approach incorporated psychoeducation about anxiety in Session 1. To help veterans incorporate informal mindfulness strategies into daily living, we integrated (for about 20 min) personal values exploration in preparation for mindful living in Session 9. Given these departures from the structure and content of official MBSR, ours is more accurately characterized as an adapted MBSR approach.

The MBSR therapist was encouraged to embody a mindful approach in all aspects of patient interaction, including group management. For example, if two participants began arguing, the MBSR therapist might state, "Let's pause for a moment. I notice the tension and anger in the room right now. Let's take a moment to notice where this is showing up in our bodies. I can feel my stomach and jaw tightening. Does anyone else notice something going on inside of them?"

Adapted MBSR Session 1 introduced two different types of mindfulness practice (mindfulness of raisin eating and body scan) and psychoeducation about fear and anxiety. Session 2 continued with mindfulness practice (body scan) and briefly reviewed psychoeducation on fear and anxiety. Session 3 introduced formal sitting meditation, 3-min breathing spaces, and discussed stress reactivity versus mindful responding. Session 4 introduced slow mindful yoga and discussed anxiety as a form of avoidance. Session 5 continued with mindful yoga and sitting meditation, and discussed "judging mind", or the tendency to label experiences as good/acceptable or bad/unacceptable, particularly in the context of anxiety and negative affect. Session 6 continued with mindful yoga, sitting meditation, and/or the body scan, introduced a 3-min "coping breathing space", and prepared Ps for the 3-h meditation retreat in Session 7. The retreat in Session 7 consisted of continuous silence while participating in various mindfulness practices, including yoga, body scan, sitting meditation, and brief loving kindness meditation. Session 8 continued with sitting meditation and yoga, and debriefed the retreat. In Session 9, participants were encouraged to consider personal values, mindfully direct living toward those values and notice 'judging mind' in this context. Session 10 helped Ps reflect on what they had learned and how to continue integrating mindfulness practice into their daily lives.

Diagnostic assessment

Psychiatric diagnoses were assessed with the clinician-administered MINI International Neuropsychiatric Interview for DSM-IV (Sheehan et al., 1998), enhanced with detailed diagnostic questions for anxiety and substance use disorders used in previous anxiety disorder treatment studies (Roy-Byrne et al., 2005, 2010). The MINI assessed anxiety, mood, substance, eating, and antisocial personality disorders, and screened for suicidality and psychosis. The MINI possesses good test–retest reliability in clinical samples (70% of kappas across disorders are >90%), adequate concordance with SCID interview diagnoses (anxiety disorder kappa agreement = .50–.78) and Composite International Diagnostic Interview (CIDI) diagnoses (Sheehan et al., 1998), and represents the diagnostic instrument used in the only previous comparison of MBSR and CBT for an anxiety disorder (Koszycki et al., 2007). Moreover, conducting this study in a real world clinic setting meant that we needed a highly efficient, well-validated diagnostic tool that could be administered to every new referred patient (e.g., up to one dozen patients per week). The MINI was the diagnostic instrument that best balanced efficiency (20–40 min administration time), breath, and reliability.[5]

Third and fourth year clinical psychology graduate students conducted the MINI after 10–15 h of training, including co-rating eight gold standard training interviews and demonstrating diagnostic accuracy on three consecutive interviews. Assessors were blind to treatment condition and assessed multiple waves of patients at once (e.g., patients at pre, post, and FU), blinding the time point of the assessment. Diagnoses and CSR ratings were reviewed in weekly supervision with a licensed clinical psychologist (C.A.) through verbal and written report.

For anxiety and mood disorder diagnoses, diagnostic status ratings from the MINI (yes, no) were enhanced with dimensional clinical severity ratings (CSR) made on a 0 to 8 scale based on current symptom severity, distress, and disablement (0 = none, 2 = subclinical, 4 = clinically significant, 6 = moderately severe, 8 = most severe). A CSR of "4" or above on one or more anxiety disorders meeting DSM-IV criteria on the MINI was required for study entrance (Arch et al., 2012; Craske, DeCola, Sachs, & Pontillo, 2003; Craske et al., 2007). Training in CSR ratings comprised an additional 5–10 h of training including rating 18 gold-standard CSR clinical vignettes. CSRs were reviewed and confirmed in weekly supervision. MINI diagnoses and CSRs were double checked by a highly trained (via procedures described above) offsite research assistant who was blind to patient identity and treatment assignment. We have established good to excellent inter-rater agreement for diagnostic status (clinical versus subclinical versus none) and dimensional CSR ratings in our laboratory (e.g., SAD and OCD ICC = 1.00 (100% agreement), PD ICC = .91, GAD ICC = .85, and SP ICC = .75, and CSRs across all principal diagnoses, ICC = .65,[6] Arch et al., 2012).

Outcome measures

We utilized a range of outcome measures to capture change on measures relevant across all or most of the anxiety disorders.

[3] The MBSR and CBT manuals are available from first author or and co-authors Baker or Craske, respectively.

[4] Given the high rates of PTSD comorbidity among veterans, it is likely that PTSD symptoms or other comorbid conditions contributed to veterans' difficulties sitting still and focusing for long periods.

[5] The SCID (Spitzer, Williams, Gibbon, & First, 1994) and Anxiety Disorder Interview Schedule (DiNardo, Brown, & Barlow, 1994) take 2–4 h to administer and thus did not meet the practical needs of this real-world clinical setting.

[6] The ICC across all principal diagnoses was lower than for individual diagnoses because the individual diagnoses included no symptoms (e.g., none) which promoted a higher level of agreement.

