

Mindful Moments: The Efficacy and Acceptability of
Extremely Brief Mini-Meditations

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Abstract

Increasing numbers of evidence-based mental health interventions are built on mindfulness practice techniques. However, much like other modern mental health interventions, they are inaccessible to many Americans. Current mindfulness-based interventions require a significant time commitment: up to 45 minutes of meditation a day in addition to weekly in-person meetings for 8 weeks. Alternatively, this study examined a novel mindfulness-based intervention that is delivered completely online, takes two weeks, and consists of a thirty-second or three-minute mini-meditation at least three times a day. Participants with mental health disorders were randomly assigned to the two-week waitlist, the thirty-second mini-meditation condition or the three-minute mini-meditation condition and completed a series of questionnaires at pre- and post-test as well as daily surveys. A small sample size of study completers prohibited analyses on intervention efficacy. The results do, however, indicate preliminary evidence for the high acceptability of extremely brief mini-meditations. This study elucidated the feasibility of online mindfulness-based interventions employing only mini-meditations.

Introduction

We typically spend much our time thinking about the past or the future or listening to running commentary in our heads instead of paying attention to what is actually happening in the present moment. Mindfulness is a technique developed to counteract this common habit, and cultivating mindfulness has been shown to help treat many mental health disorders (e.g. Chiesa & Serretti, 2011; Hofmann, Sawyer, Witt, & Oh, 2010). Unfortunately, interventions based in teaching mindfulness often can be financially costly and require a significant time commitment: standard mindfulness-based interventions prescribe at least forty-five minutes of daily practice every day for eight weeks, daily informal practice, one 8-hour “day of mindfulness” retreat, and weekly two-hour meetings. Similar costs accompany many other modern mental health interventions and contribute to the failure of over half of Americans with a mental health disorder to receive treatment (Kessler et al., 2005; Wang et al., 2005). The present study examines the possibility of a much easier and more accessible way of teaching mindfulness to treat mental health disorders. Specifically, it examines the acceptability and efficacy of an extremely brief, internet-based, mindfulness mini-meditation.

Mindfulness has been incorporated into many modern, secular, evidence-based mental health treatments such as Mindfulness-Based Stress Reduction (MBSR; Kabat-Zinn, 1990), Mindfulness-Based Cognitive Therapy (MBCT; Segal, Williams, & Teasdale, 2012), Dialectical Behavior Therapy (DBT; Linehan, 1993) and Acceptance and Commitment Therapy (ACT; Hayes et al., 1999). There is growing evidence that these treatments have psychological benefits for clinical populations (Khoury et al., 2013; Grossman et al., 2004; Chiesa, & Serretti, 2011; Powers, Vörding, & Emmelkamp, 2009).

Of these interventions, MBSR and MBCT are the most centered around formal mindfulness practice. Unlike informal mindfulness practice, formal mindfulness practice involves disengaging from regular actions and doing something specific that one would not normally do. Sitting meditation, body-scan meditation and mindful yoga are the methods of formal mindfulness practice taught in these interventions. In sitting meditation, for example, one is directed to focus his or her attention on the physical sensations of the breath. The breath serves as a backdrop on which to observe other thoughts or sensations that come into one's awareness. Noticing and observing these thoughts or sensations without judging them and then returning one's attention to the breath is understood to cultivate mindfulness.

Current evidence relates formal mindfulness practice to positive psychological outcomes. Frequency of formal mindfulness practice has been shown to be related to lower rumination and depressive symptoms (Hawley et al., 2014). Additionally, time spent in formal mindfulness practice has been related to increases in facets of trait mindfulness, lowered perceived stress, and improvements in some psychological symptoms (Carmody & Baer, 2008.) Despite these studies on formal practice frequency and time spent in formal practice, there have been no dose-response studies examining the effects of prescribed practice length on treatment outcomes. Both of the studies mentioned above examined interventions with prescribed formal practice lengths of around 45 minutes, but many mindfulness interventions prescribe shorter formal practices. MBSR and MBCT are often adapted to have shorter prescribed formal home practice (e.g. Bazzano et al., 2015; Bogosian et al., 2015) and other interventions like DBT suggest that patients decide with their therapist on the length of their formal home practice (Linehan, 1993). The prescribed

length of mindfulness practice may be related to both the frequency it is practiced as well as psychological outcomes.

In addition to formal mindfulness practice, MBSR and MBCT teach participants to engage in informal mindfulness practice, which is typically much shorter than formal practice. Also unlike formal practice, informal practice does not require time spent doing any specific action. It involves bringing mindful awareness to the thoughts, sensations, and emotions that arise while doing routine activities (e.g. washing dishes, doing laundry, and walking upstairs). It is one way that participants can generalize the skills learned in formal mindfulness practice to daily life (Kabat-Zinn, 1990).

However, due in part to the inconsistency and inaccuracy of its measurement, informal mindfulness practice has only weak evidence of correlation with improved psychological functioning. In a sample of patients in sustained clinical remission from Major Depressive Disorder, frequency of informal practice during an MBCT program was not significantly related to rumination or depressive symptoms (Hawley et al. 2013). A study of MBSR participants found similar null results (Carmody & Baer, 2008). Another study of MBSR to address sleep concerns in women with breast cancer found that informal practice was positively related to feelings of being rested but did not find any significant relationships between informal practice and any of the other sleep-related or psychological measures included in the study (Shapiro et al. 2003). The study was also limited by a lack of clear operationalization of informal practice. Perhaps the strongest evidence for a positive effect of informal practice comes from a non-clinical sample in which time spent in informal practice predicted lower stress (Shapiro et al., 2008). The mixed findings between studies may in part reflect measurement error. Informal practice can be spontaneous and

does not require a specified length of time or audio-recordings for guidance, so in these studies, participants may inaccurately self-report time spent in informal practice as well as the frequency of informal practice (Carmody & Baer, 2008; Hawley et al., 2013).

