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Changes in mindfulness facets across yoga, CBT and stress education in individuals with generalized anxiety disorder

Danielle Moskow Diamond^{a,*}, David Rosenfield^b, Nikki Kaiser^c, Amanda W. Baker^a, Elizabeth A. Hoge^d, Sat Bir S. Khalsa^e, Stefan G. Hofmann^f, Naomi M. Simon^c

^aCenter for Anxiety and Traumatic Stress Disorders, Harvard Medical School/Massachusetts General Hospital, 1 Bowdoin Square, Boston, MA 02114, USA

^bDepartment of Psychology, Southern Methodist University, PO Box 750442, Dallas, TX 75275, USA

^cAnxiety, Stress & Prolonged Grief Program, New York University Langone, 1 Park Avenue, New York, NY 10016, USA

^dAnxiety Disorders Research Program, Georgetown University Medical Center, 2115 Wisconsin Ave, NW, Washington, DC 20007, USA

^eDivision of Sleep Medicine, Brigham and Women's Hospital, 221 Longwood Avenue, Boston, MA 02115, USA

^fDepartment of Psychology, Philipps-Universität Marburg, Schulstrasse 12, 35037 Marburg, Germany

Abstract

Improving mindfulness is an important treatment target for generalized anxiety disorder (GAD). However, less is known about how different treatments impact specific aspects of mindfulness. In a clinical trial (Simon et al., 2021), 226 individuals with GAD were randomized to 12 weeks of Kundalini Yoga (KY), cognitive behavioral therapy (CBT) or stress education (SE). To examine whether specific facets of mindfulness, as measured by the Five Facet Mindfulness Questionnaire (FFMQ) change more than others across treatment and between treatments, we ran a multi-variate multilevel growth curve model (MMLM). Results indicated that while the Non-judge, Act with Awareness, and Non-react facets increased significantly during treatment, the Observe and Describe facets did not. Improvement in the Acting with Awareness facet during treatment was significantly greater for KY than CBT. These findings reveal the need to better understand how behavioral treatments can influence specific components of mindfulness for those with anxiety.

Keywords

Anxiety; Yoga; Treatment; Mindfulness; Stress; Therapy

1. Introduction

Generalized anxiety disorder (GAD) is associated with pervasive worry [1]. As GAD increases in prevalence, it is critical to determine which treatments are most efficacious [2]. Individuals with GAD often have low levels of mindfulness [3], thus mindfulness is encouraged as adjunct or stand-alone treatment. Mindfulness has also been proposed as a change mechanism for several interventions [4]. Although yoga does not emphasize mindfulness practice to the same degree as formal mindfulness training, yoga includes meditative focus and engagement of brain regions involved in attention, which accounts for the evidence that yoga practice leads to increases in mind body awareness, interoception and mindfulness [5]. While previous studies have emphasized cognitive behavioral therapy's (CBT) robustness for treating GAD [6], mindfulness has also shown important benefits.

A randomized trial that examined the effectiveness of CBT, Kundalini Yoga (KY), and stress education (SE) found that treatment response across each arm was associated with greater total scores on the Five Facet Mindfulness Questionnaire (FFMQ) [7]. The FFMQ is a 39 item self-report questionnaire that assesses five facets of mindfulness: Observe, Describe, Act with Awareness, Non-judge and Non-react [8]. Studies have investigated the effects of yoga on mindfulness, measured by the FFMQ, without a control. One study found after individuals engaged in iRest Yoga Nidra, a deep relaxation yoga with guided meditation, all mindfulness facet scores increased significantly, with highest scores on the Act with Awareness and Non-judge facets [9]. Another study investigating a Hatha yoga intervention found a significant main effect of time on FFMQ total score, and on the Describe and Non-react facets [10].

However, studies comparing yoga to control groups reveal conflicting results. A 2016 study found that participants randomized to yoga (n = 60) had significant increases in the Act with Awareness facet compared to individuals who completed assessments but were not assigned to yoga (n = 43); however no other mindfulness facet differed between groups [11]. Another study investigating the effectiveness of yoga on PTSD symptoms randomized 80 participants to yoga or waitlist control and found non-significant moderate increases in each mindfulness facet of the yoga condition, except for the Act with Awareness facet [12]. A 2012 study randomized participants (n = 101) to a four-month residential yoga program or control (did not participate) and found the yoga group had significantly greater score gains on each facet [13].