Diagnostic outcomes focused on CSR ratings for each P's principal anxiety disorder(s) (e.g., the most severely rated anxiety disorder per CSR ratings). If Ps had co-principal anxiety disorders (e.g., two of equal CSR severity) at Pre, we averaged the CSRs across both disorders. Additional primary outcomes included anxiety-related arousal and worry, dimensions relevant across most or all anxiety disorders (Craske, Rauch, et al., 2009). Depression symptoms and the number of co-occurring unipolar mood and anxiety disorders served as broader secondary outcomes.

Primary outcomes

Diagnostic Severity was ascertained with the CSR ratings for the principal (or average of co-principal) anxiety disorder diagnosis from the MINI (see above for inter-rater reliability). Brown, Campbell, et al. (2001) and Brown, DiNardo, et al. (2001) further established the reliability and construct validity of CSR ratings for anxiety disorders.

Worry was assessed with the widely-used 16-item *Penn State Worry Questionnaire* (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990). Although the PSWQ is particularly elevated in GAD, elevated PSWQ scores are evident across the anxiety disorders relative to non-anxious controls (Brown, Antony, & Barlow, 1992). This scale has shown good test–retest reliability ($r = .74$ to .93 across 2–10 week periods) (Molina & Borkovec, 1994) and in the current sample, $\alpha = .87$ (Pre) and .93 (Post).

The Anxious Arousal subscale (MASQ-AA, 10 items) of the *Mini Mood and Anxiety Symptom Questionnaire* (Casillas & Clark, 2000) is comprised of a subset of the items from the full MASQ Anxious Arousal subscale (Watson & Clark, 1991), and assesses the dimension of the tripartite model that is specific to anxiety (Clark & Watson, 1991). The Mini-MASQ demonstrates good convergent and discriminant validity, strong factor structures, and internal validity around $\alpha = .85$ for each subscale (Casillas & Clark, 2000). In the current sample, $\alpha = .89$ (Pre) and .90 (Post).

Secondary/broader outcome

The widely-used *Beck Depression Inventory-II* (Beck, Steer, & Brown, 1996) measured depression symptoms. In the current sample, $\alpha = .91$ (Pre) and .95 (Post).

Co-occurring disorders

Co-occurring disorders were defined as non-principal disorders with a CSR of 4 or above on the MINI. To assess the generalization of treatment effects, we compared groups on the total number of co-occurring mood plus anxiety disorders (emotional disorders; Barlow, Allen, & Choate, 2004). If significant group differences emerged, we conducting *apriori* follow-up analyses comparing groups separately on the number of co-occurring anxiety disorders and the presence of co-occurring mood disorders (major depressive disorder and dysthymia).

Treatment response

We defined *reliable diagnostic improvement* as Ps who evidenced reliable change (in the positive direction) on the principal anxiety disorder CSR at Post or FU. We defined *clinically significant improvement* as Ps who evidenced *both* reliable and clinically significant change on one or more primary outcomes at Post or FU.

Reliable change was computed using the Jacobson and Truax (1991) method, using the more conservative denominator recommended by Maassen (2004). Clinically significant change was defined as scoring within the normative range (CSR ≤ 2 or within 1SD of nonclinical norms on the PSWQ or MASQ-AA). We employed the nonclinical PSWQ norms from Molina and Borkovec (1994); MASQ-AA norms were established from our own nonclinical community-based sample ($n = 44, M = 12.00, SD = 3.41$) which was pre-screened with the MINI to rule out anxiety disorders and other psychiatric disorders. For CSR, we used Brown, DiNardo, Lehman, and Campbell (2001) inter-rater CSR reliability averaged across the anxiety disorders ($r = .79$).[7] The critical CSR change value was 2.60, that is, CSRs had to diminish at least 2.60 from Pre to Post or Pre to FU to be considered statistically reliable. The critical change value on the PSWQ was 10.48 and on the MASQ-AA, 7.27.

Treatment credibility

At mid-treatment[8] (beginning of Session 6), Ps completed a 6-item *Treatment Credibility Questionnaire* adapted from Borkovec and Nau (1972). This questionnaire assessed patients' confidence that treatment was logical in its approach and expected to be helpful. Current study $\alpha = .93$.

Treatment adherence and therapist competence

Given the importance of therapist competence and treatment adherence (Fairburn & Cooper, 2011), group sessions were discretely videotaped by consent and 2 tapes (20%) from each group were randomly selected for therapist adherence ratings, one each from the first half (sessions 2–5) and second half (sessions 6–9) of therapy. The first and last sessions were excluded because of their emphasis on introducing or closing treatment rather than on active treatment. The Drexel University ACT/CBT Therapist Adherence and Competence Rating Scale (DUACRS, McGrath, 2012; McGrath, Forman, & Herbert, in preparation) was adapted for use in the current study. The original DUACRS was validated in a large ACT versus CBT anxiety disorder treatment study (McGrath, 2012); DUACRS ratings were published as part of this treatment study (Arch et al., 2012). The adapted MBSR/CBT Scale used presently contained items from the validated DUACRS but modified the ACT items to reflect MBSR content. The adapted scale also moved the behavioral items to the CBT scale because unlike ACT, MBSR did not include any behavior therapy items (e.g., behavioral exposure); therefore, the behavioral therapy content was exclusive to CBT in the present comparison. The adapted scale included 52 items for treatment adherence: 12 non-model specific/general therapy scale items, 22 CBT-specific scale items, and 18 MBSR-specific scale items, all of which were rated for each 5-min therapy segment. Examples of MBSR items include: "discuss and work through barriers or successes in practicing mindfulness in session", and "discuss befriending fear, anxiety, and other uncomfortable emotions". Examples of CBT items include: "discuss evidence supporting or refuting the client's beliefs", and "facilitate in-vivo exposure in session". Examples of non-model specific/general therapy scale items included: "ask about the client's mood or ongoing problems" and "ask for patient feedback about session or therapy in general". Adherence ratings were completed by two independent, offsite research assistants who completed 20–30+ h of training on the adapted DUACRS, had no knowledge of Ps, and were blind to group assignment. The first research assistant rated all selected sessions and the second rated a subset (28%) to establish inter-rater

[7] We utilized Brown et al.'s (2001) inter-rater reliability estimate rather than ours because the former utilized a much larger sample ($n = 292$ in Brown et al. versus $n = 22$ in ours) and therefore, is the more robust reliability estimate.

