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Invited essay

# Examining the effectiveness of an online program to cultivate mindfulness and self-compassion skills (Mind-OP): Randomized controlled trial on Amazon's Mechanical Turk

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ABSTRACT

*Objectives:* The demand for effective psychological treatments for depression, anxiety, and heightened stress is far outstripping their supply. Accordingly, internet delivered, self-help interventions offer hope to many people, as they can be easily accessed and at a fraction of the price of face-to-face options. Mindfulness and self-compassion are particularly exciting approaches, as evidence suggests interventions that cultivate these skills are effective in reducing depression, anxiety, and heightened stress. We examined the effectiveness of a newly developed program that combines mindfulness, self-compassion, and goal-setting exercises into a brief self-guided intervention (Mind-OP). The secondary aim of this study was to investigate the feasibility of conducting a randomized-controlled trial entirely on a popular crowdsourcing platform, Amazon's Mechanical Turk (MTurk).
*Methods:* We randomized 456 participants reporting heightened depression, anxiety, or stress to one of two conditions: the 4-week Mind-OP intervention ($n$ = 227) or to an active control condition ($n$ = 229) where participants watched nature videos superimposed onto relaxing meditation music for four consecutive weeks. We administered measures of anxiety, depression, perceived stress, dispositional and state mindfulness, self-compassion, and nonattachment.
*Results:* Intent-to-treat and per-protocol analyses revealed that, compared to participants in the control condition, participants in the Mind-OP intervention condition reported significantly less anxiety and stress at the end of the trial, as well as significantly greater mindfulness, self-compassion, and nonattachment.
*Conclusions:* Mind-OP appears effective in reducing anxiety symptoms and perceived stress among MTurk participants. We highlight issues (e.g., attrition) related to feasibility of conducting randomized trials on crowdsourcing platforms such as MTurk.

As many as 50% of people in developed nations report significant symptoms of depression or anxiety (Kessler & Bromet, 2013; Remes, Brayne, Van Der Linde, & Lafortune, 2016). Even when such symptoms are not meeting formal diagnostic thresholds, they are associated with significant impairment in day-to-day functioning, and high societal and personal costs (Cuijpers et al., 2013; Haller, Cramer, Lauche, Gass, & Dobos, 2014). Although perceived stress is not pathological in itself, chronically high stress has been robustly associated with psychological and physiological disorder symptoms (Beshai, Mishra, Mishra, & Carleton, 2017). Although several efficacious treatments to manage depression, anxiety, and high perceived stress exist, the vast majority of people who would benefit from such treatments never seek them, as there are a number of barriers that prevent them from doing so. For example, many patients report that time constraints, lack of availability of services, and inflexibility of the treatment are major barriers to accessing treatments (Mohr et al., 2006). Some of the major barriers are systemic in nature; financial constraints and lack of appropriate coverage for mental health costs are often reported as a major barrier to access to quality mental health care (Mojtabai et al., 2011). The Lancet Psychiatry Commission on Psychological treatments (Holmes et al., 2018) identified this lack of access to effective treatments as a major challenge.

Mindfulness – paying purposeful attention to present-moment experiences with an attitude of openness, acceptance, and balance (Kabat-Zinn, 1982) – has garnered increasing scientific and public interest over the last two decades. Several mindfulness-based interventions have

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been designed to help those with elevated stress, depression, and anxiety (Chiesa & Serretti, 2009; Crane et al., 2017), and many of such interventions appear efficacious for such conditions (Grossman, Niemann, Schmidt, & Walach, 2004; Strauss, Cavanagh, Oliver, & Pettman, 2014). In addition to mindfulness, self-compassion has also gained scientific and clinical attention of late (Neff, 2003b). Self-compassion is defined as being aware and moved by one's own suffering, a desire to respond with kindness toward one's own suffering and see it as part of the human condition (Neff, 2003b). Self-compassion as conceptualized by Neff and other compassion-based interventions also appear efficacious for improving several mental health indices (Kirby, Tellegen, & Steindl, 2017).

To improve access to treatments, mental health professionals have begun to develop online interventions with the hope of mitigating several of these barriers to accessing quality care. Self-directed internet interventions are particularly attractive as they address many barriers to receiving mental health care (e.g., patient desire to manage problems independently, limited finances, time constraints, transportation or mobility challenges, poor access to providers, and concerns about privacy and stigma; Josephine, Josefine, Philipp, David, & Harald, 2017). There is growing and strong evidence that self-directed internet interventions are effective in reducing symptoms of anxiety and depression. In fact, the effects of many of these interventions in reducing symptoms of anxiety and depression approximate those of traditional, face-to-face evidence-based psychotherapy, with effect sizes that are typically falling in the medium to large range (Beshai, Wallace, Mcdougall, Waldmann, & Stea, 2016).

Given the need for improved access and dissemination of evidence-based psychological treatments, researchers have examined the efficacy of online forms of mindfulness and compassion-based interventions. There have been several of such trials to date. For example, Cavanagh et al. (2013) found students assigned to their brief online mindfulness intervention reported significantly less distress compared to those assigned to a waitlist control condition. Similarly, Krusche, Cyhlarova, and Williams (2013) found their online mindfulness intervention to be efficacious in lowering depression and anxiety symptoms as well as perceived stress.

Mindfulness interventions and techniques have also been packaged in popular smart-phone apps (Mani, Kavanagh, Hides, & Stoyanov, 2015). For example, researchers found that after 10 days, participants assigned to use the app titled Headspace reported significantly increased positive affect and reduced symptoms of depression compared to those assigned to a control condition (Howells, Ivtzan, & Eiro-Orosa, 2016). A recent meta-analysis confirmed the efficacy of online mindfulness interventions, with an overall small to moderate effect on depression and anxiety symptoms, and a large effect on stress (Spijkerman & Bohlemeijer, 2016). Importantly, the researchers found only two trials (Pots et al., 2016; Trompetter, Bohlmeijer, Veehof, & Schreurs, 2015) that used an active control condition, and several trials had small sample sizes.

Similarly, researchers have examined the efficacy of online delivery of compassion interventions. Smeets, Neff, Alberts, and Peters (2014) found that those randomized to a brief online self-compassion intervention evidenced significant increases in self-compassion, mindfulness, optimism, and self-efficacy, and decreases in rumination compared to those randomized to an active control condition. Researchers also found participants receiving a self-guided online self-compassion intervention reported significant increases in self-compassion and happiness, and decreases in perceived stress, depression, and anxiety (Finlay-Jones et al., 2017). More recently in a large trial, Sommers-Spijkerman, Trompetter, Schreurs, and Bohlmeijer (2018) found participants randomized to complete self-help Compassion Focused Therapy experienced higher well-being post-intervention and at three-months follow-up compared to those randomized to a waitlist control condition.

## 1. Current study

Given the increasing need for scalable, easy-to-administer, and effective psychological treatments for anxiety, depression, and heightened perceived stress, we created a brief, non-proprietary 4-week online mindfulness-based program for mild to moderate levels of depression and anxiety symptoms, and moderate perceived stress. The program is called Mind-OP, and combines psychoeducational videos, meditative exercises designed to cultivate mindfulness and self-compassion, as well as motivational interviewing and decisional control exercises to increase engagement in the self-guided program.

The mindfulness modules of Mind-OP were developed in alignment with scientific consensus on the mechanisms of mindfulness. Specifically, the modules focused on cultivating decentring or re-perceiving, which is believed to be a meta-mechanism in mindfulness (Grabovac, Lau, & Willett, 2011; Shapiro, Carlson, Astin, & Freedman, 2006). Decentring is defined as a shift in perspective wherein internal and external experiences are viewed as objective events occurring *in* consciousness rather than being identical to it (e.g., "I feel sadness" instead of "I am sad"). Use of visual imagery in the psychoeducational videos was hypothesized to facilitate the absorption of the more abstract processes within mindfulness (e.g., the nature of attention).

Modules focused on self-compassion were developed in accordance with Neff (2003a) conceptualization of the construct. Neff further conceptualizes self-compassion as bcomprised of three components: mindfulness of difficult or painful experiences (as opposed to over-identification with them) sense of common-humanity (as opposed to feeling isolated in one's suffering) and a sense of self-kindness during times of difficulties (as opposed to self-judgement and criticism). These components were cultivated directly through guided loving-kindness meditations and self-compassion exercises (e.g., self-compassion break; Hofmann, Grossman, & Hinton, 2011). Evidence supports the use of loving-kindness and compassion meditations in developing self-compassion (Boellinghaus, Jones, & Hutton, 2014).

Mind-OP was developed to meet the ever growing need to improve access to evidence-based treatments (Holmes et al., 2018). Further, the intervention was developed to be brief (under 3 hours not including practice), scalable, flexible, and most importantly free, which addresses a number of accessibility barriers (Patel, Chowdhary, Rahman, & Verdeli, 2011). Finally, the treatment was also developed in line with the stepped-care approach, which suggests providing brief, less intensive interventions for patients reporting milder forms of distress (Bower & Gilbody, 2005).

The primary goal of this trial was to examine the effectiveness of Mind-OP in reducing symptoms of anxiety and depression, and reducing heightened stress when compared with a strong active control condition (watching and paying attention to nature videos; Mayer, Frantz, Bruehlman-Senecal, & Dolliver, 2009). Further, we examined these effects among a sample that is more representative of the general population than the commonly employed student samples (Berinsky, Huber, & Lenz, 2012; Chandler & Shapiro, 2016). We anticipated participants randomized to the Mind-OP intervention would exhibit lower symptoms of anxiety and depression, and lower stress at the end of the assessment period than those randomized to the active control condition. Further, we anticipated those in the Mind-OP intervention condition to show significantly higher scores across time on the secondary outcome measures.

The secondary goal was to examine the feasibility of developing and validating online treatment modules using online participant pools such as Amazon Mechanical Turk. Although crowdsourcing platforms have been used for cross-sectional and descriptive clinical research, it is very rarely used for longitudinal research, and even more rarely used for randomized clinical trials.

## 2. Method

### 2.1. Participants and recruitment

This trial corresponds to a pre-registered report (AsPredicted file #18806; https://aspredicted.org/blind.php?x=b79ky6). We recruited participants through an extention of Amazon's Mechanical Turk, TurkPrime, an online crowdsourcing website (Litman, Robinson, & Abberbock, 2017). Crowdsourcing platforms have been used to date in several behavioral and clinical studies (e.g., Beshai, Mishra, Meadows, Parmar, & Huang, 2017; Chandler & Shapiro, 2016); however, by far the majority of clinical research conducted on such platforms is cross-sectional and descriptive in nature. Data collection for the trial was completed between April and September of 2019. All participants were compensated for their participation. To improve participant retention, compensation was backloaded, with the highest amount presented in the final week of assessment. Initially, and out of fears of duly influencing engagement with and outcomes of the intervention, we compensated participants in Waves 1 and 2 with $1.5/week (total payment of $9 USD); however, and given the high attrition rates, we increased payment to 2.5 per week (total payment of $15.00 USD). The latter payment is commensurate with compensation rates in most crowdsourcing studies (Chandler & Shapiro, 2016). Informed consent was obtained from all participants prior to data collection. This study was approved by the University of Regina's Ethics Research Board (File #2018–158).