In between formal and informal mindfulness practice, sits a form of mindfulness practice called a “mini-meditation” (Kristeller & Hallett, 1999). Like formal practice, mini-meditations involve disengaging from regular actions, and like informal practice, they are short enough to be employed spontaneously in daily life. Kristeller and Hallett (1999), who first coined this term as part of a mindfulness-based intervention for binge eating, define a mini-meditation as a time to “take a few moments to stop and become aware of thoughts and feelings,” but do not specify a definite length for mini-meditations. Their study found that time spent practicing the mini-meditation was related to change in depressive symptoms.

Another mini-meditation, the three-minute breathing space, forms “the spine” of MBCT (Segal, Williams, & Teasdale, 2012). Patients are taught to practice this mini-meditation as a first step when they face a difficulty or become overwhelmed by their thoughts. The mini-meditation is a critical step in translating what participants learn in other aspects of MBCT into healthier coping strategies. A mixed-methods analysis of MBCT found a very high acceptability of these mini-meditations, which participants continued to use even after ending their practice of longer, formal meditations (Finucane and Mercer 2006). No studies, however, have examined the specific contribution of the three-minute breathing space to the outcomes of MBCT, and no studies have examined the impact of an intervention employing only mini-meditations.

Similar to the high acceptability of mini-meditations, online interventions are

exceptionally easy to access. Online mental health interventions are extremely low-cost, easy to disseminate, and could significantly expand access to mental health care (Kazdin & Rabbitt, 2013). Mindfulness-based interventions are a particularly promising option to adapt to low-cost online delivery. A recent review found strong evidence for the efficacy of online mindfulness-based interventions in improving mental health (Spijkerman, Pots, & Bohlmeijer, 2016). As an example, one randomized controlled trial of a two-week online mindfulness-based intervention found improvements in perceived stress, depression/anxiety symptoms, and levels of mindfulness (Cavanagh et al., 2013).

Despite these positive psychological outcomes, self-directed, online interventions have consistently high attrition rates (Eysenbach, 2005). For example, the Cavanagh et al. (2013) study mentioned above had an attrition rate of 47.7%. Lowering the demand of an intervention could improve these typically low retention rates. Fewer modules of CBT included in an online intervention for depression were found to be related to lower attrition rates (Christensen, Griffiths, Mackinnon, & Brittliffe, 2006). “Disenchantment” with intervention content is also frequently a factor predicting attrition from self-guided interventions (Eysenbach, 2005), so the acceptability of an intervention may be related to rates of attrition. Psychological characteristics, such as internal health locus of control, can also predict attrition from self-directed online interventions (Geraghty, Wood, & Hyland, 2010). Because of the high attrition rate from these online interventions, understanding factors related to attrition are of critical importance in developing effective self-directed online interventions (Eysenbach, 2005).

Following the promising evidence of inherently accessible self-help interventions and the potential of online interventions to expand mental health care access, this study

examines a two-week, online, mindfulness-based intervention. In consideration of high attrition rates from self-directed online studies, the intervention employs only low-demand mini-meditations, which have never been studied in isolation. To allow for a length of meditation dose-response comparison of treatment efficacy and acceptability, the study compares a mini-meditation with a previously established length of three minutes (Segal, Williams, & Teasdale, 2012), to a thirty-second mini-meditation. Avoiding the self-report pitfalls of previous studies of informal mindfulness practice, this online intervention automatically tracks the frequency that participants access audio-recordings of the mini-meditations.

The specific hypotheses of the study are that the thirty-second mini-meditation intervention will demonstrate a higher acceptability and higher initial efficacy compared to the three-minute mini-meditation intervention. Acceptability in this study is operationalized as number of days of the study completed, attrition rate, self-reported acceptability, self-reported likelihood of continuing to practice the mini-meditation after the study, and daily frequency of mini-meditation practice. The anticipated higher frequency of mini-meditation practice in the thirty-second group is also hypothesized to mediate the anticipated higher efficacy of this mini-meditation. Efficacy is operationalized as improvements from baseline to posttest in mindfulness, anxiety, perceived stress, depression symptoms, and affect as well as improvements in daily mood and stress levels over time. Finally, exploratory hypotheses of the relationship between pre-test psychological factors and number of days of the study as well as meditation practice frequency completed will be investigated.

Method

Participants

A total of 40 participants were recruited from databases of individuals who had indicated an interest in receiving information about mental health research studies, as well as from advertisements at psychology and psychiatry clinics at Duke University in Durham, North Carolina. Recruitment databases included the participant registry at the Duke Cognitive-Behavioral Research and Treatment Program, as well as ResearchMatch, a national health volunteer registry that was created by several academic institutions and supported by the U.S. National Institutes of Health as part of the Clinical Translational Science Award program. ResearchMatch has a large population of volunteers who have consented to be contacted by researchers about health studies for which they may be eligible. The study was listed on ClinicalTrials.gov. Participants received no material compensation. The study was approved by the Duke Health Institutional Review Board.

Inclusion criteria were (a) currently receiving outpatient mental health care, (b) age 18 or older, (c) regular internet access including ability to listen to audio files (d) if receiving psychotherapy, no change in type of psychotherapy during the past month, (e) if taking medications, no change in prescription during the past month, (f) willingness to sign a release of mental health care information, (g) capacity to provide informed consent, (h) able to speak and read English. These criteria were determined by an online self-report screening survey.

Participant demographic characteristics at baseline are presented in Table

1. There were no significant differences between groups on any demographic variables or on any baseline psychological measures.