[8] Due to therapist error, we did not administer the treatment credibility to a significant portion of Ps at Session 2 and therefore, focus upon the treatment credibility results from mid-treatment.

reliability. To compute total scores for each scale, we computed the percent of the session spent on content from each scale's items.

We used the revised 6-item DUACRS therapist competence scale to rate therapist skill, rating "knowledge of treatment", "skill in delivering treatment", "appropriate application of treatment components within the context of the session", "therapeutic manner (facilitative and engaging versus dictatorial)", "positive relationship with clients" and "overall [therapist] performance".

Statistical analyses

Approach. Chi-square and *t*-tests in SPSS 17.0 were used to evaluate group differences at Pre for categorical and continuous variables, respectively; univariate ANOVAS compared groups on treatment adherence and therapist skill. Chi-squares were employed for cross-sectional group differences in responder status at Post and FU, which were limited to Ps who had data at each assessment point. Intraclass correlations assessed inter-rater reliability on the treatment adherence ratings.

Hierarchical linear models (HLMs) in HLM 6.0 (Raudenbush, Bryk, Cheong, & Congdon, 2004) were used to examine group differences in Pre-Post-FU outcomes and co-occurring disorder analyses. We compared CBT versus adapted MBSR differences in the rate of improvement (slope) and at each assessment point (intercept) through *apriori* effects coding. To simplify interpretation of effect sizes, only linear slopes were used. Intercepts and slopes represented random effects. We followed the procedures outlined by Feingold (2009) to compute HLM effect sizes (*d*).[9]

Data cleaning and model fitting. Raw data were visually inspected for outliers; outliers 3 or more standard deviations from the mean within each group were replaced with the next highest, non-outlier value following the Winsor method (Guttman, 1973). Level 1 and 2 HLM residuals and model fit statistics were examined via histograms and Q–Q plots; model fit outliers of 3 or more standard deviations were corrected using the Winsor method for individual data points or if uncorrectable with this method, were eliminated. Less than 5% of data was modified or eliminated.

Missing data. To assess if data were missing at random, we conducted *t*-test comparisons on primary outcomes comparing Ps who dropped out versus completed treatment (e.g., 70% or more), and treatment completers with present versus missing or incomplete data at FU. For dropouts versus completers, no significant differences emerged at Pre on any primary outcome variable, $ps > .1$. For treatment completers with present versus missing or incomplete FU data, no significant differences emerged at Pre or Post on CSR and PSWQ outcomes, $ps > .7$. Borderline significant differences emerged on the MASQ-AA – completers with present data versus those with missing or incomplete data demonstrated lower MASQ-AA scores at Pre ($Ms = 18.95$ [$SD = 9.37$] versus 23.89 [$SD = 8.85$], $p = .06$) and Post ($Ms = 16.00$ [$SD = 5.80$] versus 20.23 [$SD = 9.04$], $p = .05$). In that group differences in 7 of 9 comparisons were non-significant and did not reach full significance in the other 2 analyses, overall findings suggest that the data were missing at random.

HLM flexibly utilizes subjects with missing data as long as they have a single intact data point and therefore, maximized the statistical power and generalizability of the current data despite the relatively high attrition rates. Thus, the ITT sample included all Ps who attended at least one treatment session. The Completer sample included Ps who completed ~70% of the treatment (e.g., 10.5 h of treatment, which translates into 7/10 sessions or 6 sessions including the 3-h retreat in adapted MBSR).

Statistical power. Power analyses, conducted in Optimal Design (see Raudenbush & Liu, 2000), indicated that to reach 80% power, a cross sectional between-group difference (e.g., at Post) with an effect size of .70 required 67 total Ps, whereas a between-group effect size of .50 required 126 total Ps. Accounting for group clustering led to slightly lower statistical power, with 80% power reached for medium to large effect sizes only, both for group differences in rate of change (slope) and at a single time point (e.g., at Post). Therefore, our total sample size ($n = 105$) was sufficient to detect between group differences that were somewhat greater than moderate in magnitude over time and at each assessment point.

Table 2
Raw means and standard deviations for primary outcomes (for patients with data at each assessment point).

Measure & condition	Pre-treatment *M (SD)*	Post-treatment *M (SD)*	3-Month FU *M (SD)*
Primary outcomes			
Clinician's severity rating			
MBSR	6.02 (1.09)	3.09 (2.59)	2.18 (2.66)
CBT	6.08 (.86)	3.22 (2.81)	2.94 (2.83)
Penn State worry questionnaire			
MBSR	45.46 (9.83)*	39.37 (13.59)	44.73 (13.02)
CBT	39.75 (12.32)*	39.75 (12.59)	40.00 (11.58)
MASQ-Anxious Arousal Scale			
MBSR	21.05 (8.64)	20.30 (8.41)	17.69 (7.15)
CBT	20.23 (8.60)	17.14 (8.02)	16.85 (8.53)
Secondary outcomes			
Beck Depression Inventory-II			
MBSR	25.97 (11.61)	21.36 (15.26)	24.53 (15.68)
CBT	22.12 (12.32)	19.10 (14.81)	20.42 (16.55)

*Significant group difference at Pre, $p = 01$.
Note that the CBT group evidenced the same Penn State Worry Questionnaire mean at Pre and Post (i.e., this is not a reporting error).

