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Pre-treatment Social Anxiety Severity Moderates the Impact of Mindfulness-Based Stress Reduction and Aerobic Exercise

Hooria Jazaieri, M.A.^{*,a}, Ihno A. Lee, Ph.D.^b, Philippe R. Goldin, Ph.D.^c, and James J. Gross, Ph.D.^b

^aUniversity of California, Berkeley, Department of Psychology, Berkeley, CA, United States

^bStanford University, Department of Psychology, Stanford, CA, United States

^cUniversity of California, Davis, School of Nursing Science & Healthcare Leadership, Sacramento, CA, United States

Abstract

We examined whether social anxiety severity at pre-treatment would moderate the impact of Mindfulness-Based Stress Reduction (MBSR) or Aerobic Exercise (AE) for generalized social anxiety disorder. MBSR and AE produced equivalent reductions in weekly social anxiety symptoms. Improvements were moderated by pre-treatment social anxiety severity.

Social anxiety disorder (SAD) is a prevalent and debilitating disorder (Kessler et al., 2005) characterized by a fear of social and performance situations (Cox, Fleet, & Stein, 2004). Although gold-standard interventions for SAD exist (Powers, Sigmarsson, & Emmelkamp, 2008), many people are not helped by these interventions, prompting a search for alternative treatments. For example, Mindfulness-Based Stress Reduction (MBSR; Kabat-Zinn, 1990) has recently been embraced as a popular integrative medicine intervention (Hofmann, Sawyer, Witt, & Oh, 2010), while aerobic exercise (AE) has been gaining momentum as an alternative to traditional treatments for a variety of anxiety disorders (see review by Asmundson et al., 2013).

One key question is whether pre-treatment characteristics moderate the impact of non-traditional treatments (Kraemer, Frank, & Kupfer, 2006). In a randomized controlled trial (RCT) for SAD, we (1) tested whether MBSR would outperform AE, and (2) explored whether higher pre-treatment social anxiety severity would moderate the reduction in symptoms during MBSR and AE.

*Corresponding author at: University of California, Berkeley, Department of Psychology, Institute of Personality and Social Research, 4152 Tolman Hall, Berkeley, California 94720-1650, United States. Tel.: +1-408-462-1447. hooria@berkeley.edu (H. Jazaieri).

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Methods

Procedure and Patient Characteristics

Patients met criteria for a principal diagnosis of generalized SAD based on a structured interview (Di Nardo, Brown, & Barlow, 1994) with a clinical psychologist. Upon enrollment and completion of pre-treatment assessments (described below), patients were randomized to 8 weeks of either MBSR or AE using Efron's (1971) biased coin randomization procedure, which entails higher probability of allocation to the under-represented treatment group throughout the duration of the clinical trial. Patients completing less than 50% of the weekly ratings (described below) over the 8-weeks were excluded from the present analyses ($n=9$). This sample includes 47 patients (MBSR ($n=27$), AE ($n=20$)), 53% females, 23-53 years of age ($M=33.3$, $SD=8.5$), and predominantly Caucasian (45%) and Asian (45%).

Interventions

Standard MBSR (Kabat-Zinn, 1990) was administered. Patients attended public courses for adults throughout the San Francisco Bay Area. Instructors were unaware of participants' clinical status. Patients randomized to AE received two-month gym memberships. To match the individual and group components of MBSR, AE participants completed at least two individual AE sessions and one group AE class (other than yoga) each week. (For a detailed discussion of these interventions see Jazaieri et al., 2012).

Measures

Moderator: Pre-treatment Severity—The Liebowitz Social Anxiety Scale-Self-Report (LSAS-SR; Liebowitz, 1987) is a 24-item measure of social anxiety severity. The LSAS-SR is reliable with good convergent and discriminant validity (Fresco et al., 2001; Rytwinski et al., 2009) and high internal consistency (MBSR and AE α 's=0.90).

Outcome: Social Anxiety—We obtained weekly measurements of SAD-related clinical symptoms related to: anticipatory anxiety, anxiety during social situations, post-event social anxiety, social anxiety intensity, distress due to social anxiety, and interference due to social anxiety (Aldao, Jazaieri, Goldin, & Gross, 2014; Goldin et al., 2014). Items were averaged to create a social anxiety composite variable. Items were internally consistent (α 's=0.84-0.95).