Group (<i>n</i>)	Age (<i>SD</i>)	Female	At least 4-year college-education	White	Previous mindfulness experience	Currently practicing mindfulness
30-sec (9)	50.18 (15.61)	77%	77%	88%	44%	33%
3-min (4)	45.57 (10.94)	75%	75%	100%	75%	25%
WL to 30-sec (3)	45.36 (4.28)	66%	33%	100%	0%	0%
WL to 3-min (8)	41.7 (15.68)	100%	75%	100%	50%	13%
Total (24)	45.98 (13.79)	83%	71%	96%	46%	21%

Table 1. Demographics of participants who completed baseline questionnaire

Procedure

Participants completed the entire study online using REDCap electronic data capture tools hosted at Duke University (Harris et al., 2009). REDCap (Research Electronic Data Capture) is a secure, web-based application designed to support data capture for research studies, providing: 1) an intuitive interface for validated data entry; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for importing data from external sources.

After completing the screening survey with all inclusion criteria, participants were automatically directed to an online consent form. A copy of this consent form was sent to participants’ email addresses immediately after they provided their electronic signatures. Before the end of the next business day, participants were sent a demographic data form and the first series of questionnaires. Participants were then randomly assigned to the two-week waitlist, the active control group (3-minute practice), or the experimental group (30-

second practice). Waitlist participants completed this same series of questionnaires again immediately before and after the two-week intervention that they were later randomly assigned to. Participants not assigned to the waitlist completed this same series of questionnaires immediately after completing the intervention then again at a two-week follow-up. See Figure 1 for the study's participant flow.

Waitlist control

For two weeks, participants received daily emails that included mood and stress surveys and a short quote on mindfulness.

Online mindfulness interventions

To orient participants to mindfulness practice, both groups were instructed to watch a ten-minute mindfulness-training video. They were then granted access to an audio recording of either a thirty-second or three-minute guided mini-meditation depending on their random intervention type assignment. The audio guidance of both mini-meditation lengths began with deep breathing, then invited participants to open their awareness to observe any sensations they may be experiencing, and then ended with a deep breath. Instructional content was matched between mini-meditations. See Appendix A for scripts of each practice. Participants were instructed to complete this mini-meditation using the audio guidance at least three times a day for the following two weeks. For these two weeks, participants received daily email reminders that included a mood and stress survey, a short quote on mindfulness, and a link to the mini-meditation audio guidance.

Measures

Pre-test measures:

Mental Illness Diagnoses: Participants provided their current mental health diagnoses.

Diagnoses were then verified by contacting participants' mental health care providers.

Demographic data form: Participants provided information on gender, age, ethnicity, education, previous experience with any mindfulness practices, and frequency and duration of current practice.

Pre/post and follow-up measures:

Five Facet Mindfulness Questionnaire (FFMQ; Baer et al. 2008): a 39-item, self-report instrument that rates items on a 5-point Likert-type scale (1 = never or very rarely true, 5 = very often or always true). Five facets are scored: Observing, Describing, Acting with awareness, Nonjudging, and Nonreactivity. The Observing facet measures the tendency to notice or attend to internal and external experiences, such as sensations, emotions, cognitions, sounds, sights, and smells. Describing measures the tendency to describe and label these experiences with words. The Acting with awareness facet refers to bringing full awareness and undivided attention to current activity or experiences. Nonjudging measures a nonevaluative stance toward inner experiences. Nonreactivity measures the tendency to allow thoughts and feelings to come and go, without getting caught up in them or carried away by them.

Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983): a 10-item, self-report instrument that measures the degree to which one appraises his or her life to be stressful. Subjects rate how often they experienced certain thoughts or feelings on a 5-point Likert-

type scale (0 = Never, 4 = Very Often). Given the timescale of the current intervention, this measure was edited to ask participants about the previous two weeks instead of the previous month.

Generalized Anxiety Disorder Scale (GAD-7; Spitzer, Kroenke, Williams, & Löwe, 2006): a 7-item, self-report instrument that measures the severity of anxiety symptoms. Subjects rate how often they were bothered by certain anxiety-related problems during the last two weeks on a 4-point Likert-type scale (0 = Not at all, 3 = Nearly everyday). Ratings of problems in daily life were not included in this study.

Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988): a 20 item, self-report instrument that measures levels of positive and negative affect. Subjects rate to what extent they have felt certain affective states in the past week on a 5-point Likert-type scale (1 = very slightly or not at all, 5 = extremely)

Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36; Ware & Sherbourne, 1992): a 36-item, self-report instrument that measures health-related quality of life. Subjects rate how healthy they currently are, how healthy they are compared to a year before and compared to other people, the amount that their physical and mental health limits their ability to perform certain activities, the amount their health has limited their ability to perform certain activities in the last two weeks, and how they have felt emotionally during the last two weeks. Given the timescale of the current intervention, this measure was edited from its original to ask participants about the previous two weeks instead of the previous four weeks.

Patient Health Questionnaire - depression module (PHQ-8; Kroenke, & Spitzer, 2002): an 8-item, self-report instrument that measures severity of depression symptomology. Subjects

rate how often they experienced each of 8 DSM-IV diagnostic criteria for depression during the last two weeks on a 4-point Likert-type scale (0 = not at all, 3 = nearly everyday).

Suicidality is not assessed with the PHQ-8.

Daily measures:

Daily mood was measured via a 0-100 visual analogue scale anchored by 0= Very Negative and 100 = Very Positive.

Daily stress was measured via a 0-100 visual analogue scale anchored by 0 = Completely Calm and 100 = Completely Stressful.

Home mindfulness practice: During both the waitlist and the intervention periods, daily surveys asked if participants did any other form of mindfulness practice besides the practice taught in this study, and if so, how frequently they did this practice. During the mindfulness intervention, daily surveys asked how many times participants used the mini-meditation between 5:00pm of the current day and 5:00pm the day before. In addition to this self-report data, the frequency that participants accessed their online audio guidance was automatically recorded.