Results

Pre-treatment group differences

Groups showed no significant differences on demographic or clinical characteristics at Pre, see Table 1, with the exception of co-occurring mood disorders, which were significantly more common for the adapted MBSR than CBT group. Relative to previous studies of anxiety disorder outpatients (e.g., Brown, Campbell, Lehman, Grisham, & Mancill, 2001), both groups evidenced very high rates of co-occurring disorders and psychotropic medication use at Pre[10]. For outcome variables in Table 2, groups were similar at Pre except that adapted MBSR demonstrated higher PSWQ scores ($M = 45.46$, $SD = 9.83$) than CBT ($M = 39.75$, $SD = 12.32$), Satterwaite $t(95.5) = 2.56$, $p = .01$.

Treatment credibility

Treatment credibility assessed at the beginning of Session 6 (mid-treatment) revealed no differences between adapted MBSR ($M = 5.63$, $SD = 1.75$) and CBT ($M = 5.38$, $SD = 1.51$), $t(59) = .59$, $p = .56$. Both means approached 6, indicating 'mostly credible'.

[9] We did not report 95% confidence intervals for our Feingold (2009) effect sizes because there is not yet a method for doing so (see Feingold, 2009; Odgaard & Fowler, 2010).

[10] Medication use was derived from medical records and we did not have access to the medication records at Post or FU. In that most P's had been prescribed multiple psychotropic medications for many months or years and were not required to reduce medication use to participate in our study, however, it is doubtful that group differences developed at Post or FU.

Treatment integrity and therapist competence

CBT therapists spent 90.57% of session time on CBT-specific content versus .00% in adapted MBSR, a significant difference, $F(1, 15) = 723.88$, $p < .001$, $p\eta^2 = .98$. MBSR therapists spent 84.11% of sessions on MBSR-specific content versus 3.12% in CBT, a significant difference: $F(1, 15) = 49.72$, $p < .001$, $p\eta^2 = .77$. Each treatment, therefore, showed a high level of treatment integrity with little to no contamination by the other treatment. As expected, CBT and adapted MBSR did not differ on the non-model-specific subscale, $F(1, 15) = .06$, $p = .81$, $p\eta^2 = .00$.

On the therapist competence scale, therapists in both groups were rated in the range of "very good to excellent", with no significant differences between adapted MBSR ($M = 27.75$, $SD = 2.66$) and CBT ($M = 24.22$, $SD = 5.17$), $F(1, 15) = 3.01$, $p = .10$, $p\eta^2 = .17$. Inter-rater reliability across the four scales (CBT, MBSR, nonspecific, therapist competency) averaged ICC = .94 in a two-way mixed effects model.

Outcomes

Table 3 displays the within- and between-group change slopes for outcomes in the ITT sample. Table 4 shows the HLM-derived, between-group effect sizes for the ITT sample at Post and FU. We only report Completer results when they differed from ITT results in effect size or statistical significance.

Primary outcomes

Primary Outcomes Change Slopes: ITT: Summarizing the detailed findings in Table 3, both CBT ($p < .001$, $d = -3.52$) and adapted MBSR ($p < .001$, $d = -4.08$) showed very large improvements in principal anxiety disorder CSRs over time (e.g., Pre to FU), with no significant differences between groups, $p = .45$, $d = .59$. On the PSWQ, a significant group × time interaction ($p = .04$, $d = .64$) reflected the finding that adapted MBSR improved significantly over time ($p = .02$, $d = -.60$) whereas CBT did not ($p = .83$, $d = .04$). Group differences at Pre (see above), however, complicate the interpretation of this finding. On the MASQ-AA, Ps generally improved over time ($p = .003$, $d = -.35$), with no significant differences between groups ($p = .10$, $d = .35$).

Table 3
Hierarchical linear modeling effects of time (Pre-Post-FU) and condition by time interactions for ITT outcomes ($n = 105$).

	B	*SE*	*t*	*d*
Primary outcome				
Principal CSR				
Time (overall)	−1.82	.18	−10.35***	−3.79[a]
MBSR (within group)	−1.96	.26	−7.62***	−4.08[a]
CBT (within group)	−1.69	.24	−7.01***	−3.52[a]
Group × Time	.27	.35	.76	.59[a]
PSWQ				
Time (overall)	−1.66	.90	−1.85	-.28
MBSR (within group)	−3.52	1.51	−2.33*	-.60
CBT (within group)	.21	.96	.22	.04
Group × Time	3.73	1.79	2.09*	.64
MASQ-Anxiety				
Time (overall)	−.15	.05	−3.08**	-.35
MBSR (within group)	−.07	.07	−1.05	-.16
CBT (within group)	−.22	.07	−3.30**	-.51
Group × Time	.15	.09	1.64	.35
Secondary outcome				
BDI-II				
Time (overall)	−2.08	.72	−2.90**	-.34
MBSR (within group)	−3.10	1.09	−2.85**	-.51
CBT (within group)	−1.05	.93	−1.13	-.17
Group × Time	2.04	1.43	1.43	.34

$p \leq .09$, $^{*}p < .05$; $^{**}p \leq .01$, $^{***}p \leq .001$.
Note: CSR = clinical severity ratings of the principal anxiety disorder(s) from the MINI; PSWQ = Penn State Worry Questionnaire; MASQ-Anxiety = Mini Mood and Anxiety Symptom Questionnaire, Anxious Arousal scale; BDI-II = Beck Depression Inventory-II.
[a] The pre-treatment CSR range was restricted due to eligibility requirements. Thus the pre-treatment standard deviation (*SD*), which represents the denominator in the Feingold (2009) effect size formula, was very small (.96), that is, nearly 1/3rd in magnitude of the *SD* at follow up (2.73). If we use the *SD* at follow up to compute effect sizes, the CSR *ds* = 1.33, 1.44, 1.24, and .20, respectively, from column top to bottom.