### 2.2. Eligibility and randomization

Eligibility requirements were that all participants reside in an English-speaking country (i.e., Canada, United States, United Kingdom, New Zealand, and Australia), be 18 years-of-age or older, and score eight or higher on the measures of depression (PHQ-9) or anxiety (GAD-7), and/or 14 or higher on the perceived stress scale (PSS). A total of 606 participants were initially recruited. Of these, 456 participants (female $n$ = 200; 43.9%) were eligible and provided consent to be part of the trial, and were subsequently randomized into the Mind-OP intervention condition ($n$ = 227; $M_{age}$ = 36.11; 46.3% female) or active control condition ($n$ = 229; $M_{age}$ = 34.16; 41.5% female). Table 1 provides a summary of pertinent sample demographics. Chi-square analyses revealed no significant differences in the distribution of gender, ethnicity, or education attainment across the two conditions ($p$ = .56 to .80). A $t$-test revealed a significant difference in mean age between conditions, ($t$ (454) = 1.98, $p$ = .049, $d$ = 0.19).

### 2.3. Primary outcome measures

**Generalized Anxiety Disorder – 7** (GAD-7; Spitzer et al., 2006) is a seven-item self-report questionnaire that assesses the presence and severity of generalized anxiety symptoms over the past week. Respondents answer each of the seven items on a four-point Likert-type scale, from 0, or "*Not at all*", to 3, or "*Nearly every day*". Higher scores are indicative of greater distress. The GAD-7 appears to be reliable and valid among general population samples (Löwe et al., 2008), and is also sensitive to change (Beard & Björgvinsson, 2014). Researchers found cut-off scores of 5–10 on the GAD-7 to have optimal sensitivity and specificity in diagnosing generalized anxiety disorder (Kujanpää et al., 2014; Wild et al., 2014). The GAD-7 possessed a pre-intervention Cronbach's alpha of .89.

**The Patient Health Questionnaire – 9** (PHQ-9; Spitzer et al., 2000) is a nine-item self-report measure that assesses depressive symptoms over the past two weeks. The PHQ was developed in accordance with criteria for Major Depressive Episode in the fourth edition of the DSM (DSM-IV). Participants responded to each of the nine items (e.g., "Feeling down, depressed, or hopeless") on a four-point Likert-type scale, ranging from 0 (*Not at all*) to 3 (*Nearly everyday*). Higher total scores were indicative of greater distress. The PHQ-9 has excellent reliability and validity among general population members (Kroenke, Spitzer, Williams, & Löwe, 2010), and appears sensitive to change (Löwe, Unützer, Callahan, Perkins, & Kroenke, 2004). Researchers found that cut-scores of 8–11 on the PHQ-9 have optimal sensitivity and specificity in diagnosing depression (Manea, Gilbody, & McMillan, 2012). The PHQ-9 possessed a pre-intervention Cronbach's alpha of .88.

**The Perceived Stress Scale** (PSS; Cohen, Kamarck, & Mermelstein, 1983) is a 10-item self-report measure of perceived stress (PSS; Cohen,

**Table 1**
Descriptive statistics of trial participants stratified by randomization condition.

| | Total Sample ($n$ = 456) | Mind-OP Intervention ($n$ = 227) | Active Control ($n$ = 229) |
|---|---|---|---|
| Age | $M$ = 35.13 ($SD$ = 10.57) | $M$ = 36.11 ($SD$ = 11.16) | $M$ = 34.16 ($SD$ = 9.88) |
| Gender | Female $n$ = 200 (43.9%) | Female $n$ = 105 (46.3%) | Female $n$ = 95 (41.5%) |
| | Non-binary $n$ = 2 (0.4%) | Non-binary $n$ = 1 (0.4%) | Non-binary $n$ = 1 (0.4%) |
| Ethnicity | | | |
| Western European | $n$ = 192 (42.1%) | $n$ = 100 (44.1%) | $n$ = 92 (40.2%) |
| Eastern European | $n$ = 104 (22.8%) | $n$ = 53 (23.3%) | $n$ = 51 (10.9%) |
| Chinese | $n$ = 14 (3.1%) | $n$ = 7 (3.1%) | $n$ = 7 (3.1%) |
| Latin American | $n$ = 41 (9.0%) | $n$ = 16 (7.0%) | $n$ = 25 (10.9%) |
| Other | $n$ = 105 (22.6%) | $n$ = 51 | $n$ = 54 |
| Country of Residence | | | |
| United States | $n$ = 441 (96.7%) | $n$ = 221 (97.4%) | $n$ = 220 (96.1%) |
| Other | $n$ = 15 (3.3%) | $n$ = 6 (2.6%) | $n$ = 9 (3.9%) |
| Education | | | |
| High School | $n$ = 92 (20.2%) | $n$ = 52 (22.9%) | $n$ = 40 (17.5%) |
| Community College | $n$ = 76 (16.7%) | $n$ = 39 (17.2%) | $n$ = 37 (16.2%) |
| University | $n$ = 224 (49.1%) | $n$ = 105 (46.3%) | $n$ = 119 (52.0%) |
| Master or Higher | $n$ = 64 (14.0%) | $n$ = 31 (12.7%) | $n$ = 33 (14.4%) |
| Previous Mental Health Condition | $n$ = 221 (48.5%) | $n$ = 104 (45.8%) | $n$ = 117 (51.1%) |
| Previous Meditation Experience | $n$ = 303 (66.4%) | $n$ = 154 (67.8%) | $n$ = 149 (65.1%) |
| GAD-7 Caseness (≥8) | $n$ = 297 (65.13%) | $n$ = 142 (62.56%) | $n$ = 155 (67.69%) |
| PHQ-9 Caseness (≥8)_ | $n$ = 310 (67.99%) | $n$ = 148 (65.20%) | $n$ = 162 (70.74%) |
| PSS Caseness (≥14) | $n$ = 441 (96.71%) | $n$ = 217 (95.59%) | $n$ = 224 (97.82%) |

*Note.* GAD-7 = Generalized Anxiety Disorder – 7; PHQ-9 = Patient Health Questionnaire – 9; PSS = Perceived Stress Scale.

Kamarck, & Mermelstein, 1983) recording how respondents appraised their lives over the previous month as stressful, unpredictable, uncontrollable, and overloaded. Higher scores on the PSS reflect increased levels of stress. The PSS is scored on a 5-point scale (from 0 = '*never*' to 4 = '*very often*') summed into a total score (range 0–40). Researchers have divided scores on the PSS into three categories of severity: mild stress (0–13), moderate stress (14–26), and high stress (26–40; Al Rasheed, Naqvi, Ahmad, & Ahmad, 2017). This scale has demonstrated good reliability, validity, and sensitivity to change (Hewitt, Flett, & Mosher, 1992). The PSS had a pre-intervention Cronbach's alpha of .78.

### 2.4. Secondary outcome measures

**The Five Facet Mindfulness Questionnaire – 15** (FFMQ-15; Gu et al., 2016) is a 15-item self-report measure of dispositional mindfulness in five domains: Observing (ability to observe internal and external experiences), Describing (ability to label experiences), Acting with Awareness (ability to focus on experiences without acting automatically), Non Judging (ability to not evaluate internal and external experiences), and Non Reacting (ability to allow experiences to flow with equanimity). Participants responded to each of the 15 items on a 5-point Likert scale from 1, or *Never or rarely true* to 5, or *Very often or always true*, and after reversal of negatively keyed items, higher scores are indicative of greater dispositional mindfulness. The FFMQ-15 is adapted from the longer 39-item version (Baer et al., 2008), and both have excellent psychometric properties when used with general population participants and both are sensitive to change samples (Baer et al., 2008; Gu et al., 2016). The FFMQ-15 possessed a pre-intervention Cronbach's alpha of .76.

**The Self-Compassion Scale – Short Form (**SCS-SF; Raes, Pommier, Neff, & Van Gucht, 2011) is a 12-item self-report measure of dispositional self-compassion. The SCS-SF derived from the original version of SCS which includes 26 items (Neff, 2003a). Each item was rated on a scale from 1 ("*almost never*") to 5 "*almost always*". Total scores are means of all the items, and after reversing negatively worded items, and higher scores indicate higher dispositional self-compassion. Previous studies have reported adequate psychometric properties of the SCS-SF and have shown that it has a high correlation with the long form of the scale (Raes et al., 2011). The SCS appears sensitive to change (Williams, Dalgleish, Karl, & Kuyken, 2014). The SCS-SF demonstrated an excellent pre-intervention Cronbach's alpha of .87.

**The Nonattachment Scale – Short Form** (NAS-SF; Chio, Lai, & Mak, 2018) is a eight-item short form of the original (Sahdra, Shaver, & Brown, 2010). The items assessed the Buddhist concept of dispositional nonattachment, or ability to not cling to impermanent mental or physical forms (Chio et al., 2018; Sahdra et al., 2010). Items (e.g., "I can accept the flow of events in my life without hanging onto them or pushing them away") are assessed on a 6-point Likert-type scale from 1, or *Disagree Strongly* to 6 or *Agree Strongly*. Higher scores indicate higher nonattachment. The original scale and the short form appear to have strong reliability and validity (Chio et al., 2018; Sahdra et al., 2010). The NAS-SF possessed a pre-intervention Cronbach's alpha of .88.

The **Toronto Mindfulness Scale (**TMS; Lau et al., 2006) is a 13-item measure assessing state mindfulness. The scale items assessed decentring (e.g., "I experienced myself as separate from my changing thoughts and feelings") and curiosity ("I was more concerned with being open to my experiences than controlling or changing them") during meditative states. Each item is assessed on a 5-point Likert scale from 0 or *Not at all*" to 4 or "*Very much*". Total scores represent item response summation, and higher scores are indicative of greater state mindfulness. The scale has excellent reliability and validity (Lau et al., 2006) and is sensitive to change (Bieling et al., 2012). The pre-intervention TMS possessed a Cronbach's alpha of $\alpha = 0.93$.

### 2.5. Knowledge/engagement measures

At the end of each week, all participants responded to two multiple choice or true and false knowledge questions related to the content of each week (Moncher & Prinz, 1991). For example, participants in the Mind-OP intervention condition were asked "Which of the following is **NOT** a quality of mindful attention?" and provided with four answer choices to which there is one correct response. Participants in the control condition were asked questions related to the words that were embedded in each of the nature videos (see description of the active control condition below). For example, participants who completed the first week of the active control condition were asked "Which of the following words was shown on the side of the screen during the video?" and provided with four answer choices to which there was one correct response. In total, participants in either condition were asked eight knowledge questions throughout the duration of the study. Protocol fidelity was achieved when participants scored a total of 5 or higher on such knowledge questions.