Subjective efficacy: daily surveys during the intervention period asked if participants found the mini meditation helpful.

Post-intervention measures:

Acceptability: After one week of the intervention, participants are asked to qualitatively reflect on their experience with the mini meditation and are asked on a 0-100 visual analogue scale how much they have liked the mini-meditation. A question on the final day

of the intervention period asks participants how likely they are to continue using the mini-meditation.

Follow-up measures:

Acceptability: the two-week follow-up survey asks if participants have continued to use the mini-meditation.

Data Analysis

Unpaired t-tests were used to compare the three-minute mini-meditation group and the thirty-second mini-meditation group on the mean daily frequency of mini-meditation practice, the number of days of the study completed, self-reported mini-meditation acceptability at 1 week, and self-reported mini-meditation efficacy. Effect sizes (*d*) were also calculated for each test.

A chi square test compared attrition rates of the three-minute mini-meditation group and the thirty-second mini-meditation group. Kaplan-Meier survival analyses were conducted to test differences in days to drop out between the two groups.

Exploratory stepwise linear regressions were run to examine models of intervention-type and all pre-test psychological measures on number of days of the study completed as well as frequency of mini-meditation practice.

To determine the differences in the interventions on affecting stress and mood over time, 2 (intervention-type) × 2 (time) repeated measures analyses of variance (ANOVA) were conducted for first and last two consecutive days of reported stress and mood.

For effect of intervention type on psychological outcome measures, only descriptive statistics were calculated due to the small number of participants who completed the three-minute group.

Results

Participant Retention

As an indicator of acceptability, we predicted that participants in the thirty-second mini-meditation group would remain in the study for more days than those in the three-minute mini-meditation group. Figure 2 shows participant retention over time measured by the last day that participants completed a daily survey. Participants in the thirty-second mini-meditation group remained in the study for numerically more days ($M = 11, SD = 5.32$) than those in the three-minute mini-meditation group ($M = 8.86, SD = 4.22$). This is a small to medium effect size by intervention group ($d = .45$) but not a statistically significant difference ($t(13) = 0.86, p = .41$). Log-rank Kaplan-Meier analysis did not show a statistically significant difference in survival, $X^2 = .39, p = .53$.

A series of exploratory stepwise linear regressions were run to predict the length of time participants remained in the study (as measured by the last day that participants completed a daily survey) by intervention group and pre-test measures. Intervention group was entered in the first step of the model, followed by the pre-test measure of interest. Length of time in the study was not predicted by intervention group and pre-test depression scores ($F(2, 12) = 0.54, p = .6, R^2 = .08$); intervention group and pre-test anxiety scores ($F(2, 12) = 1.71, p = .22, R^2 = .22$), intervention group and pre-test FFMQ acting with

awareness scores ($F(2, 12) = 0.87, p = .45, R^2 = .126$), or intervention group and pre-test perceived stress scores ($F(2, 11) = 0.837, p = .46, R^2 = .13$).

Mean stress reported on the first two consecutive completed daily surveys, accounting for intervention group, was the only stepwise linear regression model that significantly predicted length of time participants remained in the study ($F(2, 8) = 4.61, p < .05, R^2 = .54$). Participants with higher mean daily stress scores in the first two days of the study dropped out of the study earlier than those with lower scores. However, this result should be interpreted with caution because this model only included participants with at least two consecutive daily surveys completed, so those who completed very few daily surveys may be more likely to be excluded from this model.

Of the 21 participants in both active treatment groups who completed pre-test questionnaires, only 8 (38%) completed questionnaires at post-intervention. Of the 11 participants assigned to the thirty-second intervention, 6 (55%) completed the study, which is a higher percentage than the 2 (20%) of the 10 participants assigned to the three-minute intervention. This is a medium effect by intervention condition ($r = .36$) but shows only a trend difference in statistical significance ($X^2(1, N = 21) = 2.65, p = .10$). No order effects on attrition were found between participants who began the intervention immediately after completing baseline measures and participants who didn't begin until after the two-week waitlist ($X^2(1, N = 21) = .94, p = .33$).

All participants who dropped out of the study during an intervention condition ($N = 13$) were sent a survey asking for their reasons for dropping out. Only participants assigned to the three-minute mini-meditation group responded to this survey ($N = 4$), so no comparisons can be made.