Table 4
Group differences in effect size for cross-sectional post and FU outcomes in the ITT sample.

		Between-group effect size (*d*)
Primary outcomes		
Principal CSR	Post	−.29[a]
	FU	−.56[a]
PSWQ	Post	+.07
	FU	−.25
MASQ-Anxious arousal	Post	+.31
	FU	+.49*
Secondary outcome		
BDI-II	Post	+.08
	FU	−.08

*The group difference in Betas is significant at the $p < .05$ level.
Note: A negative sign (−) denotes an effect size in favor of adapted MBSR whereas a positive sign (+) denotes an effect size in favor of CBT. Effect sizes are derived from hierarchical linear modeling using Feingold's (2009) methods.
[a] The pre-treatment CSR range was restricted due to eligibility requirements, restricting the pre *SD* used in the Feingold (2009) effect size formula. If we use the *SD* at follow up to compute effect size, the between group *ds* for CSR would be −.10 at Post and −.20 at FU. For the other outcomes, this was not an issue because *SD*s at Post and FU were similar to Pre. Due to these pre *SD* differences, the group MASQ $d = .49$ at FU is statistically significant whereas the CSR *d* at FU is not.

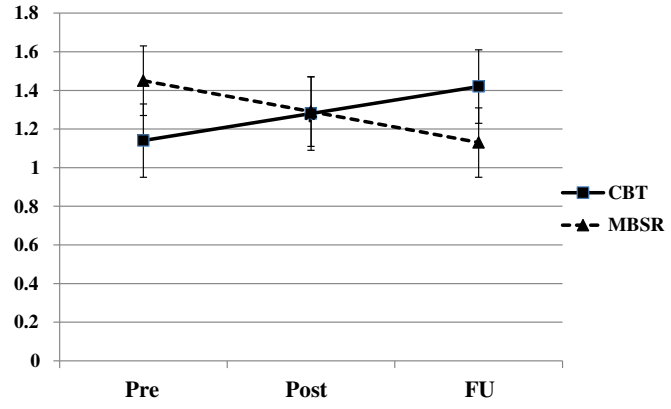
Primary Outcomes at Post and FU: ITT. Summarizing the findings from Table 4, adapted MBSR and CBT showed no significant differences at Post or FU on principal disorder CSR or PSWQ (*p*s > .33), though the pattern of results at FU evidenced small or medium effect size differences in favor of adapted MBSR (the magnitude depended on how effect size was computed, see Table 4 footnote). On the MASQ-AA, CBT showed significantly greater improvement at FU than adapted MBSR of a medium effect size ($p = .003$, $d = .49$).

Primary Outcomes Change Slopes: Completer Sample. Findings from the completer sample paralleled results from the ITT sample with several differences. On the PSWQ, Group × Time effects did not reach full significance, $B = 3.21$, $SE = 1.67$, $t(52) = 1.92$, $p = .06$, $d = .52$, although the findings were in the same direction as the ITT sample and of medium effect size, with adapted MBSR showing greater improvement over time than CBT. On the MASQ-AA, Group × Time effects became statistically significant, $B = .25$, $SE = .09$, $t(52) = 2.61$, $p = .01$, $d = .54$, with CBT showing significant improvement over time, $B = -.25$, $SE = .08$, $t(52) = -3.22$, $p < .01$, $d = .54$, and adapted MBSR showing no improvement over time, $B = .00$, $SE = .06$, $t(52) = .02$, $p = .99$, $d = .00$.

Primary Outcomes at Post and FU: Completer Sample. In the completer sample, the superiority of CBT over MBSR on the MASQ-AA at FU diminished to trend status, $B = .44$, $SE = .25$, $t(52) = 1.78$, $p = .08$, $d = .47$.

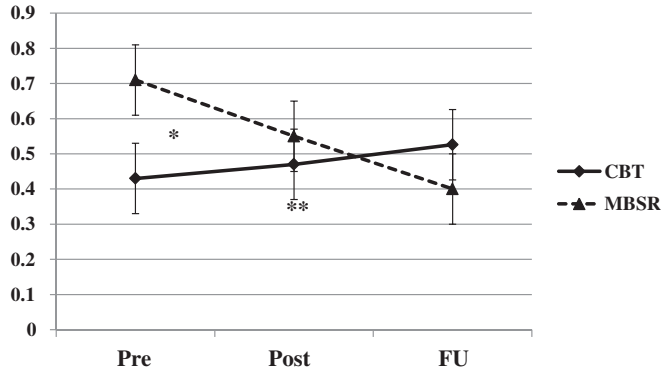
Secondary outcome

Secondary Outcome Change Slope: ITT. Summarizing findings from Table 3, Ps showed significant improvement on the BDI across time ($p = .005$, $d = -.34$). The group × time interaction was nonsignificant ($p = .16$, $d = .34$) though favored adapted MBSR by a small to medium effect size.



* Group x time interaction, $p < .05$, $d = .49$

Fig. 2. Group × time differences in the number of co-occurring mood and anxiety disorders in the ITT sample.



* Group differences at Pre, $p < .01$, odds ratio = .31
** Group x Time interaction, $p \leq .001$, odds ratio = 2.38

Fig. 3. Group × time differences in the presence of co-occurring mood disorders (odds ratios) in the ITT sample.

Secondary Outcome at Post and FU: ITT. Summarizing findings from Table 4, CBT and adapted MBSR showed no differences at Post or FU, $ps > .70$, $ds = .08$.