A large RCT (n = 342) investigated the effects of a Mindfulness-Based Stress Reduction intervention, CBT, and usual care (UC), on mindfulness using the FFMQ-Short Form, a brief version of the FFMQ that does not include the Describe facet [14]. Results showed that, compared to UC, CBT had significantly greater score increases only on the Non-react facet [14]. Additionally, a 2019 meta-analysis examined the relationship between affective symptoms and trait mindfulness assessed by the FFMQ [15]. Among 148 studies, including 44,075 participants, the Non-judge and Act with Awareness facets had the largest correlations, followed by the Non-react and Describe facets. The Observe facet was not significantly correlated with affective symptoms. Finally, a 2017 study [16] examined the factor structure and predictive validity of the FFMQ in individuals with OCD or anxiety (n

= 820). The results indicated the FFMQ should be scored using the facet scores rather than the total score, and the Acting with Awareness facet predicted post-CBT treatment symptom alleviation for individuals with GAD.

Research on associations between CBT and mindfulness specific facets is scarce, and no study has yet investigated how these specific facets change with interventions such as yoga or CBT. Using data from Simon et al., (2021), we explored whether some facets of mindfulness changed more than others, across treatments combined and between treatments [7]. In addition, given that mind-body treatments, such as yoga, include direction to practice, maintain focus and treat oneself with kindness, we hypothesized the Act with Awareness and Non-judge facets would have greater increases in KY compared to CBT and SE. Ultimately, our hope is to have a better understanding of which treatments to consider for which individuals.

2. Material and methods

The full methods of the RCT are available in Simon and colleagues (2021) [7,17]. Participants ($n = 226$) were diagnosed with GAD using the Structured Clinical Interview for DSM-IV or the Anxiety Disorders Interview Schedule-5. Participants were at least 18 years old and mostly Caucasian (71%) and female (70%), Current posttraumatic stress disorder, substance use disorders, eating disorders, significant suicidal ideation, mental disorder due to a medical or neurocognitive condition, lifetime psychosis, bipolar disorder, and developmental disorder were excluded. Participants were on a stable dose of psychotropic medication for at least 6 weeks or were not taking medication for at least 2 weeks. Participants had not completed more than 5 yoga or CBT sessions in the past 5 years.

Eligible participants were randomized to 12 weeks of KY, CBT or SE. SE was an attention control intervention designed to be structurally equivalent (in terms of therapist contact and credibility) to CBT. Participants completed questionnaires at baseline and weeks 6, 12 (post-treatment), and 38 (6-month follow-up).

Data were analyzed using intent-to-treat MLMs. Our MLM was a 2-phase growth curve model, with baseline, mid-treatment, and post-treatment comprising phase-1 (treatment phase). Phase-2 modeled change from post-treatment to 6-month follow-up. (Fig. 1).

We conducted a multivariate MLM (MMLM) [18] which treated the five FFMQ facets as the multivariate outcome. The facets were repeated measures nested within each assessment, nested within participants, nested within treatment cohorts (participants were treated in groups of 3–6). Treating the FFMQ facets as a repeated measures independent variable with five levels allows testing not only Time, Treatment Group, and Time \times Treatment within each phase, but also adds the Facet main effect, Facet \times Time, Facet \times Treatment, and Facet \times Time \times Treatment within each phase. The FFMQ facets were z-scored as recommended [18]. Interactions with Facets would indicate the facets are differentially affected by the variable(s) with which it was interacting.

2.1. Theory

In this secondary analysis, we investigated the five facets separately to determine 1) if some facets changed more than others in response to treatment, and 2) if these changes differed between treatment groups.

3. Results

Baseline sample included $n = 90$ in CBT, $n = 93$ in KY, and $n = 43$ in SE. Post-treatment assessments were completed by $n = 155$ (68.6%). Six-month follow-up was completed by $n = 137$ (60.6%); these rates did not differ between groups ($ps > 0.11$).