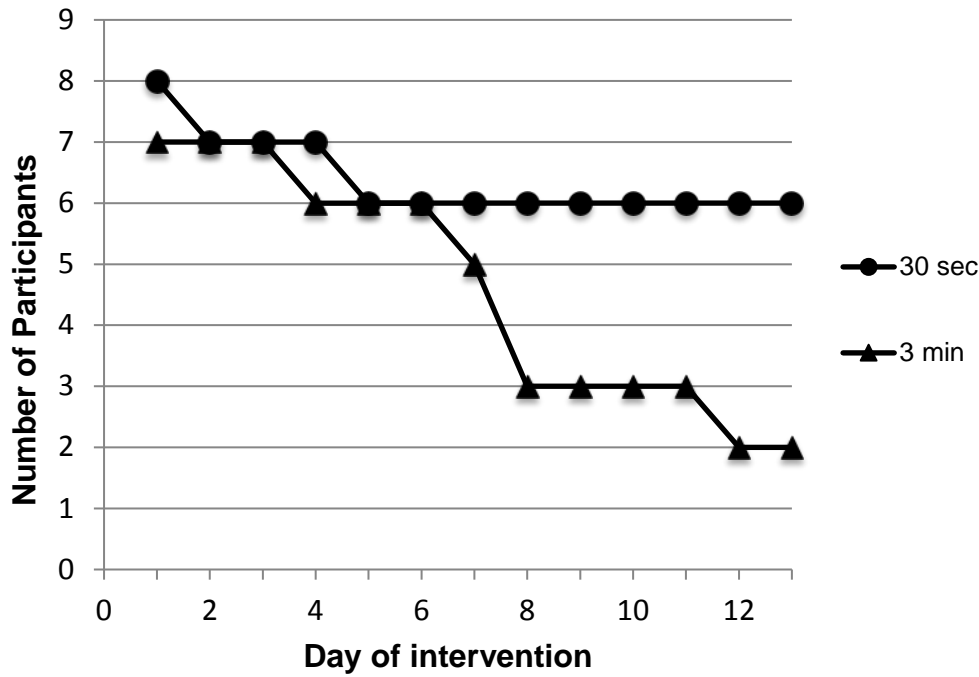


Fig. 2. Participants remaining in intervention over time by meditation type

Mini-Meditation Practice Frequency

As another indicator of acceptability, we predicted that participants in the thirty-second mini-meditation group would practice their mini-meditation more frequently than participants in the three-minute mini-meditation group. No significant overall differences were found between self-reported frequencies of mini-meditations ($M = 2.23, SD = 1.76$) and automatically collected frequency data ($M = 1.9, SD = 1.42, t(15) = 0.62, p = .55$). There was also no group x report-type interaction ($F(1, 15) = .46, p = .51$). Qualitative responses (Appendix B) indicated that some participants may have memorized their mini-meditation scripts, so self-report frequency data, which could capture memorized mini-meditation practice, were used for the present analyses. A graph of mean daily practice frequency by

group is presented in Figure 3. Participants in the thirty-second mini-meditation group practiced their mini-meditation numerically more frequently each day ($M = 3.04, SD = 2.43$) than those in the three-minute mini-meditation group ($M = 1.29, SD = 0.53$). This is a large effect size by intervention group ($d = 1.00$) but shows only a trend difference in statistical significance ($t(13) = 1.86, p = .09$).

A series of exploratory stepwise linear regressions were run to predict mean daily mini-meditation practice frequency by intervention group and pre-test measures. Intervention group was entered in the first step of each model, followed by the pre-test predictor variable. Pre-test Energy level (SF-36, Energy subscale) was the only model that significantly predicted mean daily mini-meditation practice frequency ($F(2, 8) = 4.69, p < .05, R^2 = .44$). Participants with higher pre-test Energy scores practiced their mini-meditations more frequently than those with lower scores. Mean stress reported on the first two consecutive completed daily surveys showed a non-significant trend predicting mean daily mini-meditation practice frequency ($F(2, 8) = 4.02, p = .06, R^2 = .5$). This trend was in the direction of participants with higher stress practicing their mini-meditations more frequently than those with lower stress. Neither the first two days of mood or any other pre-test measure predicted mini-meditation practice frequency, $F(2, 8)$'s = 2.74 – 1.6, p 's = .24 – .11.

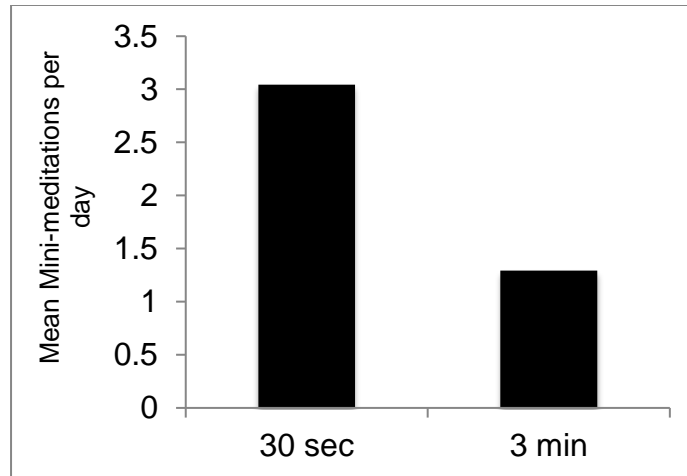


Fig. 3. Mean of frequency of self-reported mini-meditations practiced per day.

Acceptability at 1-week

We predicted that participants in the thirty-second mini-meditation group would report a higher acceptability of their mini-meditation. In response to, “How much have you liked using the mindfulness practice that you've been taught in this study?” Participants in the thirty-second mini-meditation group reported numerically higher acceptability ($M = 66.25$, $SD = 9.5$, $N = 4$) than participants in the three-minute mini-meditation group ($M = 54.25$, $SD = 14.408$, $N = 4$). This is a large effect size by intervention group ($d = 0.98$) but not a statistically significant difference ($t(6) = 1.39$, $p = .21$).

After 1 week of the intervention, participants were also asked to reflect briefly on their experience practicing the mini-meditation. These qualitative responses ($N = 7$) are included in Appendix B.

Likelihood to Continue Practicing Mini-meditation

As a final indicator of acceptability, we predicted that participants in the thirty-second mini-meditation group would report a higher likelihood of continuing to practice

their mini-meditation at the end of the study. On a scale from 0 (not at all likely) to 100 (extremely likely), participants in the thirty-second mini-meditation group reported numerically higher likelihood to continue practicing their mini-meditation ($M = 73, SD = 16.17, N = 5$) than participants in the three-minute mini-meditation group ($M = 56, SD = 2.83, N = 2$). Parametric test were not conducted because of the small sample size of three-minute mini-meditation intervention completers.