Finally, and to improve data quality, we administered two attention check questions at the end of the pre and post-assessment sessions. The questions promoted participants to indicate on a seven point Likert-type scale (where 1 was "*Not at all attentive*" and 7 was "*Very attentive*") how much attention and care they devoted in completing the measures (where 1 was "*Not at all attentive*" and 7 was "*Very attentive*"), and a yes/no format question asking whether their data should be retained. Attentiveness was defined as a score of 4 or higher on the first question and a "Yes" response on the second.

### 2.6. Adherence and acceptability measures

At the beginning of modules 2, 3, 4, and of the post-assessment, participants were asked to indicate on a sliding visual scale from 0 to 100 how many minutes of meditation practice they engaged in. At the end of each module, participants were asked to rate the quality of each module from 1 (poor) to 10 (excellent). Participants were also invited to provide a global rating of the program (1–10) at the post-intervention stage.

### 2.7. Mind-OP intervention

Mind-OP is an entirely self-guided, brief online intervention that is hosted on Qualtrics. The intervention includes four modules/lessons, each focusing on a new aspect of mindfulness or self-compassion practice. The modules themselves are a combination of psychoeducational videos (designed to introduce a new concept), followed by audio-guided meditations that intend to cultivate the concept introduced in the psychoeducational videos. Embedded at the end of each module is a scheduler that prompts participants to schedule meditations throughout the week, as well as motivational interviewing inspired exercises to enhance decisional control and commitment to the weekly practice. For example, participants are asked to indicate how confident they are they will follow through with the scheduled practice, what might get in the way of their scheduled practice, and think briefly of potential solutions to or ways around identified obstacles to practicing. Each module is administered on a weekly basis, for a total of four weeks.

Module one (Week 1) is comprised of two videos (each approximately 5 min long) and one guided meditation (5 min). The first video contained general mental health psychoeducation related to anxiety, depression, and stress, while the second video introduces the concept of mindfulness. Participants are then guided to complete a guided mindfulness meditation of the breath. Module two (Week 2) then focuses on attention to body and thoughts. The first video (~5 min) discusses how attention is limited, and how mindfulness can train the "attentional muscle" to make it more purposeful, balanced, and accepting. This psychoeducational video is followed by a guided audio of a body scan meditation (~6 min). This meditation is then followed by another

psychoeducational video related to paying attention to the flow of thoughts (~5 min), again, followed by an audio guided meditation focused on mindfulness of thoughts.

Module three (Week 3) is also comprised of two psychoeducation videos and two guided meditations (each approximately 5–6 min long). The first psychoeducational video introduces the concept of self-compassion, specifically the mindfulness subcomponent of self-compassion (Neff, 2003b). This psychoeducational video is followed by a guided meditation that focuses on sitting with uncomfortable emotions with equanimity, balance, and acceptance. Since this meditation may be associated with increased negative emotions, participants are reminded to return to the breath if they feel overwhelmed. Further, participants are guided to engage in loving kindness at the end of the meditation, to counteract the potential uncomfortable nature of negative emotions to which they may have been exposed during the meditation. The second psychoeducation video introduces the self-compassion component of common humanity, which is then followed by a guided meditation that guides participants to extend loving-kindness toward imagined others.

Module four (Week 4) focuses entirely on the self-kindness component of self-compassion (Neff, 2003). The module is comprised of one psychoeducational video (~6 min) introducing said concept and differentiating it from self-pity. After watching the video, participants are invited to answer questions that help differentiate self-kindness and its effects from self-pity. In the final psychoeducational video, participants are invited to practice self-kindness in relation to a specific stressful event or situation. This video prompts participants to complete an adapted Self-Compassion Break exercise, as inspired by Neff and other colleagues' work in the area (Finlay-Jones et al., 2017; Kirby, 2017; Neff & Germer, 2013). The final guided meditation invites participants to complete a loving-kindness meditation directed entirely toward self at different developmental timepoints (e.g., "imagine yourself as a 5-year old child").

### 2.8. Active control condition

Participants randomized to the active control condition were guided to watch one video per week, for the 4-week duration of the intervention. Each video featured 40 high quality, peaceful stock nature images that were presented in a slideshow (with each image appearing on screen for 6 s). Each video was approximately 4 min long and featured the same guided audio music soundtrack as the Mind-OP guided meditations. Finally, participants were presented with two words during each video that were small, white font, in the corner of the screen, and appeared for only a few seconds at random intervals throughout.

### 2.9. Procedure

All trial tasks were distributed online through TurkPrime (Litman et al., 2017), an MTurk-based crowdsourcing platform. The trial design employed a two-arm randomized, parallel trial with a 1:1 randomization sequence. Study surveys and weekly modules were hosted on Qualtrics. After providing consent, participants completed the pre-intervention measures, including a demographic information form, the PHQ-9, GAD-7, PSS, FFMQ-15, SCS-SF, NAS-SF, and TMS.

In the week between completion of the pre-intervention survey and distribution of Module 1/Week 1 tasks, trained research assistants who were not blind to the conditions computed scores on the PHQ-9, GAD-7, and PSS. Those eligible (PHQ-9 or GAD-7 of 8 or higher or PSS of 14 and higher), were randomized into either the Mind-OP or Control condition using SPSS's 1:1 ratio Random Case Selection procedure. Ineligible participants were contacted via TurkPrime, thanked, and provided with links to the four modules to use at their own discretion. Eligible participants were contacted and provided with Week 1 materials. Trial tasks were distributed every Friday throughout the 6-week duration of the trial, with one email reminder sent out each Wednesday. At the end of the trial, all participants in the control condition were provided links to the Mind-OP intervention modules. Only participants completing control task/module in the week allotted were provided with subsequent modules/tasks.

### 2.10. Statistical analysis plan

*Power Analysis.* Several online mindfulness interventions evidenced medium effects when compared to inactive control conditions on main outcomes of interest (Spijkerman & Bohlemeijer, 2016). Accordingly, and given the conservative nature of our design, sample size estimates were calculated using G*Power (Faul, Erdfelder, Buchner, & Lang, 2009), based on a small effect between groups across time (f = 0.10). The analysis indicated a total sample size of 164 participants to detect a small effect with power of .80. We anticipated 50% eligibility and 50% attrition, and so, we planned to recruit a total of 700 participants (for an anticipated 175 protocol adherent participants). We opted to stop recruitment after 606 participants given limitations in resources.

*Data management and preliminary checks.* To examine the normality of the dependent variables, we explored the skewness and kurtosis for all four measures both pre and post intervention (Tabachnick et al., 2007). Further, using a series of chi-square and *t*-test analyses, we examined demographic and psychological variable differences between completers and those who were randomized but never completed or adhered to the protocol.

*Main Outcome Analyses*. We conducted two sets of main outcome analyses, one in accordance with intent-to-treat (ITT) methodology involving all randomized participants, and one in accordance with per-protocol methodology. For the per-protocol analyses, only those who completed all modules and demonstrated high treatment fidelity to the Mind-OP intervention ($n$ = 68) or control ($n$ = 91) were analyzed.

To examine the primary hypotheses, we conducted multilevel modelling (MLM) analyses of changes in anxiety/depression symptoms and perceived stress over the six-week study period comparing those assigned to Mind-OP (coded as 1) vs. active control condition (coded 2). These analyses were consistent with "Intent-to-Treat" methodology, wherein all participants who were initially randomized were included in the analyses. For each model, time point (level 1) was nested within participants (level 2). Time was coded into six time points including, (1) Pre-intervention, (2) Week/Module 1, and (3) Week/Module 2, (4) Week/Module 3, (5) Week/Module 4, and (6) Post-intervention. The Mind-OP group served as the reference for comparisons between groups over time. Differences in pre-intervention scores on the GAD-7, PHQ-9 and PSS were accounted for by using both a fixed and random intercept in the model. Final models included the fixed main and interaction effects of time by group. The interaction effect between Time and Group being of most interest for addressing primary study hypotheses. When examining the interaction effect of time and group, we emphasized the effect of group assignment on changes from Pre (time 1)to Post (time 6) and not generally across the six assessment time points. All three models used the maximum-likelihood estimation an unstructured variance vectors, and hypothesis testing was conducted at an α level of 0.05 using 2-tailed tests. Analyses were also bootstrapped using 1000 samples to provide robust probability values and confidence intervals. We provided Cohen's d estimates, which is interpreted $d$ = 0.20 as small but meaningful effect, $d$ = 0.50 medium effect, and $d$ = 0.80 as a large effect . Additions of intercept and unstructured covariance significantly improved model fit in all three analyses in accordance with a Chi-square significance test McLean, Sanders, & Stroup, 1991;.

Per-protocol analyses were conducted using a mixed factor repeated-measures analysis of variance (ANOVA), wherein there were one between-subject (randomization group) and one within-subject (pre-post assessment) main effect, and one interaction effect. Significant interaction effects between time (pre-and-post intervention) and group (Mind-OP vs. Control) were of most interest to address hypotheses. Significant interaction effects were followed up by a series of

paired samples t-tests to examine effect sizes related to change from pre-to post-assessment within each of the randomization conditions.

*Secondary Outcome Analyses*. A series of repeated-measures ANOVAs were conducted to examine differences across time and condition on measures of dispositional mindfulness (FFMQ-15), self-compassion (SCS-SF), nonattachment (NAS-SF), and state-level mindfulness during a recent meditation session (TMS). We followed up significant interaction effects with a series of paired-samples t-tests to examine effect size related to the change over time within each condition. We also conducted several exploratory paired samples t-tests to examine within-subject effect size differences on the facets of mindfulness (FFMQ) and the decentring and curiosity subfactors of the TMS within each randomization condition.

We calculated the proportions of participants who achieved reliable improvement on the PHQ-9 and GAD-7, with reliable improvement defined as a reduction of at least 4 points on the GAD-7, and at least 5 points on the PHQ-9 (Gyani, Shafran, Layard, & Clark, 2013; Jacobson & Truax, 1991). Finally, we conducted exploratory descriptive analyses of between module meditation time, and module and program ratings. Alpha/significance level for all analyses was set at 0.05 and were conducted using SPSS v. 25.

## 3. Results

### 3.1. Normality checks

Skewness for all measures (pre and post intervention) ranged from −0.55 to 0.62, all within the suggested range of ± 1 for normal distributions (Tabachnick et al., 2007). Similarly, all kurtosis statistics for the dependent measures were within the range expected of a normal distribution, ranging from −0.72 to 0.76.