3.1. Improvement during treatment

MMLM analyses indicated that, collapsing over the five facets and the three treatments, participants' facet scores increased significantly from pre- to post-treatment ($b = 0.031/\text{wk}$, $t(3348) = 6.36$, $p < 0.001$ for main effect for Time). However, change over time differed significantly between facets, $F(4,3348) = 3.17$, $p = 0.013$ for the Facet \times Time interaction. While the Non-judge, Act with Awareness, and Non-react facets increased significantly during treatment ($b = .047/\text{wk}$, $p < .001$; $b = .040/\text{wk}$, $p < 0.001$, $b = .039/\text{wk}$, $p < 0.001$, respectively), the Observe and Describe facets did not ($b = .010/\text{wk}$, $p = 0.22$; and $b = .015/\text{wk}$, $p = 0.07$). See Fig. 1.

The change in facets (as a group) over time did not differ significantly between treatment groups, $F(2,3348) = 1.35$, $p = .260$ for the Treatment \times Time interaction (collapsing over facets). Further, the Facet \times Treatment \times Time interaction was not significant ($F(8,3348) = 0.88$, $p = 0.578$), indicating the Treatment \times Time interaction was similar across the five facets. However, directly testing our specific hypotheses (Increases in Act with Awareness and Non-judge would be greater in KY than in CBT and SE), we examined the Treatment \times Time interaction for these two facets individually. These MMLM analyses indicated that improvement in Act with Awareness during treatment was greater in KY than CBT ($b = .033/\text{wk}$, $t(670) = 2.50$, $p = .013$ for the KY vs CBT \times Time interaction). Simple slope analyses showed improvement in KY was $b = .051/\text{wk}$, $t(670) = 5.48$, $p < .001$, while improvement in CBT was $b = .019/\text{wk}$, $t(670) = 2.14$, $p = .033$ (Fig. 2). Improvement in Act with Awareness was not significantly greater in KY than SE ($p = 0.319$). For Non-judge, improvement during treatment was marginally greater in KY than SE ($b = .030/\text{wk}$, $t(670) = 1.92$, $p = .055$).

3.2. Improvement during follow-up

The average change per week in mindfulness (collapsed across facets and treatments) during follow-up period was not significant, $b = .001$, $p = 0.64$ (Fig. 1). These slopes did not differ by Treatment or Facet ($ps > 0.59$). Examined individually, the slopes for each facet were flat ($ps > .18$).

4. Discussion

The primary aim of this study was to explore whether some facets of mindfulness changed more than others, across all treatments combined and between treatments (yoga, CBT or SE). Participants' scores on the Non-judge, Act with Awareness and Non-react facets increased significantly throughout treatment, while the Observe and Describe facets did not.

Contrary to our expectation, individuals did not differ significantly in FFMQ facet scores across treatments. Additionally, treatment and follow-up completion rates did not significantly differ across groups. None of the mindfulness facets showed significant change during follow-up, which did not vary by facet or treatment group. Improvement in the Act with Awareness facet during treatment was significantly greater in KY than CBT. Improvement in the Non-judge facet during treatment was marginally greater in KY than SE, although not significantly.

There are several possibilities why groups did not differ in Act with Awareness and Non-judge facet scores, thought to be impacted by meditation and yoga. Previous research has found contradictory results with the Observe facet [19,20]. The FFMQ facets may measure non-specific effects of group treatment that do not particularly relate to yoga. For instance, if KY is not encouraging individuals to observe their environment nonjudgmentally, the Observe facet might not differ in outcomes. Finally, most mindfulness questionnaires were designed based on mindfulness meditation practices, which specifically instructs practitioners to not to react to thoughts and feelings. In contrast, yoga more often involves focusing on a single target, such as a phrase or the breath. Future studies may want to utilize other assessments that most accurately assess these items most specifically.

The main finding from these analyses was a significant Facet by Time interaction, indicating change over time differed by mindfulness facet. While the Non-judge, Act with Awareness, and Non-react facets increased significantly during treatment, the Observe and Describe facets did not. This finding is similar to previous research [16,19,20]. One possibility is the Observe facet does not differentiate between where one observes and why [21]. Additionally, describing can be antithesis to mindfulness, involving attaching labels to an experience. Perhaps these findings suggest the Act with Awareness, Non-judge and Non-react facets most closely represent components of mindfulness. The concentrative form of meditation more dominant in yoga may not work through the exact same mechanisms as mindfulness meditation. Perhaps there is a non-specific effect of treatment on each of the mindfulness facets, simply because people are paying attention to their anxiety.