Subjective Efficacy

We predicted that participants in the 30-second mini-meditation group would report a higher subjective efficacy of the mini-meditation. In response to the daily question, “Did this mindfulness practice help you be aware of your emotions or help you focus your attention on the present moment?” Participants in the 30-second mini-meditation group responded “yes” 93% of the time, and those in the 3-minute mini-meditation group responded “yes” only 71% of the time. This is a large effect size by intervention group ($d = 0.87$) but not a statistically significant difference ($t(12) = 1.63, p = .13$).

Psychological Outcome Measures

We predicted that participants in the 30-second mini-meditation group would demonstrate greater improvements in psychological outcomes than those in the 3-minute mini-meditation group. Parametric test were not conducted on pre- to post- measures because of the small sample size ($N = 2$) of the three-minute mini-meditation group completers. Because of this small sample size, we also did not test the hypothesis that meditation frequency would mediate changes in psychological outcome measures.

Descriptive statistics for all pre- and post-intervention outcome measures are presented in Table 2. To combat the small sample size, participants who completed the waitlist then an intervention arm have their post-waitlist/pre-intervention scores included in both the post-waitlist mean and the pre-test mean of their intervention condition. It must be stressed that the statistics in Table 2 are only numerical differences, and conclusions cannot be drawn from the present sample.

Daily Stress and Mood

We predicted that participants in the 30-second mini-meditation group would demonstrate greater improvements in daily measures of stress and mood than those in the 3-minute mini-meditation group. Participants' mean of stress level reported on their first two consecutive completed daily surveys was compared with participants' mean of stress level reported on their last two consecutive completed daily surveys. The same comparison was done with daily mood. Using the last two reported days, as opposed to the last two days of the study, allowed for those who did not finish the entire study to be included in analyses. 2 (intervention-type) \times 2 (time) repeated measures analyses of variance (ANOVA) were conducted on the means of the first and last two consecutive days of daily stress and daily mood reported. There was a no significant group by time interaction for stress ($F(1, 8) = 0.19, p = .67$) or mood ($F(1, 7) = 1.52, p = .26$).

Measure	30 second		3 minute		Waitlist	
	Pre-test Mean (SD) <i>n</i> = 8	Post-test Mean (SD) <i>n</i> = 6	Pre-test Mean (SD) <i>n</i> = 7	Post-test Mean (SD) <i>n</i> = 2	Pre-test Mean (SD) <i>n</i> = 11	Post-test Mean (SD) <i>n</i> = 8
Depressive Symptoms (PHQ-8)	19.33 (4.33)	19.33 (6.12)	16.53 (5.83)	17 (9.9)	17.6 (4.95)	16.54 (4.22)
Anxiety (GAD-7)	17 (5.64)	17.6 (4.22)	15 (3.94)	19 (12.73)	25.64 (5.45)	24.13 (7.2)
Positive Affect (PANAS-PA)	25.05 (7.7)	26 (8.1)	23.7 (6.8)	26 (11.31)	24.31 (8.74)	23.38 (6.63)
Negative Affect (PANAS-NA)	28.1 (8.9)	27 (9.7)	23.5 (6.72)	23 (14.14)	16.64 (5.28)	14.13 (4.49)
Perceived Stress (PSS)	23.5 (7.43)	23 (8)	23.68 (8.53)	22.5 (13.44)	22.18 (6.66)	20.14 (6.19)
FFMQ Observing	23.08 (6.29)	23.6 (2.61)	21 (5.72)	21 (4.24)	20.6 (4.84)	21.13 (4.42)
FFMQ Describing	25 (6.13)	26.6 (5.46)	25.9 (6.14)	24 (7.07)	25.82 (3.95)	26.38 (2)
FFMQ Acting with Awareness	21.58 (7.23)	21 (4.74)	20.8 (7.16)	24 (16.97)	21.45 (3.56)	23.75 (8.38)
FFMQ non-judging of inner experience	22.83 (6.9)	26.2 (7.16)	24.8 (7.9)	26.5 (17.68)	20.36 (7.03)	24.88 (7.68)
FFMQ non-reactivity to inner experience	17.83 (4.61)	18.8 (1.92)	16.5 (5.99)	16 (8.49)	16.6 (4.84)	18.63 (4.57)
Physical Functioning (SF-36)	65.45 (31.66)	66.67 (25.03)	88.5 (16.84)	82.5 (10.61)	74.09 (29.31)	81.88 (21.54)
Role Limitations due to Physical Health (SF-36)	54.55 (43.04)	70.83 (40.05)	85 (31.62)	75 (35.36)	63.64 (46.59)	62.5 (51.75)
Role Limitations due to Emotional Problems (SF-36)	33.33 (39.44)	50 (45.95)	26.67 (37.84)	33.33 (47.14)	33.33 (33.33)	45.83 (43.42)
Energy/Fatigue (SF-36)	28.33 (20.38)	39.17 (23.75)	38 (15.85)	32.5 (17.68)	28.33 (16.35)	38.75 (16.2)
Emotional Well-Being (SF-36)	44.17 (18.22)	50.67 (25.13)	54.4 (20.33)	60 (39.6)	51.64 (19.71)	56 (22.12)
General Health (SF-36)	45.42 (18.02)	49.17 (24.98)	60.13 (20.11)	40 (28.28)	47.27 (25.92)	47.66 (20.07)
Social Functioning (SF-36)	46.59 (24.43)	52.08 (36.59)	68.75 (23.75)	75 (35.36)	57.95 (33.67)	57.81 (30.57)
Pain (SF-36)	65.63 (30.12)	69.17 (16.78)	77.75 (20.56)	55 (31.82)	62.27 (33)	78.75 (20.83)

Table 2. Mean differences in outcome measures of post-test completers at pre- and post- test

Note. Participants who completed the waitlist then an intervention arm are included in both the post-waitlist mean and the means of their intervention condition

Discussion

There is growing evidence to support online mindfulness-based interventions as a means of expanding access to effective mental health treatment (Cavanagh et al., 2013; Cavanagh, Strauss, Forder, & Jones, 2014; Spijkerman et al., 2016). However, no studies, in-person or online, have examined the potential of employing only mini-meditations, and no studies have examined the effect of prescribed meditation length on treatment outcomes and acceptability.