### 3.2. Attrition and adherence

Fig. 1 depicts participant flow throughout all timepoints in the study. Attrition rates were high across both conditions, but were higher for the treatment condition, $\chi^2$ (1) = 4.80, $p$ = .028. Of the $n$ = 227 participants randomized to the Mind-OP condition, 80 did not initiate the treatment, 27 discontinued from week 1–2, 29 from week 2–3, 6 from week 3–4, and 10 from week 4–post-intervention assessment. An additional 7 participants were excluded from per-protocol analyses for failing attention check and/or half or more of the knowledge test items. Of the $n$ = 229 participants randomized to the active control condition, 53 did not initiate the control tasks, while 30 discontinues from week 1–2, 25 from week 2–3, 13 from week 3–4, and 4 from week 4–post-intervention assessment. An additional 13 participants were removed from the per-protocol analyses for failing included attention check and half or more knowledge questions (See Fig. 1 for CONSORT Flow diagram).

Analyses revealed no significant differences between those who adhered (completed all modules, passing attention and knowledge questions) to the protocol compared to those who did not in age, $t$ (454) = −0.82, $p$ = .41 ($d$ = 0.08), gender, $\chi^2$ (2) = 0.28, $p$ = .87, ethnicity, $\chi^2$ (10) = 9.52, $p$ = .48, previous meditation experience, $\chi^2$ (1) = 0.48, $p$ = .49, and previous mental health condition, $\chi^2$ (1) = 2.51, $p$ = .11. There was a significant difference between those adhering to the protocol compared to those not adhering in distribution of highest levels of educational attainment, $\chi^2$ (5) = 12.63, $p$ = .027.

Independent samples $t$-test analyses revealed no significant differences between those adhering to the protocol compared to those who did not on pre-treatment levels of anxiety, $t$ (454) = 1.49, $p$ = .14 ($d$ = 0.14), depression, $t$ (454) = 1.49, $p$ = .14 ($d$ = 0.14), stress, $t$ (454) = −0.68, $p$ = .52 ($d$ = 0.06), or dispositional mindfulness, $t$ (454) = 1.23, $p$ = .14 ($d$ = 0.12).

There were significant differences between those who adhered versus those who did not on measures of self-compassion, $t$ (454) = 2.79, $p$ = .005 ($d$ = 0.26), nonattachment, $t$ (454) = 2.68, $p$ = .007 ($d$ = 0.25), and state mindfulness, $t$ (454) = 3.26, $p$ < .001 ($d$ = 0.31). These analyses revealed that those who adhered to the treatment scored significantly lower than those who did not on the SCS-SF, NAS-SF, and TMS. Descriptive statistics of outcome measures, stratified by condition among protocol adherent participants, are summarized in Table 2.

### 3.3. Intent-to-treat primary outcome analyses

*Anxiety*. MLM analyses results are summarized in Table 3. Analyses revealed a significant time by group interaction on the GAD-7. Specifically, participants assigned to the Mind-OP condition exhibited significantly reduced symptoms of anxiety at the end of six-week study period compared with those assigned to the active control condition, $b$ = 1.34, p = .03 ($d$ = 0.20). There were significant main fixed effects of time (week of assessment), $b$ = 2.28, p < .001 ($d$ = 0.50), and group allocation, $b$ = −1.78, p < .01 ($d$ = 0.24), on GAD-7 scores (See Fig. 2).

*Depression*. There was no significant interaction effect between time and group allocation on PHQ-9 scores, $b$ = 0.87, p = .20 ($d$ = 0.12). There was a significant main fixed effect of time (week of assessment) on PHQ-9 scores, $b$ = 2.78, p < .001 ($d$ = 0.59). There was no significant fixed effect of group membership on PHQ-9 scores, $b$ = −1.61, p = .054 ($d$ = 0.18) (See Fig. 3).

*Stress*. There was a significant interaction effect between time and group allocation on PSS scores, $b$ = 2.78, $p$ = .001 ($d$ = 0.31). Participants in the Mind-OP condition exhibited greater reductions in PSS scores at the end of the study period than those assigned to the active control condition. There were also significant main fixed effects of time, $b$ = 3.89, p < .001 ($d$ = 0.66), and group allocation, $b$ = 3.65, $p$ < .001 ($d$ = 0.37) on PSS scores (See Fig. 4).

### 3.4. Per-protocol primary outcomes

Repeated-measures ANOVAs statistics are summarized in Table 4. There were significant interaction effects between time and group on the GAD-7 and PSS, as well as significant group main effects on the same measures reduced distress in the Mind-OP arm. Analyses also found significant main effects for time on all three primary outcome measures, showing improved wellbeing for both groups across time.

### 3.5. Per-protocol Secondary Outcome Analyses

All per-protocol repeated-measures ANOVA Results for secondary outcomes are summarized in Table 5. As can be observed, there was a significant interaction between time and group membership on the FFMQ-15, SCS-SF, NAT-SF, and TMS. These analyses revealed significant reported increases in secondary measures over the trial period for those in the Mind-OP condition compared to active control condition. Further, there were significant main effects of time in increasing scores on these secondary outcomes regardless of group allocation.

### 3.6. Exploratory paired samples tests

Exploratory paired samples t-tests indicated that participants allocated to the intervention condition experienced significant changes from pre to post with effect sizes that ranged from $d$ = 0.57 (TMS) to 1.64 (PSS). By comparison, participants in the active control condition experienced changes with effect sizes ranging from $d$ = 0.02 (TMS) to 0.61 (PSS). Similarly, effect sizes of change from pre to post on FFMQ-15 and TMS subscales for people in the intervention condition ranged from 0.22 (FFMQ-Describe) to 0.74 (TMS-Decentring). These results are summarized in Tables 5 and 6.

EFFECTIVENESS OF MIND-OP ON MTURK 48

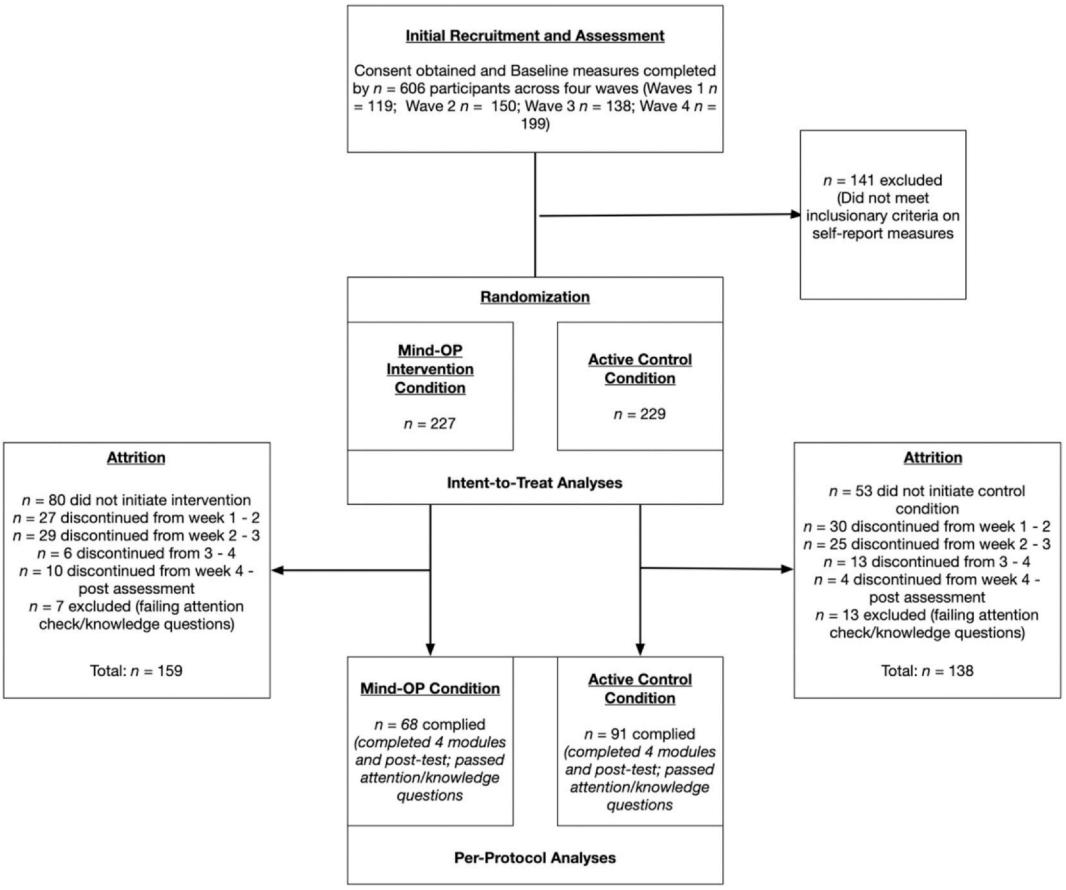


**Fig. 1.** CONSORT participant flow throughout all timepoints in the study, stratified by randomization condition.

**Table 2**
Descriptive statistics of primary and secondary outcome measures, stratified by condition among protocol adherent participants.

| Measure | Mind-OP ($n$ = 68) | | | | Active Control ($n$ = 91) | | | |
|---|---|---|---|---|---|---|---|---|
| | Pre | | Post | | Pre | | Post | |
| | *M* (*SD*) | 95% CI | *M* (*SD*) | 95% CI | *M* (*SD*) | 95% CI | *M* (*SD*) | 95% CI |
| GAD-7 | 8.82 (4.16) | 7.82–9.83 | 5.06 (4.63) | 3.94–6.18 | 9.71 (5.43) | 8.57–10.85 | 7.66 (5.31) | 6.54–8.77 |
| PHQ-9 | 10.13 (5.05) | 8.91–11.35 | 6.24 (5.70) | 4.86–7.62 | 10.91 (5.90) | 9.67–12.15 | 8.08 (6.18) | 6.78–9.37 |
| PSS | 21.78 (4.73) | 20.63–22.93 | 14.01 (5.85) | 12.60–15.43 | 22.56 (6.68) | 21.16–23.96 | 18.56 (8.60) | 16.66–20.26 |
| FFMQ-15 | 45.35 (7.09) | 43.63–47.07 | 50.13 (7.22) | 48.39–51.88 | 45.60 (9.80) | 43.55–47.65 | 48.20 (9.95) | 46.12–50.28 |
| SCS-SF | 2.57 (0.65) | 2.41–2.73 | 3.10 (0.74) | 2.92–3.29 | 2.52 (0.89) | 2.34–2.71 | 2.79 (0.93) | 2.59–2.98 |
| NAS-SF | 27.93 (5.71) | 26.54–29.31 | 32.87 (6.48) | 31.30–34.44 | 28.27 (8.39) | 26.51–30.02 | 31.36 (8.76) | 29.52–33.19 |
| TMS | 19.68 (8.95) | 17.51–21.84 | 24.81 (9.95) | 22.40–27.22 | 20.11 (10.08) | 18.00–22.22 | 20.28 (11.49) | 17.87–22.58 |

*Note.* GAD-7 = Generalized Anxiety Disorder – 7; PHQ-9 = Patient Health Questionnaire – 9; PSS = Perceived Stress Scale; FFMQ-15 = Five Facet Mindfulness Questionnaire – 15; SCS-SF = Self-Compassion Scale – Short Form; NAS-SF = The Nonattachment Scale – Short Form; TMS = Toronto Mindfulness Scale.