Secondary Outcome Change Slope: Completer Sample. In the completer sample, BDI change slopes were similar to the ITT sample except that significance values were more modest, likely due to the smaller sample size. The overall effect of Time was significant, $B = -1.79$, $SE = .79$, $t(52) = 2.26$, $p = .03$, $d = .26$ The Group × Time interaction was non-significant, $B = 2.00$, $SE = 1.59$, $t(52) = 1.26$, $p = .22$, $d = .29$, though favored MBSR by a small to medium effect size.

Co-occurring disorders

The ITT sample evidenced a significant Group × Time interaction number of co-occurring anxiety and mood disorders, $B = .29$, $SE = .14$, $t(99) = 2.08$, $p = .04$, $d = .49$, which tended to decrease in adapted MBSR, $B = -.16$, $SE = .10$, $t(99) = -1.56$, $p = .12$, $d = .27$, but tended to increase in CBT, $B = .14$, $SE = .10$, $t(99) = -1.39$, $p = .17$, $d = .24$, see Fig. 2. Group differences at Pre were non-significant, $B = -.32$, $SE = .23$, $t(99) = -1.38$, $p = .17$, $d = .27$.

To pinpoint the source of this group difference, we conducted follow-up analyses comparing groups on co-occurring anxiety versus mood disorders. Groups evidenced no differences for change in co-occurring anxiety disorders over time, $B = .12$, $SE = .11$, $t(99) = 1.08$, $p = .28$, $d = .28$. The presence of co-occurring mood disorders, however, showed a significant Group × Time interaction, $B = .87$, $SE = .26$, $t(221)$[11] $= 3.30$, $p = .001$, odds ratio = 2.38 (95% CIs: 1.16, 4.84), with adapted MBSR resulting in reduced mood disorders, $B = -.67$, $SE = .19$, $t(221) = -3.50$, $p = .001$, odds ratio = .51 (95% CIs: .30, .89), and CBT resulting in no change in mood disorders, $B = .20$, $SE = 1.8$, $t(221) = 1.10$, $p = .27$, odds ratio = 1.22 (95% CIs: .78, 1.91), see Fig. 3. Significant group differences at Pre, $B = 1.17$, $SE = .41$, $t(102) = 2.85$, $p = .006$, odds ratio = .31 (95% CIs: .12, .80), however, demonstrated the more frequent presence of mood disorders among adapted MBSR ($B = .89$, $SE = .32$, odds ratio = 2.43 [95% CI: 1.17, 5.04]) than CBT Ps, ($B = -.28$, $SE = .26$, odds ratio = .75 [95% CI: .41, 1.39]), complicating the interpretation of this finding, see Table 1.

[11] The GHLM slopes were fixed to promote model convergence, that is, models easily converged with fixed slopes but did not converge with random slopes. Intercepts remained random.

Treatment response

Adapted MBSR and CBT showed no significant differences in reliable diagnostic improvement or clinically significant improvement at Post or FU, see Table 5.

Attrition

Ps in adapted MBSR ($M = 5.64$, $SD = 2.87$) and CBT ($M = 6.27$, $SD = 2.82$) did not differ in the average number of sessions attended, $t(103) = 1.11$, $p = .27$. Even when accounting for the 3-h retreat (i.e., considering it as 2 treatment sessions), adapted MBSR ($M = 6.04$, $SD = 3.25$) and CBT ($M = 6.27$, $SD = 2.82$) did not differ in the number of treatment sessions attended, $t(103) = .38$, $p = .71$. Further, adapted MBSR (44.44%) and CBT (56.67%) did not differ in the portion of Ps who met criteria for 'treatment completion' (as defined above), $\chi^2(1) = 1.54$, $p = .22$.

Discussion

In a randomized clinical trial conducted at a VA outpatient clinic, we compared the efficacy of group CBT versus adapted MBSR for heterogeneous anxiety disorders. We explored the degree to which both treatments reduced the severity of the principal anxiety disorder, and tested the hypotheses that CBT would reduce anxiety symptoms to a greater degree than adapted MBSR, whereas adapted MBSR would reduce broader symptoms (e.g., depression and co-occurring emotional disorders) to a greater degree than CBT. Overall findings offered limited support for the main set of

Table 5
Treatment response rates.

Assessment	CBT	MBSR	χ^2	p	Cramer's v
Reliable change[a] on principal disorder CSR					
Post-treatment	47.2% (17/36)	40.6% (13/32)	.30	.58	.07
3-month follow-up	54.8% (17/31)	72.7% (16/22)	1.75	.19	.18
3-month follow-up[b]	51.3% (20/39)	59.4% (19/32)	.47	.50	.08
Reliable *and* Clinically significant change[a] based on one or more primary outcomes (of three)					
Post-treatment	52.8% (19/35)	40.0% (12/30)	1.07	.30	.13
3-month follow-up	53.8% (14/26)	68.2% (15/22)	1.02	.31	.15
3-month follow-up[b]	51.3% (20/39)	58.1% (18/31)	.32	.57	.07

[a] Reliable change required the following *minimum* improvement values from pre-treatment: principal disorder CSR = 2.60, PSWQ = 10.48, MASQ-AA = 7.27.
[b] In this analysis, we carried the Post data forward to FU for those with missing FU data.

hypotheses. That is, both adapted MBSR and CBT significantly reduced principal anxiety disorder(s) diagnostic severity, with no significant differences between groups in rate or degree of improvement. On anxiety-related self-report measures, CBT outperformed adapted MBSR on one measure whereas adapted MBSR outperformed CBT on the other measure, although group differences at Pre may account for the latter finding. For broader treatment effects, as predicted, adapted MBSR outperformed CBT on reducing the number of clinician-rated co-occurring mood and anxiety disorders. In summary, the results did not generally support the prediction that CBT would show superior anxiety-specific outcomes but offered some support for the prediction that adapted MBSR would show superior outcomes on broader measures.