There are several strengths and limitations to this study. Of note, one third of participants did not complete the post-treatment assessments. Instructors were trained for certification and supervised throughout the study by expert investigators to maintain fidelity and reduce cross-site variability [7]. However, the treatment protocols did not explicitly emphasize mindfulness techniques, which did not lend itself directly to assessing for traits of mindfulness before and after treatment. In addition, the study did not differentiate between who had explicit prior meditation/mindfulness experience. Future studies would benefit from including a comparison between yoga and mindfulness meditation. Studies would also

benefit from measuring outcomes more specific to yoga, such as relaxation effects. Finally, use of other scales that assess specific aspects of mindfulness, would be more useful, such as a scale that breaks down the Observe facet into an item that more specifically measures internal or external items and the function of that observation [21].

4.1. Conclusions

This study found that specific components of mindfulness increased for all treatments. The Non-judge, Act with Awareness and Non-react facets increased throughout treatment, while the Observe and Describe facets did not. Individuals did not differ significantly in mindfulness facet scores across various behavioral treatments. Additionally, treatment and follow-up completion rates did not significantly differ across groups. No mindfulness facet showed significant changes during follow-up, and this did not vary by facet or treatment group. Improvement in the Act with Awareness facet during treatment was significantly greater in KY than CBT. Improvement in the Non-judge facet during treatment was marginally greater in KY than SE, although not significantly. Ultimately, the hope is that future studies and further scale development can help us better understand how behavioral treatments can influence specific components of mindfulness for those with anxiety.

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References

- [1]. Hoge EA, Hölzel BK, Marques L, Metcalf CA, Brach N, Lazar SW, Simon NM. Mindfulness and self-compassion in generalized anxiety disorder: examining predictors of disability. *Evid-Based Complement Altern Med* 2018;2013.
- [2]. Millan MJ. Agomelatine for the treatment of generalized anxiety disorder: focus on its distinctive mechanism of action. *Ther Adv Psychopharmacol* 2022;12:1–19.
- [3]. Mankus AM, Aldao A, Kerns C, Mayville EW, Mennin DS. Mindfulness and heart rate variability in individuals with high and low generalized anxiety symptoms. *Behav Res Ther* 2013;51(7):386–91. [PubMed: 23639305]
- [4]. Hofmann SG, Gomez AF. Mindfulness based interventions for anxiety and depression (2017). *Psychiatr Clin North Am* 2017;40(4):739–49. [PubMed: 29080597]
- [5]. Gibson J. Mindfulness, interoception, and the body: a contemporary perspective. *Front Psychol* 2019;10:2012. [PubMed: 31572256]
- [6]. Hofmann SG, Smits JAJ. Cognitive-behavioral therapy for adult anxiety disorders: a meta-analysis of randomized placebo-controlled trials. *J Clin Psychiatr* 2008;69 (4):621–32. &.
- [7]. Simon NM, Hofmann SG, Rosenfield D, Hoepfner SS, Hoge EA, Bui E, Khalsa SBS. Efficacy of yoga vs. cognitive behavioral therapy vs. stress education for the treatment of generalized anxiety disorder: a randomized clinical trial. *JAMA Psychiatr* 2021;78(1):13–20.
- [8]. Baer RA, Smith GT, Hopkins J, Krietemeyer J, Toney L. Using self-report assessment methods to explore facets of mindfulness. *Assessment* 2006;13(1): 27–45. [PubMed: 16443717]
- [9]. Livingston E, Collette-Merrill K. Effectiveness of integrative restoration (iRest) yoga nidra on mindfulness, sleep, and pain in health care workers. *Holist Nurs Pract* 2018;32(3):160–6. [PubMed: 29642130]
- [10]. Curtis K, Osadchuk A, Katz J. An eight-week yoga intervention is associated with improvements in pain, psychological functioning and mindfulness, and changes in cortisol levels in women with fibromyalgia. *J Pain Res* 2011:189–201. [PubMed: 21887116]
- [11]. Butzer B, Ahmed K, Khalsa SBS. Yoga enhances positive psychological states in young adult musicians. *Appl Psychophysiol Biofeedback* 2016;41:191–202. [PubMed: 26721471]
- [12]. Jindani F, Turner N, Khalsa SBS. A yoga intervention for posttraumatic stress: a preliminary randomized control trial. *Evid-Based Complement Altern Med* 2015: 351746.
- [13]. Gard T, Brach N, Hölzel BK, Noggle JJ, Conboy LA, Lazar SW. Effects of a yoga-based intervention for young adults on quality of life and perceived stress: the potential mediating roles of mindfulness and self-compassion. *J Posit Psychol* 2012;7(3):165–75.
- [14]. Turner JA, Anderson ML, Balderson BH, Cook AJ, Sherman KJ, Cherkin DC. Mindfulness-based stress reduction and cognitive-behavioral therapy for chronic low back pain: similar effects on mindfulness, catastrophizing, self-efficacy, and acceptance in a randomized controlled trial. *Pain* 2016;157(11):2434. [PubMed: 27257859]
- [15]. Carpenter JK, Conroy K, Gomez AF, Curren LC, Hofmann SG. The relationship between trait mindfulness and affective symptoms: a meta-analysis of the five facet mindfulness questionnaire (FFMQ). *Clin Psychol Rev* 2019;74:101785. [PubMed: 31751877]
- [16]. Hawley LL, Rogojanski J, Vorstenbosch V, Quilty LC, Laposa JM, Rector NA. The structure, correlates, and treatment related changes of mindfulness facets across the anxiety disorders and obsessive compulsive disorder. *J Anxiety Disord* 2017;49: 65–75. [PubMed: 28432894]
- [17]. Hofmann SG, Curtiss J, Khalsa SBS, Hoge E, Rosenfield D, Bui E, Keshaviah A, Simon N. Yoga for generalized anxiety disorder: design of a randomized controlled clinical trial. *Contemp Clin Trials* 2015;44:70–6.
- [18]. Hox JJ, Moerbeek M, Van de Schoot R. *Multilevel analysis: techniques and applications*. New York, NY: Routledge; 2018.
- [19]. Brown DB, Bravo AJ, Roos CR, Pearson MR. Five facets of mindfulness and psychological health: evaluating a psychological model of the mechanisms of mindfulness. *Mindfulness* 2015;6(5):1021–32. [PubMed: 26504498]
- [20]. Curtiss J, Klemanski DH. Factor analysis of the five facet mindfulness questionnaire in a heterogeneous clinical sample. *J Psychopathol Behav Assess* 2014;36(4): 683–94.