### *3.7. Reliable improvement*

A total of 52.9% of participants in the Mind-OP condition achieved reliable improvement (≥4 points) on the GAD-7, compared to 40.7% of those in the active control condition. Total of 39.7% of the Mind-OP condition achieved reliable improvement (≥5 points) on the PHQ-9, compared to 33.0% of the active control.

### *3.8. Between module meditation and program acceptability*

Mean meditation practice times between modules 1–2, 2–3, 3–4, and 4–post-intervention were 20.66 (SD = 15.90), 23.91 (SD = 18.71), 23.21 (SD = 18.5), and 27.95 min (SD = 30.60), respectively.

Module ratings were $M$ = 7.91 (SD. 1.75), 8.03 (SD = 1.73), 8.05 (SD = 1.68), and 8.24 (SD = 1.59) for modules 1–4, respectively. Overall program rating was $M$ = 8.23 (SD = 1.49).

## 4. Discussion

In this randomized trial, we examined the effectiveness of an online program designed to cultivate mindfulness and self-compassion skills, and to reduce symptoms of anxiety, depression, and heightened subjective stress. The intervention itself was novel, combining exercises from fields of mindfulness, self-compassion, decisional control, and

**Table 3**
Intent-to-treat (MLM) analyses coefficients for main outcome variables.

| | Estimates of Fixed Effects | | | | Effect Size | |
|---|---|---|---|---|---|---|
| | *b* | 95% CI | t statistic | p | d | 95% CI |
| GAD-7[a] | | | | | | |
| Intercept | 7.81 | 6.92–8.69 | 17.37 | < .001[e] | 1.63 | 1.42–1.84 |
| Effect of Time (Pre vs. Post) | 2.28 | 1.49–3.08 | 5.61 | < .001[e] | 0.50 | 0.34–0.71 |
| Effect of Group (Mind-OP vs. Control) | −1.78 | −3.11 to −0.46 | −2.65 | .009[e] | 0.24 | 0.06–0.43 |
| Time X Group | 1.34 | 0.13–2.55 | 2.18 | .03[d] | 0.20 | 0.02–0.39 |
| PHQ-9[b] | | | | | | |
| Intercept | 8.77 | 7.74–9.80 | 16.78 | < .001[e] | 1.57 | 1.36–1.78 |
| Effect of Time (Pre vs. Post) | 2.79 | 1.92–3.67 | 6.28 | < .001[e] | 0.59 | 0.4–0.78 |
| Effect of Group (Mind-OP vs. Control) | −1.61 | −3.03–0.02 | −1.94 | .054 | 0.18 | −0.002–0.37 |
| Time X Group | 0.87 | −0.46–2.19 | 1.29 | .20 | 0.12 | −0.06–0.30 |
| PSS[c] | | | | | | |
| Intercept | 18.52 | 17.30–19.73 | 30.03 | < .001[e] | 2.81 | 2.55–3.07 |
| Effect of Time (Pre vs. Post) | 3.89 | 2.80–4.98 | 7.06 | < .001[e] | 0.66 | 0.47–0.85 |
| Effect of Group (Mind-OP vs. Control) | −3.65 | −5.47 to −1.83 | −3.94 | < .001[e] | 0.37 | 0.18–0.55 |
| Time X Group | 2.78 | 1.11–4.42 | 3.29 | .001[e] | 0.31 | 0.12–0.49 |

[a] Generalized Anxiety Disorder – 7.
[b] Patient Health Questionnaire – 9.
[c] Perceived Stress Scale.
[d] = significant at the .05 level.
[e] = significant at the .01 level.

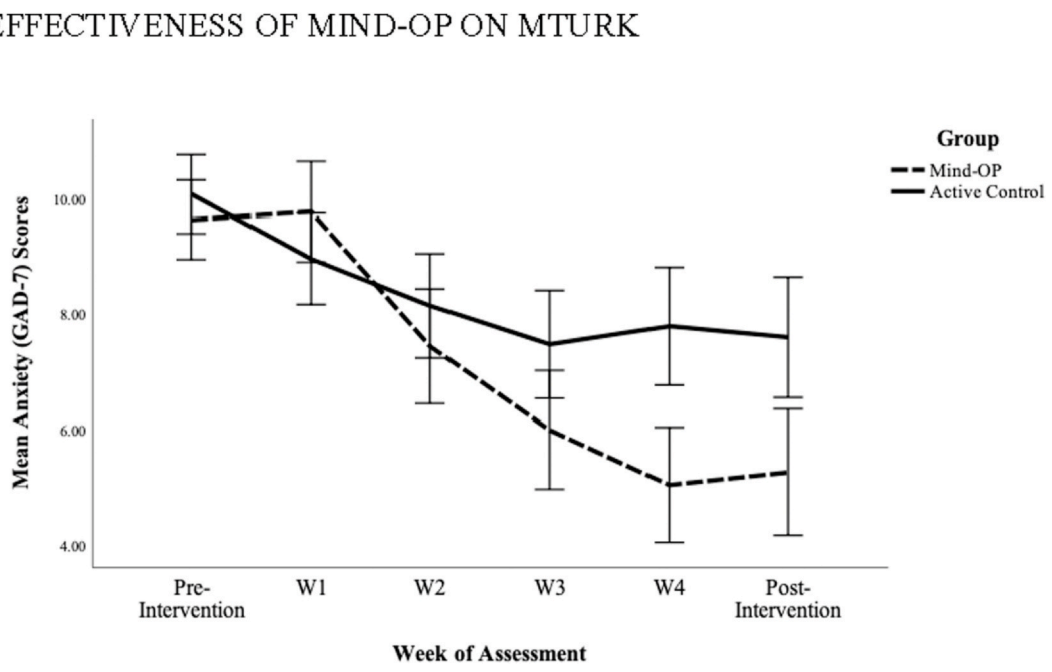


**Fig. 2.** Mixed Linear Modeling analyses revealed significant effects of Time (week of assessment) and Group allocation on GAD-7 (Generalized Anxiety Disorder – 7) scores.

goal-setting in a brief audio-visual package. Further, this is one of the first trials of its kind to be conducted entirely on a crowdsourcing platform such as Amazon's Mechanical Turk. Accordingly, this was a proof-of-concept, feasibility study. The intervention itself had encouraging results and had medium-to-large effects on reducing anxiety symptoms and managing stress, as well as on the secondary outcomes of dispositional and state mindfulness, self-compassion, and non-attachment. Further, we tested the effects of the intervention against a relatively stringent active control condition, wherein participants watched nature videos, superimposed onto the meditation music from our Mind-OP meditation videos (Mayer et al., 2009).

Consistent with other trials of self-guided interventions (Beshai et al., 2016), attrition was high in both conditions, but was higher among those randomized to Mind-OP. Complete adherence rates (i.e., completed all modules, while paying attention and engaging with the material) in the Mind-OP condition were 30%, which is consistent with other studies which found adherence of 14–50% in self-guided interventions for depression (Cuijpers et al., 2011; Karyotaki et al., 2015). It is noteworthy that the differences in attrition among those randomized to the intervention and control conditions can be accounted for by higher attrition rates between baseline and initiation of Module 1. If the increased attrition at this specific time point is accounted for, attrition rates were similar across conditions at 50% (i.e., 50% of those who initiated week 1 of either condition had complete adherence).

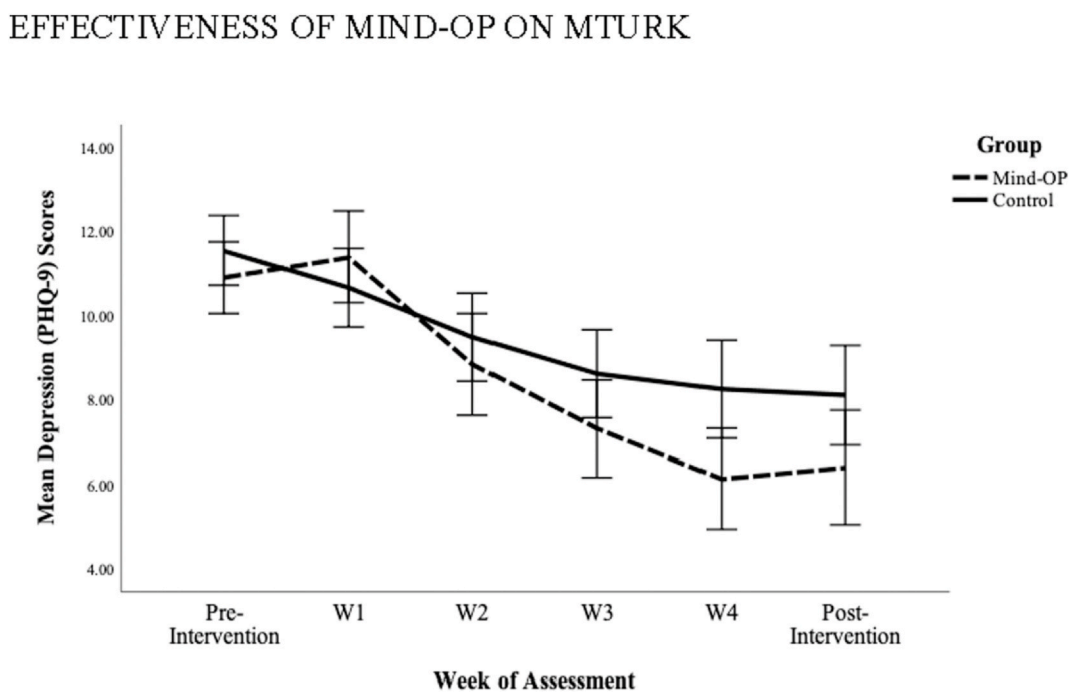


**Fig. 3.** Mixed Linear Modeling analyses revealed significant effects of Time (week of assessment) and Group allocation on PHQ-9 (Patient Health Questionnaire – 9) scores.

Also, consistent with other trials of online mindfulness and self-compassion interventions, we found that Mind-OP had the largest effects on perceived stress (Spijkerman, Pots, & Bohlmeijer, 2016). The treatment evidenced small effects for anxiety symptoms across time and compared to the active control condition, but did not appear to be effective for depression symptoms when compared with the active control procedure. There is evidence to suggest that therapist-guided interventions are more effective for the treatment of depression than are entirely self-guided interventions (Gellatly et al., 2007). Further, per-protocol analyses demonstrated that participants randomized to Mind-OP showed significant increases in secondary outcomes of dispositional mindfulness, self-compassion, non-attachment, and state mindfulness compared to controls. These are also consistent with results of other trials which showed that online mindfulness and self-compassion interventions are efficacious in raising these important secondary and process outcomes (Smeets et al., 2014; Trompetter et al., 2015).