The present study evaluated the efficacy and acceptability of a two-week, online, self-guided intervention employing either a 30-second or 3-minute mindfulness mini-meditation. Non-significant but consistent trends in frequency of mini-meditation practice, self-reported acceptability after 1 week of the intervention, number of days in study before drop out, and self-reported likelihood to continue practicing the mini-meditation after the study suggest preliminary support for our hypothesis predicting a higher acceptability of the 30-second mini-meditation compared to the 3-minute mini-meditation. The 30-second mini-meditation intervention also demonstrated a non-significant trend towards a higher subjective efficacy than the 3-minute mini-meditation intervention. Descriptive statistics of improvements in outcome measures were mixed, and parametric tests of outcome measures were not conducted due to a small sample size. There were no significant effects of meditation type or time on daily mood and stress levels. Study attrition was high, but this is a natural and typical feature of online self-guided interventions (Eysenbach, 2005). A study of another two-week, online, self-guided mindfulness-based intervention had a similarly high attrition rate nearing 50% (Cavanagh et al., 2013). Unlike drug-trials or in-person therapy, these types of interventions have no supervision of adherence or cost to

the participant for either enrolling or dropping out (Eysenbach, 2005). Participants who drop out should not be considered as simply non-compliant and glossed over in analyses as is typical (e.g. Berghoff, Wheelless, Ritzert, Wooley, & Forsyth, 2017), but as a critical indicator of the acceptability and efficacy of an online intervention system.

In this study, exploratory stepwise linear regressions were run to examine whether any pre-test psychological measures or demographic characteristics predicted the number of days of the intervention completed before dropping out, above and beyond any effects of the practice duration itself. No significant results were found. However higher stress on the first two days reported during the intervention were shown to predict lower retention rates and showed a trend to predict higher daily mini-meditation practice frequency above and beyond any effects of the practice duration itself. These conflicting effects on indicators of intervention acceptability warrant future investigation on the influence of early-intervention stress on intervention engagement.

Many evidence-based mindfulness-based interventions are designed or adapted for specific mental health diagnoses. For example, MBCT was developed for preventing depressive relapse, DBT for borderline personality disorder, and both of these interventions have been adapted to treat eating disorders (Kristeller, Baer, & Quillian-Wolever, 2006; Linehan, 1993; Segal et al., 2012). To determine for which mental illnesses mini-meditations may be most effective, future analyses should examine the effect of participants' mental health diagnoses on the present intervention's efficacy and acceptability.

Limitations and Future Directions

There are several limitations to the current study that may limit its interpretability.

One key factor is that many participants may not have fully understood how to correctly practice the present interventions' mini-meditations, which may in part explain the lack of clear trends in outcome measures. Mindfulness is a subtle concept, and participants watched only a ten-minute training video to explain the topic. They also had no access to any clinician to answer any questions they may have had about mindfulness practice. MBCT, which employs mini-meditations as "the spine" of the treatment program does not introduce these mini meditations until after participants have two full weeks mindfulness training including two-hour weekly meetings and 45 minutes of daily home practice (Segal et al., 2012). Future analyses of the present intervention should examine the effect of previous meditation experience on outcome measures, and future research should examine the impact of the quantity of provided mindfulness training resources in online mindfulness-based interventions on treatment outcomes.

Instead of automatically collected mini-meditation practice frequency data, the present study analyzed self-report frequency data because of qualitative indications that participants may have practiced the mini-meditations without the audio recording. Demand characteristics and the spontaneity at which mini-meditations can be practiced present a risk of measurement error in these self-reported frequencies.

The small sample size of post-intervention completers is a major limitation of this study. Power analyses conducted before study registration indicated a 95% chance of detecting a between-group effect size of $d=0.45$ (α level=0.05) on anxiety and depression measures with a sample size of 60 individuals reaching post-intervention assessments. The current analyses included only a sample size of 8 individuals reaching post-intervention assessments.

The study sample was largely female, white and college educated, so the results cannot be generalized to a more diverse population. This online, easily accessible intervention was meant to explore an intervention that could expand access to mental health treatment, so examining a group that systematically has greater access to mental health treatment (Alegría et al., 2008; Wang et al., 2005) is an especially important limitation. It is critical that future research examines interventions explicitly developed for and targeted to groups that face the greatest disparities in mental health treatment access.

In order to effectively target these interventions to individuals who will benefit most and improve intervention acceptability and efficacy, future research should continue exploring participant characteristics as well as intervention characteristics that may influence a participant's likelihood of dropping out. In this study, participants were prompted to practice their mini-meditation via daily emails, but future studies could include full app development to include features that are becoming more common in behavioral health apps. This could include motivational features such as feedback on progress, praise/rewards for practice frequency, or informal peer support via social media. Instead of one general mini-meditation, variability in topics could be added for specific situations and objects of attention. Future studies should also examine longer-term outcomes and frequency of maintained practice over months or years.