- [21]. Moskow DM. Rethinking A Facet of Mindfulness: Development of the Adaptive-maladaptive Focus Scale. Doctoral dissertation. Boston University; 2023.

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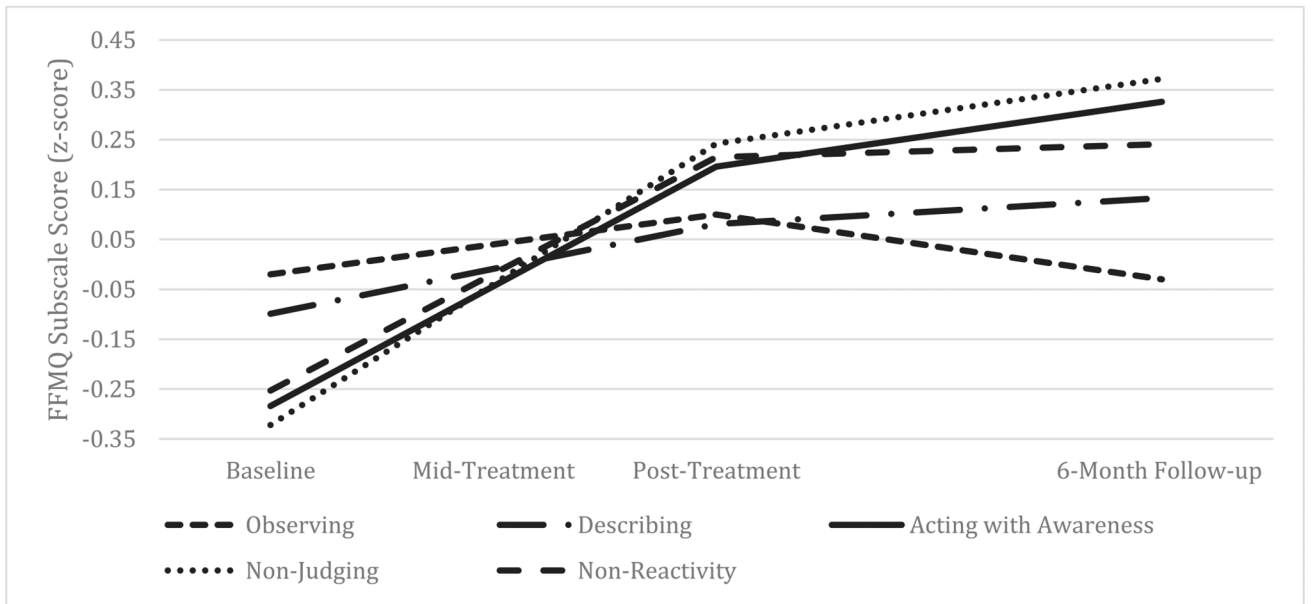