Primary outcomes

On the three primary outcomes, overall improvement was mixed. For clinician-rated diagnostic severity of the principal anxiety disorder(s), both treatments showed large effect size improvements from pre- to post-treatment and follow up. Thus, both CBT and adapted MBSR were efficacious in treating the principal anxiety disorder(s). Further, groups did not show significant differences in reliable or clinically significant change.

On the self-reported outcomes, improvements were more modest in magnitude, with effect sizes in adapted MBSR comparable to previous MBSR findings (Vollestad et al., 2011). Several group differences emerged. First, a significant group by time interaction of medium to large magnitude demonstrated that adapted MBSR significantly reduced worry whereas CBT did not. The adapted MBSR group evidenced higher worry than CBT at pre-treatment, however, pointing to the possibility that regression to the mean accounted for this group difference. An alternative explanation, however, is that adapted MBSR was particularly effective at reducing ruminative worry processes, a finding that is consistent with previous studies (Jain et al., 2007; Ramel et al., 2004). The finding that CBT did not reduce worry is inconsistent with previous research (Arch et al., 2012; Newman et al., 2011), and may stem from the current patients' low socioeconomical status (e.g., they faced real circumstances about which to worry) coupled with the limited number of completed treatment sessions.

For self-reported anxious arousal outcomes, the opposite pattern emerged: CBT showed significant reductions over time of medium effect size whereas MBSR did not, a difference that reached significance among Completers only. By follow up, CBT showed lower anxious arousal than adapted MBSR in the ITT sample. CBT's emphasis on exposure and the resulting extinction or inhibitory learning (Craske et al., 2008) may have reduced anxiety-related physiological arousal and related perceptions. In contrast, MBSR's body scan exercise may have heightened perception of internal bodily sensations, and thus led to fewer gains on this measure.

Overall, the divergent pattern of group differences on worry and anxious arousal outcomes suggests that change on these measures were decoupled, and that adapted MBSR may have more effectively improved cognitive symptoms of anxiety (e.g., uncontrollable worry) whereas CBT more effectively improved physical symptoms of anxiety (e.g., perceived arousal).

Secondary/broader outcomes

On broader outcome of co-occurring mood and anxiety disorders, adapted MBSR evidenced superior outcomes relative to CBT. Adapted MBSR reduced the total number of co-occurring mood and anxiety disorders (e.g., emotional disorders; Barlow et al., 2004) over time to a greater extent than CBT, despite a lack of group differences at Pre. Follow-up analyses demonstrated that group differences in mood disorder reduction drove these results, that is, adapted MBSR was more than twice as likely as CBT to result in the elimination of co-occurring mood disorders. At Pre, however, adapted MBSR patients evidenced significantly greater rates of co-occurring mood disorders than CBT patients, allowing greater room for improvement. On the other hand, nearly half of CBT patients also had mood disorders at pre-treatment, and this rate did not improve following treatment. In summary, although pre-treatment differences complicate the interpretation of results, findings support the possibility that adapted MBSR exerted a more powerful therapeutic effect on co-occurring mood disorders than CBT. Although group by time differences did not reach significance on a self-reported depression measure, group differences were in the same direction, and within-group depression symptom improvements were significant in adapted MBSR but not CBT (see Table 2).

Overall, adapted MBSR compared more favorably to CBT in the present study than in the one previous study comparing these treatments (Koszycki et al., 2007), particularly on principal disorder severity outcomes. The study comparison may not be apt, however, because the Koszycki et al. study focused only on social anxiety disorder, treated a less severe and complex patient sample, and administered far more treatment than the present study (77% received 27.5–30 h of treatment versus a mean of 9 h in the current study). It is plausible that adapted MBSR compares more favorably to CBT among more complex patients with limited treatment time, as in the current study. Importantly, outside of academic settings, patients with limited time to devote to treatment are the rule rather than the exception (e.g., Trepka, 1986; Wang et al., 2005). Therefore, this study informs the key question of how adapted MBSR versus CBT performs under 'real world' conditions. Future studies are needed to clarify the specific anxiety disorders, patient and treatment characteristics that result in different outcomes within MBSR versus CBT.

Study strengths and limitations and future recommendations

Along with notable strengths, this study has multiple limitations. Strengths included conducting the study within a real-world treatment setting with socioeconomically disadvantaged patients and utilizing few exclusion criteria, all of which enhanced the external validity of the study. Fully half of the sample was disabled or unemployed, and only a minority were married or working professionals (at a mean age of 46). Further, relative to previously studied heterogeneous anxiety disorder samples (e.g., Arch et al., 2012; Brown, Campbell, et al., 2001), the current sample suffered from particularly high rates (70%) of co-occurring mood and anxiety disorders. Relatively few randomized clinical trials for anxiety disorders in the literature, particularly outside of PTSD, treat such clinically complex and socioeconomically disadvantaged patients. The results of this study therefore are relevant to mental health practitioners in real-world settings, and suggest that both group CBT and adapted MBSR can be effective in such settings.