Data Analysis

Utilizing multilevel modeling in SAS, we examined group differences in week-to-week changes in social anxiety symptoms. We implemented the following model with week of assessment, dummy-coded MBSR (vs. AE), and the week \times MBSR cross-level interaction as predictors:

$$\text{Social Anxiety}_{ij} = \gamma_{00} + \gamma_{10}(\text{Week}) + \gamma_{01}(\text{MBSR}) + \gamma_{11}(\text{week} \times \text{MBSR}) + u_{0j} + u_{1j}(\text{Week}) + e_{ij} \quad \text{Model 1}$$

The fixed effect γ_{11} , reflects group differences in week-to-week change in social anxiety symptoms. The intercept and week slope were specified as random (i.e., varying across individuals; u_{0j} , u_{1j}).

To examine whether pre-treatment symptom severity (LSAS-SR) moderates the intervention effect on weekly levels of social anxiety symptoms (H2), we implemented Model 2 with week of assessment, dummy-coded MBSR (vs. AE), pre-treatment LSAS-SR, and the MBSR \times pre-treatment LSAS-SR interaction as predictors:

$$\begin{aligned} \text{Social Anxiety}_{ij} = & \gamma_{00} + \gamma_{10} (\text{Week}) \\ & + \gamma_{01} (\text{MBSR}) \\ & + \gamma_{02} (\text{Pre-treatment LSAS-SR}) \\ & + \gamma_{03} (\text{MBSR} \\ & \times \text{Pre-treatment LSAS-SR}) + u_{0j} + u_{1j} (\text{Week}) + e_{ij} \end{aligned} \quad \text{Model 2}$$

MBSR and pre-treatment LSAS-SR were added as person-level predictors of the intercept only¹. The fixed effect γ_{03} , reflects the group \times pre-treatment symptom severity interaction. Fixed effects γ_{01} and γ_{02} are the main effects of MBSR (vs. AE) and pre-treatment LSAS-SR, respectively.

Results

Group Differences in Weekly Trajectories of Social Anxiety Symptoms

Weekly trajectories did not differ by group ($\gamma_{11} = -0.59$, $SE = 0.70$, $p = 0.40$). For both MBSR and AE patients, social anxiety levels decreased from pre-treatment (MBSR: $M = 61.05$, $SD = 13.59$; AE: $M = 70.37$, $SD = 17.52$) through session 8 (MBSR: $M = 41.43$, $SD = 16.34$; AE: $M = 39.17$, $SD = 21.58$) (Figure 1). Both MBSR and AE produced significant reductions in weekly social anxiety symptoms (MBSR: $\gamma_{10} = -2.84$, $SE = 0.38$, $p < 0.001$; AE: $\gamma_{10} = -3.49$, $SE = 0.62$, $p < 0.001$) indicating large effects (MBSR: $PRV^2 = 0.39$; Exercise: $PRV = 0.32$), though these effects did not vary across patients ($ps > 0.24$)³.

Moderation of Weekly Levels of Social Anxiety Symptoms

We observed a group \times pre-treatment social anxiety severity (LSAS-SR) interaction on the weekly levels of social anxiety ($\gamma_{03} = 0.59$, $SE = 0.20$, $p < 0.004$; $PRV^4 = 0.37$), indicating that MBSR (vs. AE) effects on social anxiety symptoms during treatment were conditional on pre-treatment social anxiety severity (LSAS-SR). MBSR patients with *low* pre-treatment social anxiety severity (LSAS-SR < -1 SD) had significantly lower levels of social anxiety symptoms throughout MBSR than those in AE ($\Delta_{\text{Anx}} = -13.21$, $t = 2.45$, $p = 0.015$). In

¹Social anxiety trajectories did not differ by group. We did not hypothesize a week \times MBSR \times pre-treatment LSAS-SR interaction, so MBSR and pre-treatment LSAS-SR were specified as predictors of the intercept, but not the week slope.

² PRV represents the proportional reduction in level-1 residual variance associated with adding week as a predictor to a null model.

³Given no week \times MBSR interaction, we estimated MBSR and AE trajectories separately in an abbreviated Model 1 (with only week as a predictor).

⁴Here, PRV represents the proportional reduction in level-2 intercept variance associated with adding the interaction term to a main-effects model.

contrast, patients with *high* pre-treatment severity (LSAS-SR > +1 SD) had marginally higher symptom levels during MBSR versus AE ($d_{Anx} = 9.16$, $t=1.76$, $p=0.079$) (Figure 2).

