Pilot Evaluation of the Stop, Breathe & Think Mindfulness App for Student Clients on a

College Counseling Center Waitlist

Abstract

Objectives: College counseling centers face significant challenges meeting the mental health needs of their students and waitlists are common. Mobile apps offer a promising solution to increase access to resources while students wait for services. **Methods:** This pilot randomized controlled trial evaluated the feasibility and acceptability of a publicly available mindfulness app. Students on a counseling center waitlist (n=23) were randomized to use the app or not, with assessments completed over four weeks. **Results:** Recruitment over three semesters was slow, leading to an underpowered trial. Participants reported high satisfaction and moderate app usage. Very preliminary support was found for potential app efficacy relative to the control condition, particularly for depression, anxiety, and overall distress. Weaker, mixed effects were found for mindfulness and values processes. **Conclusions:** Overall, these results provide mixed findings suggesting the potential benefits, but also challenges in using a mindfulness app for students waiting to receive counseling services.

Keywords: Mindfulness, mHealth, eHealth, Online, College Students.

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College counseling centers experience significant challenges with meeting the mental health needs of their college students. Mental health problems are highly prevalent among college students.[1,2] For example, the 2018 National College Health Assessment found at some point in a given year the majority of college students feel overwhelmed (86%), very sad (69%), very lonely (65%), overwhelming anxiety (63%), and hopeless (55%), with 13% seriously considering suicide.[1] Research indicates that the prevalence and severity of mental health problems among college students is rising as well as the rate of treatment seeking.[3-5] Yet, college counseling center staffing has not grown to match this increase in demands, with approximately 1 counselor for every 2,081 students.[3]

A number of methods are being employed to address the discrepancy between the demand for treatment and supply of service resources, but some form of waiting to start treatment is still common.[3,6] In one national survey, 34% of centers reported having a formal waitlist, but across all clients the average wait time before first appointment was 6.7 business days, indicating some notable waiting time occurs for most clients.[6] These waiting times represent a gap in services that could be addressed with innovative, efficient solutions.

Mobile apps provide a promising solution to increase mental health resources for clients waiting to begin counseling, without placing significant additional resource costs on centers. There is a growing body of evidence supporting the efficacy of mobile apps to improve mental health in general[7] as well as among college students specifically.[8,9] A mobile app can teach evidence-based strategies in a self-guided format to improve mental health concerns for

waitlisted students, potentially preventing a worsening of concerns, reducing current suffering, and preparing them for therapy.

Most college counseling centers report using mobile technology in some manner (e.g., health information, intervention[10]), but to the best of our knowledge only one study has evaluated mobile apps for students waiting for counseling center services. This small open trial of a prototype mobile app teaching skills from acceptance and commitment therapy (ACT) in waitlisted students found significant decreases in depression, anxiety, and stress over two weeks, in addition to high acceptability.[11] Although this pilot found positive results, it used a prototype app that is not readily available to counseling centers. Studies are needed to evaluate publicly available apps that counseling centers can, or may already be recommending to clients waiting for services.

Mindfulness apps may be particularly well-suited for waitlisted students. Mindfulness interventions involves learning how to flexibly attend to experiences in the present moment in a way that is nonjudgmental and nonreactive. Mindfulness-based therapies when delivered in-person have been found effective for a wide range of mental health concerns including depression, anxiety disorders, eating disorders, and substance abuse,[12-14] which is advantageous given the range of presenting problems students seeking help may have.[6] Mindfulness has also been found effective meta-analyses relative to other active treatments including treatment as usual ($g = .44$), psychoeducation ($g = .61$), and supportive therapy ($g = .37$), and equivalent to cognitive behavioral therapies ($g = -.07$).[12] In addition to efficacy, a review of mediational analyses found empirical support for theorized mechanisms of change for mindfulness including increased mindfulness skills, decreased repetitive negative thinking (e.g., rumination, worry), decreased cognitive/emotional reactivity, and increased self-compassion.[15]