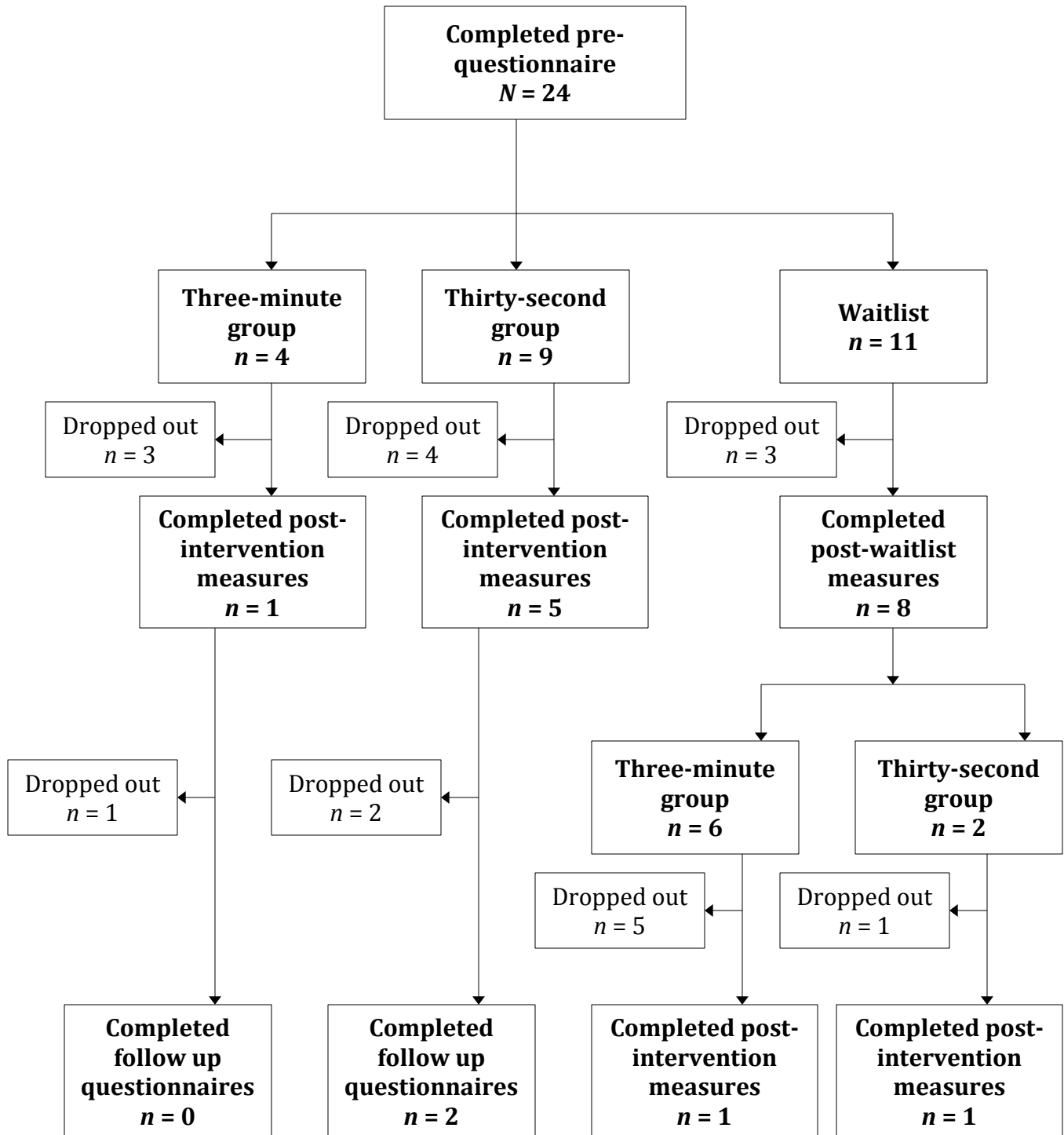


Fig. 1. Diagram outlining participant flow through study

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Appendix A

30-second mini meditation script

Taking a deep breath down into your belly and out

And another, feeling your belly rise and fall

At the completion of this breath, allowing your breathing to be just as it is

Turning your attention to your feelings or any sensations you may be experiencing in the present

Not trying to change these feelings or sensations, just noticing them

And taking a deep breath down into your belly and out

3-minute mini-meditation script

Taking a deep breath down into your belly and out

And another, feeling your belly rise and fall

At the completion of this breath, allowing your breathing to be just as it is

Without trying to change it, just letting your breath be

Now turning your attention to your feelings or any sensations you may be experiencing in the present

Not trying to change these feelings or sensations, just noticing them

Being like a witness, seeing but not interrupting

Without altering what you observe

Noticing how you are feeling right here and right now

And taking a deep breath down into your belly and out

And another feeling your belly rise and fall

At the completion of this breath, allowing your breathing to be just as it is

Appendix B

Group	Response
30-second	It's been helpful. Surprisingly, practicing what I was taught, lead me back into the practice of mindfulness meditation that I have missed terribly. Peace and serenity will return with daily meditation, since this study reignited my fire to meditate. Grateful for this study!
30-second	Some days are so busy I forget and I'm sorry! I have taken this practice most to heart with my eating (believe it or not) and by concentrating on what I'm eating instead of being distracted I tend to be more satisfied and eat less. Nice!
30-second	While the recording is repetitive, I do find myself focusing. I wish that the mindfulness exercises were a bit longer and that it is more variation in the exercises. I think repeating each activity 3 times is sufficient.
3-minute	I'm not sure what I'm supposed to be trying to 'feel'. All I can do is focus on physical attributes not anything emotional
3-minute	It has been really hard to find time with 2 little kids in the house. I have enjoyed it when I have been able to do it though
3-minute	It's helpful in the moment, but I haven't been able to employ it when I feel I need it most
3-minute	This mindfulness practice is simple but effective, it helps me fall asleep at night in no time and during the day, I can identify emotions that I didn't know I was feeling. I also see pictures like I do in most of my meditations, but I have occasionally heard thoughts which is new for me. I still need the audio I haven't yet memorized the meditation.

Qualitative responses to, "Please reflect briefly on your experience using this mindfulness practice." Asked after one week of the intervention.