Summary and Discussion

MBSR and AE produced significant and equivalent reductions in weekly trajectories of social anxiety symptoms. Although there were no differences between the two interventions (replicating prior findings suggesting that MBSR and AE have an equivalent impact on pre-to-post social anxiety severity; Jazaieri et al., 2012), exploratory analyses revealed that patients with *lower* pre-treatment social anxiety severity had significantly *less* weekly levels of social anxiety symptoms throughout MBSR when compared to AE. In contrast, MBSR patients with *higher* pre-treatment social anxiety severity had marginally *higher* weekly levels of social anxiety symptoms when compared to AE.

Given the small sample for moderator analyses, future studies with larger sample sizes are needed to replicate and extend these findings. Future studies should also examine MBSR and AE within other anxiety disorders to understand whether these patterns are generalizable. It will also be useful to compare MBSR and/or AE directly to gold-standard treatments.

These limitations notwithstanding, this study highlights that for SAD, measuring pre-treatment social anxiety severity may be a useful approach to informing treatment recommendations. Currently there is little empirical evidence in the area of treatment matching for anxiety disorders (Arch & Ayers, 2013), meaning that clinicians who make decisions about matching patients to treatments on a daily basis have little empirical guidance. Further, although both MBSR and AE were equally effective in reducing social anxiety symptoms, this study suggests that these interventions may have differential effects on patients, depending on pre-treatment social anxiety severity. These findings could inform future research examining a sequence of interventions based on the patients' social anxiety level; for example, patients arriving with high social anxiety severity may begin treatment with an aerobic exercise intervention and once the patient's social anxiety severity decreases, the patient could then take part in a standard 8-week MBSR intervention. While the results from this study are encouraging, large sample replication efforts and continued examination of session-by-session changes are needed.

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Practitioner Points

- Mindfulness-Based Stress Reduction (MBSR) and aerobic exercise (AE) are effective in reducing symptoms of social anxiety
- Pre-treatment social anxiety severity can be used to inform treatment recommendations
- Both MBSR and AE produced equivalent reductions in weekly levels of social anxiety symptoms
- MBSR appears to be most effective for patients with lower pre-treatment social anxiety symptom severity
- AE appears to be most effective for patients with higher pre-treatment social anxiety symptom severity