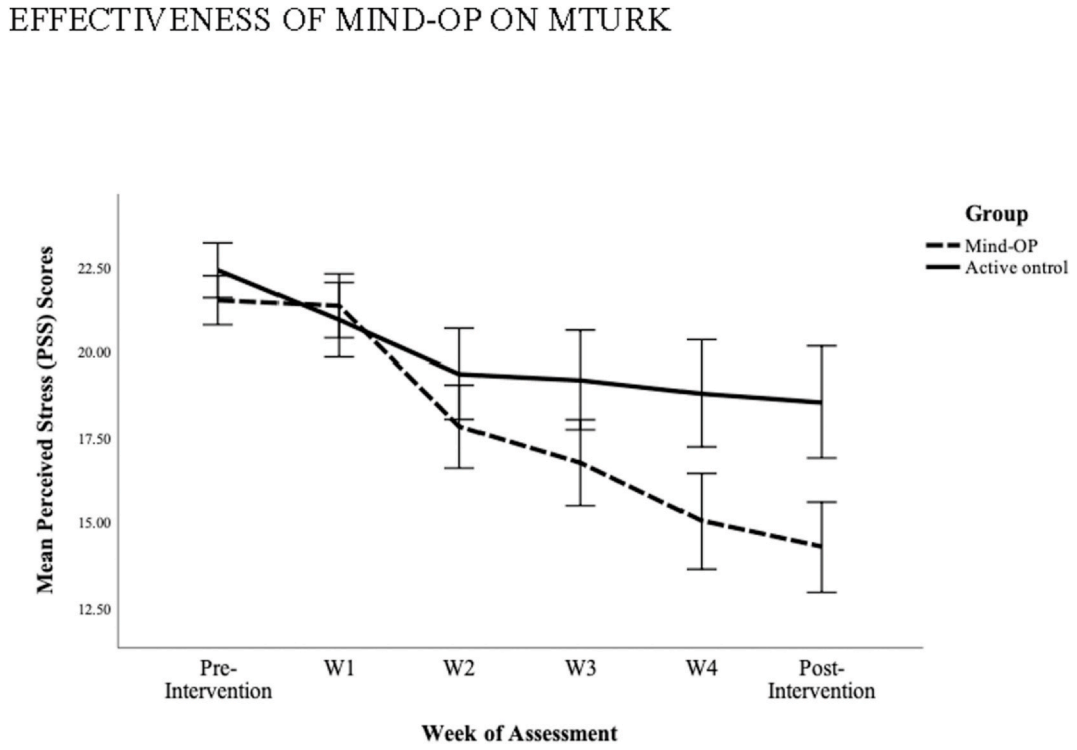


**Fig. 4.** Mixed Linear Modeling analyses revealed significant effects of Time (week of assessment) and Group allocation on PSS (Perceived Stress Scale) scores.

**Table 4**
Per-protocol repeated measures analyses (ANOVAs) statistics of primary and secondary outcomes.

| | F-statistic | p | $\eta_p^2$ |
|---|---|---|---|
| GAD – 7 | | | |
| Effect of Time (Pre vs. Post) | 60.93 | < .001[b] | .28 |
| Effect of Group (Mind-OP vs. Control) | 6.34 | .01[b] | .04 |
| Time X Group | 4.75 | .031[a] | .03 |
| PHQ – 9 | | | |
| Effect of Time (Pre vs. Post) | 70.73 | < .001[b] | .31 |
| Effect of Group (Mind-OP vs. Control) | 2.57 | .11 | .02 |
| Time X Group | 1.76 | .19 | .01 |
| PSS | | | |
| Effect of Time (Pre vs. Post) | 152.75 | < .001[b] | .49 |
| Effect of Group (Mind-OP vs. Control) | 7.25 | .008[b] | .04 |
| Time X Group | 15.17 | < .001[b] | .09 |
| FFMQ-15 | | | |
| Effect of Time (Pre vs. Post) | 59.44 | < .001[b] | .28 |
| Effect of Group (Mind-OP vs. Control) | 0.39 | .53 | .00 |
| Time X Group | 5.09 | .025[a] | .03 |
| SCF-SF | | | |
| Effect of Time (Pre vs. Post) | 65.51 | < .001[b] | .29 |
| Effect of Group (Mind-OP vs. Control) | 1.96 | .16 | .01 |
| Time X Group | 7.67 | .006[b] | .05 |
| NAS-SF | | | |
| Effect of Time (Pre vs. Post) | 69.70 | < .001 | .31 |
| Effect of Group (Mind-OP vs. Control) | 0.20 | .65 | .00 |
| Time X Group | 3.99 | .047[a] | .03 |
| TMS | | | |
| Effect of Time (Pre vs. Post) | 13.22 | < .001[b] | .08 |
| Effect of Group (Mind-OP vs. Control) | 1.92 | .17 | .01 |
| Time X Group | 11.61 | < .001[b] | .07 |

GAD-7 = Generalized Anxiety Disorder – 7; PHQ-9 = Patient Health Questionnaire – 9; PSS = Perceived Stress Scale; FFMQ-15 = Five Facet Mindfulness Questionnaire – 15; SCS-SF = Self-Compassion Scale – Short Form; NAS-SF = The Nonattachment Scale – Short Form; TMS = Toronto Mindfulness Scale.
[a] = Significant at the .05 level.
[b] = Significant at the .01 level.

**Table 5**
Pre-post paired T-Test analyses and effect sizes on primary and secondary outcomes, stratified by randomization condition.

| Measure | Mind-OP Condition | | | Active Control Condition | | |
|---|---|---|---|---|---|---|
| | t-statistic | P | Cohen's d | t-statistic | p | Cohen's d |
| GAD-7 | 6.76 | < .001[b] | 0.90 | 4.23 | < .001[b] | 0.39 |
| PHQ-9 | 6.98 | < .001[b] | 0.77 | 5.12 | < .001[b] | 0.48 |
| PSS | 11.97 | < .001[b] | 1.64 | 6.05 | < .001[b] | 0.61 |
| FFMQ-15 | 7.08 | .02[a] | 0.67 | 3.98 | < .001[b] | 0.27 |
| SCS-SF | 6.65 | < .001[b] | 0.82 | 4.35 | < .001[b] | 0.29 |
| NAS-SF | 8.04 | < .001[b] | 0.87 | 4.42 | < .001[b] | 0.36 |
| TMS | 4.69 | < .001[b] | 0.57 | 0.17 | .86 | .02 |

GAD-7 = Generalized Anxiety Disorder – 7; PHQ-9 = Patient Health Questionnaire – 9; PSS = Perceived Stress Scale; FFMQ-15 = Five Facet Mindfulness Questionnaire – 15; SCS-SF = Self-Compassion Scale – Short Form; NAS-SF = The Nonattachment Scale – Short Form; TMS = Toronto Mindfulness Scale.
[a] = Significant at the .05 level.
[b] = Significant at the .01 level.

**Table 6**
*Pre-Post Paired T-Test Analyses and Effect Sizes on Subfacets of the TMS and FFMQ-15, Stratified by Randomization Condition.*

| Measure | Mind-OP Condition | | | Active Control Condition | | |
|---|---|---|---|---|---|---|
| | t-statistic | P | Cohen's d | t-statistic | p | Cohen's d |
| TMS-Dec | 5.59 | < .001[b] | 0.74 | 0.21 | .83 | 0.02 |
| TMS-Cur | 2.52 | .01[a] | 0.31 | 0.02 | .98 | 0.02 |
| FFMQ-Des | 2.50 | .02[a] | 0.22 | 3.39 | .001[b] | 0.23 |
| FFMQ-Obs | 3.72 | < .001[b] | 0.34 | 0.10 | .92 | 0.01 |
| FFMQ-Aw | 4.51 | < .001[b] | 0.43 | 2.07 | .04 | 0.16 |
| FFMQ-NJ | 4.15 | < .001[b] | 0.43 | 2.81 | .01[a] | 0.22 |
| FFMQ-NR | 3.25 | .002[b] | 0.40 | 2.26 | .03[a] | 0.20 |

*Note*. TMS = Toronto Mindfulness Scale; TMS-Dec = Decentring Subscale; TMS-Cur = Curiosity Subscale; FFMQ-15 = Five Facet Mindfulness Questionnaire – 15; FFMQ-Des = Describe Subscale; FFMQ-Obs = Observe Subscale; FFMQ-Aw = Awareness Subscale; FFMQ-NJ = Non-judge Subscale; FFMQ-NR = Non-react Subscale.
[a] = Significant at the .05 level.
[b] = Significant at the .01 level.

The current trial had several strengths. First, the program itself was unique in combining evidence-based psychoeducational videos and exercises from disparate fields (mindfulness, self-compassion, decisional control, and goal-setting theories). Secondly, there are currently very few published works that compared online mindfulness or compassion-based interventions with an active control condition, by far the majority of existing trials treatments compared with passive waitlist conditions. The results of the trial clearly demonstrate that even paying attention to a brief nature video and completing study measures on a weekly basis evidenced small-moderate effects on both primary and secondary outcomes. Moreover, and to the best of our knowledge, this is the first study of its kind to be completed entirely on a crowdsourcing platform such as MTurk. Despite the high attrition rates, this trial was proof-of-concept that such recruitment methods are indeed feasible and have immense potential in clinical research (Chandler & Shapiro, 2016). Also, despite high attrition rates we still had a relatively large sample of participants adhering to trial protocol ($n$ = 159), which lends confidence in the obtained results.

The study also suffers from several limitations that pave the way for future trials. First, we did not compare the results of the intervention and active control conditions to those of a waitlist/passive control. As such, it was not possible to ascertain the effects of these conditions compared to receiving no treatment at all. Second, a major limitation is we only assessed participants post-intervention, and thus, we did not have a longer follow-up to evaluate whether the results hold across time (Spijkerman et al., 2016). Third, and as mentioned, attrition rates were demonstrably high. It is difficult to ascertain whether these high attrition rates were due to the non-acceptable nature of the intervention itself, or whether these rates were due to the nature of the recruitment platform, which is essentially a work-for-pay environment. It is noteworthy that some participants complained about the incentive structure, many of whom felt that a) the payment was too low, or b) that homework adherence (in the form of completing meditations) needs to be further incentivized through payment that is independent from payment for completing each module. Fourth, the wide net recruitment strategy using MTurk for a mental health intervention raises a few ethical concerns; given jurisdictional restrictions and lack of adequate resources, we could not closely monitor outcomes on an individual basis, nor could we respond to any crises that arose as result of the intervention or otherwise. With that said, this treatment was entirely self-guided, and so participants were free to engage or disengage from the treatment at their own discretion. Further, the treatment was pilot tested among a small sample of university students, and its safety was ascertained prior to deployment on MTurk. Accordingly, the potential mental health benefits of offering this intervention widely through MTurk far outweighed the potential risks, given the ubiquity of mental health concerns among this sample (Arditte, Çek, Shaw, & Timpano, 2016).