Research indicates that mindfulness is similarly effective when delivered in self-guided formats without concurrent in-person treatment.[16] A recent, growing body of research has further found support for the efficacy of mindfulness mobile apps specifically, [17] including with college students.[18-21] For example, 208 college students were randomized to one of two publicly available mindfulness apps (*Headspace* or *Smiling Mind*) or a control group (*Evernote*), with results indicating significant improvements in depression over 10 days for the mindfulness apps relative to control condition.[18] Support was also found for underlying processes of change with Headspace increasing self-reported mindfulness relative to control and mindfulness app usage predicting maintenance of mental health improvements over time.[18] Similarly, a study randomized 88 college students reporting high stress to the *Calm* mindfulness app (publicly available) or a waitlist, with results indicating significant improvements in stress, mindfulness, and self-compassion over 8-weeks for the mindfulness app relative to waitlist.[19]

Another publicly available mindfulness app that has received minimal direct research to-date is *Stop, Breathe & Think* (https://www.stopbreathethink.com/). In addition to providing a library of mindfulness exercises, the *Stop, Breathe & Think* app assesses users' emotional state at the start of a session, to guide suggestions for mindfulness exercises, and after completing an exercise. *Stop, Breathe & Think* has not been tested in a randomized controlled trial, but a naturalistic study examined changes in emotional states among 120,000 app users.[22] Results indicated significant improvements in emotional states over time, with longer app usage predicting greater improvements.

Although there are initial studies supporting the efficacy of mindfulness apps as a self-guided resource for college students,[18-21] there appears to be no research into whether mindfulness apps may benefit those waiting for treatment. In addition to their potential efficacy,

mindfulness apps are among the most common mental health apps,[23] available at low or no cost[24] and initial evidence suggests therapists using mindfulness apps find them useful when working with their clients.[25] Thus, mindfulness apps may be ideal for use in counseling center waitlists, but this has yet to be empirically tested. If mindfulness apps are acceptable to students waiting for treatment and using such apps results in improved mental health, it would indicate that mindfulness apps could be used to help meet crucial mental health needs on campus without placing a significant additional burden onto college counseling centers.

The current pilot randomized controlled trial sought to evaluate the feasibility and acceptability of a popular mindfulness meditation app (*Stop, Breathe & Think*) for students on a college counseling center waitlist. The mindfulness app was compared to a condition in which students received no additional resources, with assessment completed 2- and 4-weeks after baseline. This study predicted that the mindfulness app would be acceptable to waitlisted students as indicated by high self-reported satisfaction and app usage. The study also predicted the mindfulness app would result in greater improvements in mental health and mindfulness relative to those who did not receive the app.

Method

Participants

The final sample consisted of 23 university students on the waitlist for the Counseling and Psychological Services center (CAPS) at a university in the Mountain West region of the United States. Study inclusion criteria were 1) 18 years of age or older, 2) owning a smartphone (Android or iPhone), 3) current student at the university, and 4) currently seeking treatment at CAPS with an expected wait time of at least two weeks for services. Recruitment occurred over three semesters from January 2018 to March 2019. Participants were primarily recruited through

flyers provided at CAPS by counseling center staff. Initially, 44 individuals were screened for

eligibility, but 21 were identified as ineligible, with the remaining 23 participants completing the

baseline assessment and being randomized to either the SBT ($n = 10$) or control conditions ($n =$

13; see Figure 1).

Procedures

This study was approved by the authors' Institutional Review Board and all participants

provided informed consent prior to participating. Participants completed online assessments at

three time points: a baseline survey, a mid-intervention survey (2 weeks after baseline), and a

post-intervention survey (4 weeks after baseline). The mid-intervention assessment corresponded

to the expected 2-week waiting period before seeing a counselor, with the post-intervention

assessment corresponding to an expected 2-weeks of receiving therapy from a counselor.

After participants completed the first baseline survey, they were randomized to either use

the *Stop, Breathe, and Think* mindfulness app right away for four weeks (SBT condition) or to

wait for four weeks without receiving additional resources (Control condition). Randomization

was conducted automatically through Qualtrics immediately after completing baseline, with a 1:1

allocation ratio in blocks of 10 (to ensure equal sample sizes over time). Those assigned to the

SBT condition, were asked to download the app onto their smartphone to use daily over four

weeks. Participants in the Control condition received instructions on how to download the SBT

app after completing the final post-intervention survey.