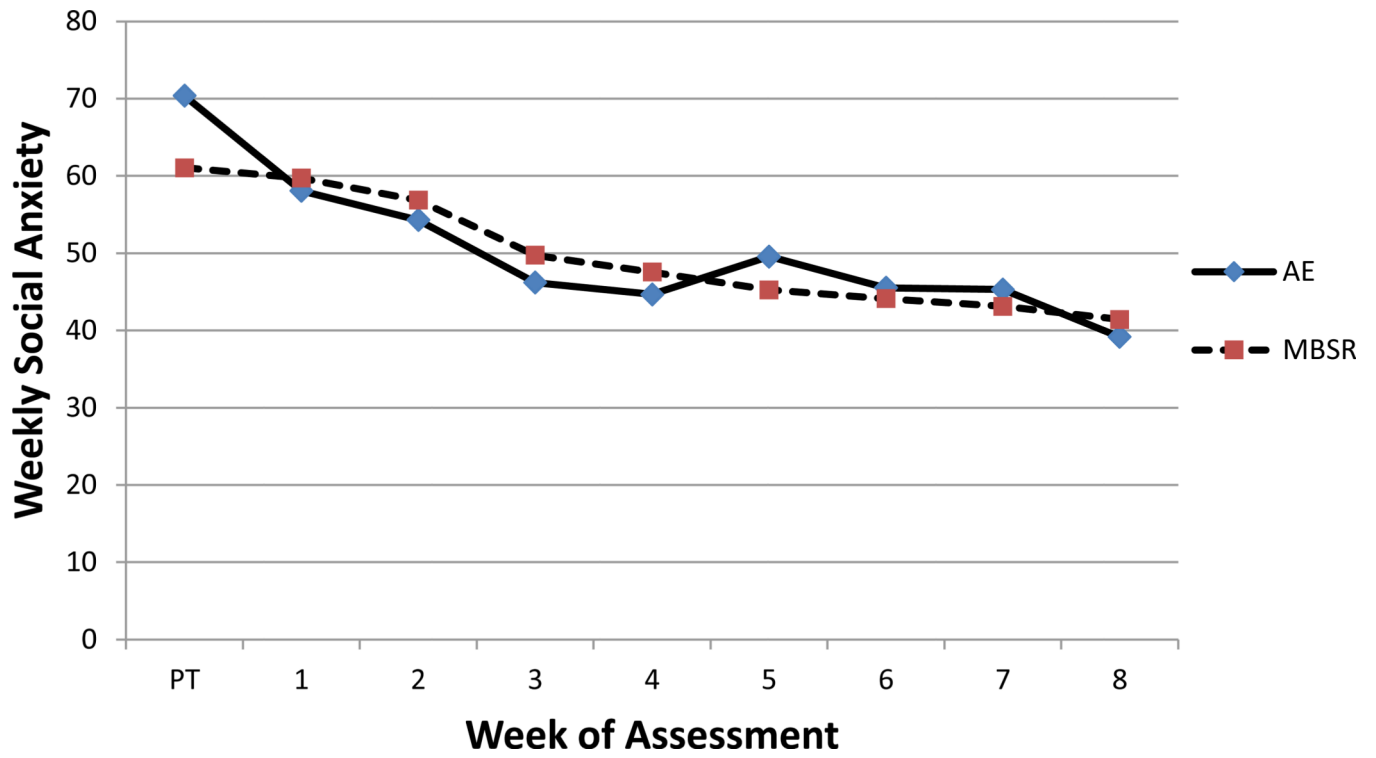


Figure 1. Trajectory of pre-treatment (PT) and weekly social anxiety across 8-weeks of Mindfulness-Based Stress Reduction (MBSR) and aerobic exercise (AE) groups

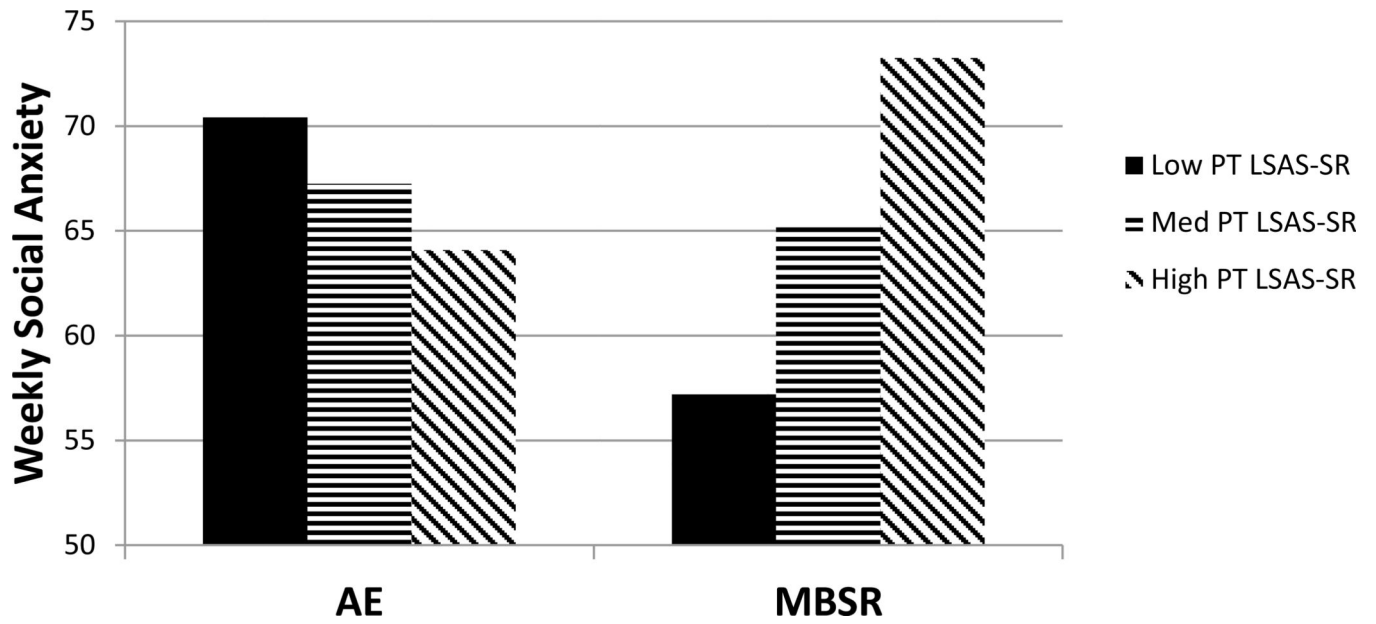


Figure 2. Pre-treatment Liebowitz Social Anxiety Scale Self-Reported (LSAS-SR) as a moderator of Mindfulness-Based Stress Reduction (MBSR) and aerobic exercise (AE) group effects of weekly anxiety