Fifth, although we assessed previous meditation experience, this

question was broad and did not differentiate between varying levels of experience. Sixth, we did not measure demonstrably important moderators of engagement in mindfulness and self-compassion interventions, such as fear of compassion (Kirby, Day, & Sagar, 2019). Seventh, we relied solely on the SCS-SF for measurement of self-compassion. There are debates on the construct validity of the SCS, and whether its negatively valanced items inflate the association with psychopathology measures (Gilbert, Basran, MacArthur, & Kirby, 2019; Muris & Petrocchi, 2017). With that, total scores on the SCS and its close variant SCS-SF have been demonstrated to capture 90% of variance in the higher-order self-compassion construct among several samples (Neff, 2016). Finally, theoretical foundations of Mind-OP were consistent with a specific mechanistic model in mindfulness (decentring; Shapiro et al., 2006), and specific conceptualization of self-compassion (Neff, 2003 ab).

Despite the enormous progress made in designing effective interventions for common mental health concerns, access to and engagement with these interventions have remained dismally low. Online, brief, non-proprietary self-guided interventions hold great promise, given their scalability and their ability to address several of the barriers to access, most notably costs, experienced by those who need these treatments most. Mindfulness and self-compassion are particularly promising, given their wide general appeal as well as the growing scientific evidence that backs their efficacy. Our treatment combines several evidence-based mindfulness and self-compassion techniques and packages them with other behavioral techniques for improved mental health and engagement. This treatment evidenced small to moderate effects for stress and small effects for anxiety when compared with a strong active control condition. Further, and as an added bonus, we were able to demonstrate that a randomized trial of this nature is feasible on a crowdsourcing recruitment platform such as MTurk. As such, we hope this trial paves the way for future clinical work using this versatile platform.

## CRediT authorship contribution statement

**Shadi Beshai:** Conceptualization, Methodology, Software, Formal analysis, Resources, Data curation, Writing - original draft, Visualization, Supervision. **Christine Bueno:** Software, Formal analysis, Data curation, Visualization, Project administration. **Mabel Yu:** Software, Visualization. **Justin R. Feeney:** Methodology, Software, Visualization, Writing - review & editing. **Adrian Pitariu:** Methodology, Writing - review & editing, Resources.

## References


Al Rasheed, F., Naqvi, A. A., Ahmad, R., & Ahmad, N. (2017). Academic stress and prevalence of stress-related self-medication among undergraduate female students of health and non-health cluster colleges of a public sector university in Dammam, Saudi Arabia. *Journal of Pharmacy & Bioallied Sciences, 9*(4), 251–258. https://doi.org/10.4103/jpbs.JPBS_189_17.

Arditte, K. A., Çek, D., Shaw, A. M., & Timpano, K. R. (2016). The importance of assessing clinical phenomena in Mechanical Turk research. *Psychological Assessment, 28*(6), 684–691. https://doi.org/10.1037/pas0000217.

Baer, R. A., Smith, G. T., Lykins, E., Button, D., Krietemeyer, J., Sauer, S., et al. (2008). Construct validity of the five facet mindfulness questionnaire in meditating and nonmeditating samples. *Assessment, 15*(3), 329–342. https://doi.org/10.1177/1073191107313003.

Beard, C., & Björgvinsson, T. (2014). Beyond generalized anxiety disorder: Psychometric properties of the GAD-7 in a heterogeneous psychiatric sample. *Journal of Anxiety Disorders, 28*(6), 547–552. https://doi.org/10.1016/j.janxdis.2014.06.002.

Berinsky, A. J., Huber, G. A., & Lenz, G. S. (2012). Evaluating online labor markets for experimental research: Amazon. com's Mechanical Turk. *Political Analysis, 20*(3), 351–368. https://doi.org/10.1093/pan/mpr057.

Beshai, S., Mishra, S., Meadows, T. J., Parmar, P., & Huang, V. (2017). Minding the gap: Subjective relative deprivation and depressive symptoms. *Social Science & Medicine, 173*, 18–25. https://doi.org/10.1016/j.socscimed.2016.11.021.

Beshai, S., Mishra, S., Mishra, S., & Carleton, R. N. (2017). Personal relative deprivation associated with functional disorders via stress: An examination of fibromyalgia and gastrointestinal symptoms. *PloS One, 12*(12).

Beshai, S., Wallace, L. M., Mcdougall, K. H., Waldmann, K., & Stea, J. N. (2016). Reduced contact cognitive-behavioral interventions for adult depression: A review. *Journal of Psychology, 150*(2), 252–279. https://doi.org/10.1080/00223980.2015.1087376.

Bieling, P. J., Hawley, L. L., Bloch, R. T., Corcoran, K. M., Levitan, R. D., Young, L. T., et al. (2012). Treatment-specific changes in decentering following mindfulness-based cognitive therapy versus antidepressant medication or placebo for prevention of depressive relapse. *Journal of Consulting and Clinical Psychology, 80*(3), 365–372.

Boellinghaus, I., Jones, F. W., & Hutton, J. (2014). The role of mindfulness and loving-kindness meditation in cultivating self-compassion and other-focused concern in health care professionals. *Mindfulness, 5*(2), 129–138.

Bower, P., & Gilbody, S. (2005). Stepped care in psychological therapies: Access, effectiveness and efficiency: Narrative literature review. *The British Journal of Psychiatry, 186*(1), 11–17.

Cavanagh, K., Strauss, C., Cicconi, F., Griffiths, N., Wyper, A., & Jones, F. (2013). A randomised controlled trial of a brief online mindfulness-based intervention. *Behaviour Research and Therapy, 51*(9), 573–578. https://doi.org/10.1016/j.brat.2013.06.003.

Chandler, J., & Shapiro, D. (2016). Conducting clinical research using crowdsourced convenience samples. *Annual Review of Clinical Psychology, 12*, 51–82. https://doi.org/10.1146/annurev-clinpsy-021815-093623.

Chiesa, A., & Serretti, A. (2009). Mindfulness-based stress reduction for stress management in healthy people: A review and meta-analysis. *Journal of Alternative & Complementary Medicine, 15*(5), 593–600.

Chio, F. H., Lai, M. H., & Mak, W. W. (2018). Development of the nonattachment scale-short form (NAS-SF) using item response theory. *Mindfulness, 9*(4), 1299–1308. https://doi.org/10.1007/s12671-017-0874-z.

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of health and social behavior*, 385–396.

Crane, R. S., Brewer, J., Feldman, C., Kabat-Zinn, J., Santorelli, S., Williams, J. M. G., et al. (2017). What defines mindfulness-based programs? The warp and the weft. *Psychological Medicine, 47*(6), 990–999. https://doi.org/10.1017/S0033291716003317.

Cuijpers, P., Donker, T., Johansson, R., Mohr, D. C., van Straten, A., & Andersson, G. (2011). Self-guided psychological treatment for depressive symptoms: A meta-analysis. *PloS One, 6*(6), Article e21274. https://doi.org/10.1371/journal.pone.0021274.

Cuijpers, P., Vogelzangs, N., Twisk, J., Kleiboer, A., Li, J., & Penninx, B. W. (2013). Differential mortality rates in major and subthreshold depression: meta-analysis of studies that measured both. *The British Journal of Psychiatry, 202*(1), 22–27. https://doi.org/10.1192/bjp.bp.112.112169.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G* Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods, 41*(4), 1149–1160.

Finlay-Jones, A., Kane, R., & Rees, C. (2017). Self-compassion online: A pilot study of an internet-based self-compassion cultivation program for psychology trainees. *Journal of Clinical Psychology, 73*(7), 797–816. https://doi.org/10.1002/jclp.22375.

Gellatly, J., Bower, P., Hennessy, S., Richards, D., Gilbody, S., & Lovell, K. (2007). What makes self-help interventions effective in the management of depressive symptoms? Meta-analysis and meta-regresssion. *Psychological Medicine, 37*, 1217–1228.

Gilbert, P., Basran, J., MacArthur, M., & Kirby, J. N. (2019). Differences in the semantics of prosocial words: An exploration of compassion and kindness. *Mindfulness, 10*(11), 2259–2271.

Grabovac, A. D., Lau, M. A., & Willett, B. R. (2011). Mechanisms of mindfulness: A buddhist psychological model. *Mindfulness, 2*(3), 154–166.

Grossman, P., Niemann, L., Schmidt, S., & Walach, H. (2004). Mindfulness-based stress reduction and health benefits: A meta-analysis. *Journal of Psychosomatic Research, 57*(1), 35–43.

Gu, J., Strauss, C., Crane, C., Barnhofer, T., Karl, A., Cavanagh, K., et al. (2016). Examining the factor structure of the 39-item and 15-item versions of the Five Facet Mindfulness Questionnaire before and after mindfulness-based cognitive therapy for people with recurrent depression. *Psychological Assessment, 28*(7), 791–802. https://doi.org/10.1037/pas0000263.

Gyani, A., Shafran, R., Layard, R., & Clark, D. M. (2013). Enhancing recovery rates: Lessons from year one of IAPT. *Behaviour Research and Therapy, 51*(9), 597–606.

Haller, H., Cramer, H., Lauche, R., Gass, F., & Dobos, G. J. (2014). The prevalence and burden of subthreshold generalized anxiety disorder: A systematic review. *BMC Psychiatry, 14*(1), 128. https://doi.org/10.1186/1471-244X-14-128.

Hewitt, P. L., Flett, G. L., & Mosher, S. W. (1992). The Perceived Stress Scale: Factor structure and relation to depression symptoms in a psychiatric sample. *Journal of Psychopathology and Behavioral Assessment, 14*(3), 247–257.

Hofmann, S. G., Grossman, P., & Hinton, D. E. (2011). Loving-kindness and compassion meditation: Potential for psychological interventions. *Clinical Psychology Review, 31*(7), 1126–1132.

Holmes, E. A., Ghaderi, A., Harmer, C. J., Ramchandani, P. G., Cuijpers, P., Morrison, A. P., et al. (2018). The Lancet Psychiatry Commission on psychological treatments research in tomorrow's science. *The Lancet Psychiatry, 5*(3), 237–286.

Howells, A., Ivtzan, I., & Eiroa-Orosa, F. J. (2016). Putting the 'app'in happiness: A randomised controlled trial of a smartphone-based mindfulness intervention to enhance wellbeing. *Journal of Happiness Studies, 17*(1), 163–185.

Jacobson, N. S., & Truax, P. (1991). Clinical significance: A statistical approach to defining meaningful change in psycho-therapy research. *Journal of Consulting and Clinical Psychology, 59*, 12–19.