These strengths, however, also resulted in limitations. First, utilizing a particularly complex patient population also meant that attrition rates were high – only about half of patients completed an adequate dose of treatment (defined here as 70% or 10.5 h). These attrition rates are consistent with previous findings of high drop out rates for psychotherapy interventions targeting veterans (e.g., Chemtob, Novaco, Hamda, & Gross, 1997; Escalona, Canive, Calais, & Davidson, 2002) and for socioeconomically disadvantaged and unemployed individuals more generally (Edlund et al., 2002; Trepka, 1986; Wierzbicki & Pekarik, 1993). For CBT patients, attrition resulted in a limited number of exposure-focused treatment sessions for many. The vast majority of patients who did not

complete all CBT sessions, however, attended the group intermittently throughout the 10 weeks of treatment, and therefore received at least some dose of exposure (albeit a limited dose in many cases). Notwithstanding the impressive improvements in clinician-rated principal disorder severity in both treatments, effect sizes on self-report measures were more modest than those found in the extant CBT for heterogeneous anxiety disorders literature (e.g., Arch et al., 2012; Norton & Philipp, 2008). The ITT and Completer analyses demonstrated relatively few differences, however, suggesting that the complex nature of the patient sample rather than the limited completed treatment sessions likely account for the relatively modest self-reported gains. Further, the finding that blind clinician ratings evidenced *far* greater improvement than self-reported patient ratings suggests that patients may have lacked motivation to report improvement. A substantial portion of participants received government disability payments for psychiatric-related conditions which may have impacted their desire to report improvement on psychiatric outcomes (e.g., Pitman, Orr, Altman, & Longpre, 1996).

Second, our sample size ($n = 105$) was respectable but somewhat underpowered to detect group differences of medium effect size, more so due to attrition. Null findings should be interpreted with caution as some differences between treatment groups may have been too small to detect; attention should be directed toward group differences in effect size. The sample size was insufficiently large to conduct disorder-specific analyses. In that principal panic disorder and GAD patients represented the majority of the sample whereas principal OCD patients represented less than 5% of the sample, caution must be used in generalizing to OCD samples in particular. Relatedly, we focused our discussion on the HLM statistical models, which flexibly included patients with missing data, rather than on the raw data, which were drawn only from participants with data at a given time point and therefore, may not model change across time accurately in a sample with significant attrition. The raw data indicated a pattern of increased self-reported worry and depression at follow-up in the MBSR group; however, these patterns were not reflected in the statistical models that drew from all participants. Third, conducting the trial in a real-world treatment clinic resulted in the necessity of a weighted randomization approach, with greater numbers of patients assigned to CBT than adapted MBSR. Further, randomization successfully equalized groups on principal anxiety disorder severity but did not equalize groups on worry or co-occurring depression variables, which were more severe at pre-treatment in adapted MBSR than CBT.[12] Significant pre-treatment differences complicated the interpretation of group differences on these outcomes, particularly given the lack of a waitlist control group. Future studies should consider balancing groups on comorbid conditions during randomization. Fourth, the need to match the length of both treatments as closely as possible meant that adapted MBSR group sessions were shorter (90 versus120–150 min; a 3 h retreat versus all-day retreat) and more enduring (10 sessions versus 8 sessions) than typical MBSR formats (Kabat-Zinn, 1990), whereas CBT groups involved fewer sessions (10 versus12 or more) than usual. The group format modifications necessitated by treatment matching somewhat reduced the dose of both interventions (more so given the high attrition), which may have diminished their efficacy relative to typical delivery. Fifth, MBSR was modified to include anxiety disorder psychoeducation and brief mindfulness of values work. Although these components comprised only a portion of 2 of 10 sessions, it is uncertain if our results would generalize to contexts in which anxiety disorder patients underwent unmodified MBSR groups without an anxiety focus. Sixth, conducting the study in a VA clinic meant that the vast majority of patients were male, which does not reflect the predominance of females in both community and clinic anxiety disorder samples (Craske, 2003; Kessler, Berglund, Demler, Jin, & Walters, 2005). However, the focus on males is also strength in that they represent a less-studied clinical group with respect to many anxiety disorders. Seventh, we assessed treatment credibility in mid-treatment, at which point many participants had already dropped out or attended sparsely. Assessing treatment credibility in the first or second session would have allowed us to more assess a broader sample, and to determine the relationship between early treatment credibility and later attrition.

Despite the relatively diverse participant sample, ethnic/racial minorities were significantly less likely to begin treatment than were white/Caucasian patients. Future related interventions within the VA should focus specifically on recruiting and retaining minorities. Designing study brochures that include pictures of minority patients, ensuring that VA-related posters and images in clinic and study rooms include minority veterans, and utilizing ethnically diverse assessors and therapists may assist with retaining minority veterans. For all participants, providing more robust financial incentives for attendance, organizing a ride van for participants with driving difficulties or for those who do not own a car, and creating a buddy system for home practice accountability may assist in increasing session attendance and adherence. Future studies would also benefit from a longer follow up period and utilization of biological and behavioral outcomes. To minimize participant burden we did not use self-report measures that assessed each disorder's unique constellation of symptoms. Future studies can expand our understanding of each intervention's impact by including disorder-specific measures.

Summary and conclusions

In a sociodemographically complex patient sample with heterogeneous anxiety disorders, group CBT and MBSR showed similar results across most outcomes, with several exceptions. Specifically, CBT resulted in superior anxious arousal outcomes. Adapted MBSR resulted in superior co-occurring mood disorder and worry outcomes, but evidenced greater severity on these outcomes at pre-treatment, complicating their interpretation. Blind clinician-rated principal anxiety disorder severity demonstrated very large effect size improvements across both treatments whereas effect sizes on self-report outcomes demonstrated more modest improvements.

Overall findings suggest that group CBT and adapted MBSR affected similar rates of therapeutic change, and that both are worthy of future investigations for heterogeneous anxiety disorders. The results support the possibility of expanding group-based options for anxiety disorder treatment to include adapted MBSR, at least for veterans. With greater infrastructure support for retention, both group CBT and adapted MBSR have the potential to serve as viable real-world treatment options. Finally, based on the current findings, future studies should examine whether CBT better serves patients high in anxiety-related arousal and whether MBSR better serves patients high in worry or with co-occurring mood disorders.

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[12] We are not suggesting that weighted randomization accounted for this effect, which may have occurred with typical randomization as well.

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