Fig. 1.
FFMQ Facet Scores Over Time.

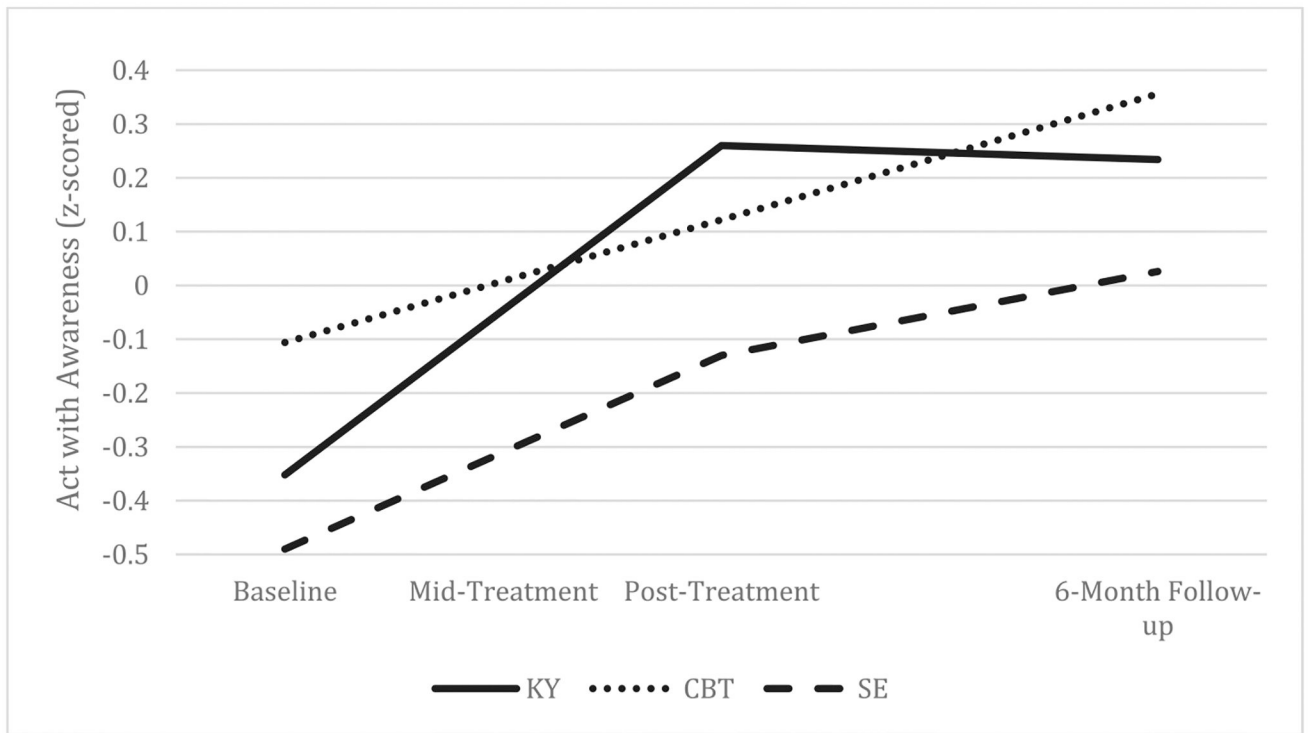


Fig. 2.
Changes in Acting with Awareness in the Three Treatment Groups.