Josephine, K., Josefine, L., Philipp, D., David, E., & Harald, B. (2017). Internet-and mobile-based depression interventions for people with diagnosed depression: A systematic review and meta-analysis. *Journal of Affective Disorders, 223*, 28–40.

Kabat-Zinn, J. (1982). An outpatient program in behavioral medicine for chronic pain patients based on the practice of mindfulness meditation: Theoretical considerations and preliminary results. *General Hospital Psychiatry, 4*(1), 33–47.

Karyotaki, E., Kleiboer, A., Smit, F., Turner, D. T., Pastor, A. M., Andersson, G., et al. (2015). Predictors of treatment dropout in self-guided web-based interventions for depression: An 'individual patient data'meta-analysis. *Psychological Medicine, 45*(13), 2717–2726. https://doi.org/10.1017/S0033291715000665.

Kessler, R. C., & Bromet, E. J. (2013). The epidemiology of depression across cultures. *Annual Review of Public Health, 34*, 119–138.

Kirby, J. N. (2017). Compassion interventions: The programmes, the evidence, and implications for research and practice. *Psychology and Psychotherapy: Theory, Research and Practice, 90*(3), 432–455.

Kirby, J. N., Day, J., & Sagar, V. (2019). The 'flow'of compassion: A meta-analysis of the fears of compassion scales and psychological functioning. *Clinical Psychology Review, 70*, 26–39.

Kirby, J. N., Tellegen, C. L., & Steindl, S. R. (2017). A meta-analysis of compassion-based interventions: Current state of knowledge and future directions. *Behavior Therapy, 48*(6), 778–792. https://doi.org/10.1016/j.beth.2017.06.003.

Kroenke, K., Spitzer, R. L., Williams, J. B., & Löwe, B. (2010). The patient health questionnaire somatic, anxiety, and depressive symptom scales: A systematic review. *General Hospital Psychiatry, 32*(4), 345–359. https://doi.org/10.1016/j.genhosppsych.2010.03.006.

Krusche, A., Cyhlarova, E., & Williams, J. M. G. (2013). Mindfulness online: An evaluation of the feasibility of a web-based mindfulness course for stress, anxiety and depression. *BMJ open, 3*(11), Article e003498. https://doi.org/10.1136/bmjopen-2013-003498.

Kujanpää, T., Ylisaukko-Oja, T., Jokelainen, J., Hirsikangas, S., Kanste, O., Kyngäs, H., et al. (2014). Prevalence of anxiety disorders among Finnish primary care high utilizers and validation of Finnish translation of GAD-7 and GAD-2 screening tools. *Scandinavian Journal of Primary Health Care, 32*(2), 78–83. https://doi.org/10.3109/02813432.2014.920597.

Lau, M. A., Bishop, S. R., Segal, Z. V., Buis, T., Anderson, N. D., Carlson, L., et al. (2006). The Toronto mindfulness scale: Development and validation. *Journal of Clinical Psychology, 62*, 1445–1467. https://doi.org/10.1002/jclp.20326.

Litman, L., Robinson, J., & Abberbock, T. (2017). TurkPrime. Com: A versatile crowdsourcing data acquisition platform for the behavioral sciences. *Behavior Research Methods, 49*(2), 433–442. https://doi.org/10.3758/s13428-016-0727-z.

Löwe, B., Decker, O., Müller, S., Brähler, E., Schellberg, D., Herzog, W., et al. (2008). Validation and standardization of the generalized anxiety disorder screener (GAD-7) in the general population. *Medical Care, 46*(3), 266–274. https://doi.org/10.1097/MLR.0b013e318160d093.

Löwe, B., Unützer, J., Callahan, C. M., Perkins, A. J., & Kroenke, K. (2004). Monitoring depression treatment outcomes with the patient health questionnaire-9. *Medical Care,* 1194–1201. https://doi.org/10.1097/00005650-200412000-00006.

Manea, L., Gilbody, S., & McMillan, D. (2012). Optimal cut-off score for diagnosing depression with the patient health questionnaire (PHQ-9): A meta-analysis. *Canadian Medical Association Journal, 184*(3), E191–E196. https://doi.org/10.1503/cmaj.110829.

Mani, M., Kavanagh, D. J., Hides, L., & Stoyanov, S. R. (2015). Review and evaluation of mindfulness-based iPhone apps. *JMIR mHealth and uHealth, 3*(3), e82.

Mayer, F. S., Frantz, C. M., Bruehlman-Senecal, E., & Dolliver, K. (2009). Why is nature beneficial? The role of connectedness to nature. *Environment and Behavior, 41*(5), 607–643. https://doi.org/10.1177/0013916508319745.

McLean, R. A., Sanders, W. L., & Stroup, W. W. (1991). A unified approach to mixed linear models. *The American Statistician, 45*(1), 54–64. https://doi.org/10.1080/00031305.1991.10475767.

Mohr, D. C., Hart, S. L., Howard, I., Julian, L., Vella, L., Catledge, C., et al. (2006). Barriers to psychotherapy among depressed and nondepressed primary care patients. *Annals of Behavioral Medicine, 32*(3), 254–258. https://doi.org/10.1207/s15324796abm3203_12.

Mojtabai, R., Olfson, M., Sampson, N. A., Jin, R., Druss, B., Wang, P. S., et al. (2011). Barriers to mental health treatment: Results from the national comorbidity survey replication. *Psychological Medicine, 41*(8), 1751–1761.

Moncher, F. J., & Prinz, R. J. (1991). Treatment fidelity in outcome studies. *Clinical Psychology Review, 11*(3), 247–266.

Muris, P., & Petrocchi, N. (2017). Protection or vulnerability? A meta-analysis of the relations between the positive and negative components of self-compassion and psychopathology. *Clinical Psychology & Psychotherapy, 24*(2), 373–383.

Neff, K. D. (2003a). The development and validation of a scale to measure self-compassion. *Self and Identity, 2*, 223–250.

Neff, K. (2003b). Self-compassion: An alternative conceptualization of a healthy attitude toward oneself. *Self and Identity, 2*(2), 85–101.

Neff, K. D. (2016). The self-compassion scale is a valid and theoretically coherent measure of self-compassion. *Mindfulness, 7*(1), 264–274.

Neff, K. D., & Germer, C. K. (2013). A pilot study and randomized controlled trial of the mindful self-compassion program. *Journal of Clinical Psychology, 69*(1), 28–44. https://doi.org/10.1002/jclp.21923.

Patel, V., Chowdhary, N., Rahman, A., & Verdeli, H. (2011). Improving access to psychological treatments: Lessons from developing countries. *Behaviour Research andTherapy, 49*(9), 523–528.

Pots, W. T., Fledderus, M., Meulenbeek, P. A., Peter, M., Schreurs, K. M., & Bohlmeijer, E. T. (2016). Acceptance and commitment therapy as a web-based intervention for depressive symptoms: Randomised controlled trial. *The British Journal of Psychiatry, 208*(1), 69–77.

Raes, F., Pommier, E., Neff, K. D., & Van Gucht, D. (2011). Construction and factorial validation of a short form of the self-compassion scale. *Clinical Psychology & Psychotherapy, 18*(3), 250–255.

Remes, O., Brayne, C., Van Der Linde, R., & Lafortune, L. (2016). A systematic review of reviews on the prevalence of anxiety disorders in adult populations. *Brain and Behavior, 6*(7), Article e00497. https://doi.org/10.1002/brb3.497.

Sahdra, B. K., Shaver, P. R., & Brown, K. W. (2010). A scale to measure nonattachment: A buddhist complement to western research on attachment and adaptive functioning. *Journal of Personality Assessment, 92*(2), 116–127.

Shapiro, S. L., Carlson, L. E., Astin, J. A., & Freedman, B. (2006). Mechanisms of mindfulness. *Journal of Clinical Psychology, 62*(3), 373–386.

Smeets, E., Neff, K., Alberts, H., & Peters, M. (2014). Meeting suffering with kindness: Effects of a brief self-compassion intervention for female college students. *Journal of Clinical Psychology, 70*(9), 794–807. https://doi.org/10.1002/jclp.22076.

Sommers-Spijkerman, M. P. J., Trompetter, H. R., Schreurs, K. M. G., & Bohlmeijer, E. T. (2018). Compassion-focused therapy as guided self-help for enhancing public mental health: A randomized controlled trial. *Journal of Consulting and Clinical Psychology, 86*, 101–115. https://doi.org/10.1037/ccp0000268.

Spijkerman, M. P. J., Pots, W. T. M., & Bohlmeijer, E. T. (2016). Effectiveness of online mindfulness-based interventions in improving mental health: A review and meta-analysis of randomised controlled trials. *Clinical Psychology Review, 45*, 102–114. https://doi.org/10.1016/j.cpr.2016.03.009.

Spitzer, R. L., Kroenke, K., Williams, J. B., & Löwe, B. (2006). A brief measure for assessing generalized anxiety disorder: The GAD-7. *Archives of Internal Medicine, 166*(10), 1092–1097. https://doi.org/10.1001/archinte.166.10.1092.

Spitzer, R. L., Williams, J. B., Kroenke, K., Hornyak, R., McMurray, J., & Patient Health Questionnaire Obstetrics-Gynecology Study Group (2000). Validity and utility of the PRIME-MD patient health questionnaire in assessment of 3000 obstetric-gynecologic patients: The PRIME-MD patient health questionnaire obstetrics-gynecology study. *American Journal of Obstetrics and Gynecology, 183*(3), 759–769. https://doi.org/10.1067/mob.2000.106580.

Strauss, C., Cavanagh, K., Oliver, A., & Pettman, D. (2014). Mindfulness-based interventions for people diagnosed with a current episode of an anxiety or depressive disorder: A meta-analysis of randomised controlled trials. *PloS One, 9*(4), Article e96110. https://doi.org/10.1371/journal.pone.0096110.

Tabachnick, B. G., Fidell, L. S., & Ullman, J. B. (2007). *Using multivariate statistics, Vol. 5*. Boston, MA: Pearson.

Trompetter, H. R., Bohlmeijer, E. T., Veehof, M. M., & Schreurs, K. M. (2015). Internet-based guided self-help intervention for chronic pain based on acceptance and commitment therapy: A randomized controlled trial. *Journal of Behavioral Medicine, 38*(1), 66–80. https://doi.org/10.1007/s10865-014-9579-0.

Wild, B., Eckl, A., Herzog, W., Niehoff, D., Lechner, S., Maatouk, I., et al. (2014). Assessing generalized anxiety disorder in elderly people using the GAD-7 and GAD-2 scales: Results of a validation study. *American Journal of Geriatric Psychiatry, 22*(10), 1029–1038. https://doi.org/10.1016/j.jagp.2013.01.076.

Williams, M. J., Dalgleish, T., Karl, A., & Kuyken, W. (2014). Examining the factor structures of the five facet mindfulness questionnaire and the self-compassion scale. *Psychological Assessment, 26*(2), 407–418. https://doi.org/10.1037/a0035566.