Intervention

Stop, Breathe, and Think is a free app with the option of purchasing a premium version

for access to additional guided meditation content. Participants were instructed to just use the

free version of the app. When the app is opened, there is an option to complete a brief check-in

assessment, which asks the user to rate how they are doing physically and mentally, with a "great", "good", "meh", "poor", or "rough" rating scale. The assessment then asks about how the user is doing emotionally, offering an extensive list of emotions to choose from. The result of the assessment is a short list of tailored meditation options based on the results. Alternatively, there is also an option for the user to skip the check-in assessment and go straight to the full list of guided meditations contained in the app.

The full list of meditations includes collections of meditations based on a theme (e.g. "Get Started," "Sleep Well," "Tame Your Anxiety," "Find Your Calm," "Connect With Your Body") as well as the option to browse all exercises. Guided meditations include breathing meditations, body scan mediations, mindful walking exercises, loving-kindness focused meditations, mindfulness of sounds, mindfulness of sensations, gratitude mindfulness and mindfulness of other positive experiences, and grounding mindfulness exercises. These meditations covered a wide range of mindfulness procedures engaging a similarly broad range of mindfulness-related processes (e.g., observing, describing, cognitive decentering, being nonjudgmental, acceptance, emotion regulation). The guided exercises generally range from one to ten minutes, with most being in the three to seven minutes range. After a meditation exercise is completed, the user is prompted to choose one of three options: to complete another brief assessment check-in, to view their meditation progress, or to complete another exercise; they can also select "finish" instead of choosing one of the three options. The mobile app also included self-guided instructions to learn more about mindfulness and how to develop a mindfulness practice.

The app also monitors the user's progress via current and "all-time" daily streaks, meaning the number of days in a row the user has checked-in or completed a meditation

exercise. It also tracks the user's mental and physical check-ins before and after meditations, the user's "top emotions" before and after meditations, the user's top meditation exercise choice, and the user's total time spent meditating with the app. Additionally, engagement with the app in the form of check-in assessments and completing meditations results in receiving "stickers" to reinforce app engagement.

Measures

Counseling Center Assessment of Psychological Symptoms-34 item version (CCAPS-34[26]). The CCAPS is the gold-standard measure for mental health symptoms among college counseling centers and was used as the primary outcome for this study. The 34-item version of the CCAPS includes an overall distress score as well as subscales for depression, general anxiety, social anxiety, academic distress, eating concerns, hostility, and alcohol use. Thirty-four items are rated on a 5-point scale, with higher numbers indicating higher levels of distress or concern. The CCAPS has been found to have good reliability and validity in previous studies with both non-clinical and distressed college students.[26]

Mental Health Continuum – Short Form (MHC-SF[27]). The MHC-SF was included as a secondary outcome measure of positive mental health. The MHC-SF assesses emotional well-being, psychological well-being, and social well-being.[27] The MHC-SF uses a 6-point scale, with higher scores indicating more positive mental health. The MHC-SF has been shown to have good validity and reliability with a variety of samples (*e.g.*[27,28]).

Five Facet Mindfulness Questionnaire (FFMQ[29]). The FFMQ was used as the primary process of change measure. The FFMQ is a 39-item measure of mindfulness that assesses five key facets of the construct: Observing, Describing, Acting with awareness, Nonjudging of inner experiences, and Nonreactivity to inner experiences. Each item is rated on a 5-point scale. The

FFMQ has demonstrated good validity and reliability with college student samples, although with mixed results for the observing subscale.[29]

Valuing Questionnaire (VQ[30]). The VQ was included as a secondary process measure. The VQ measures valued action, a construct from the broader acceptance and mindfulness-based therapy literature that refers to behaving consistently with what is deeply meaningful and important to oneself. The 10-item VQ includes two subscales assessing values progress (i.e., actions consistent with personal values) and values obstruction (i.e., difficulty engaging in valued action). Each item is rated on a 7-point scale. The VQ has been found to have good reliability and validity including among college students.[30]

System Usability Scale (SUS[31]). The SUS measures program usability and acceptability with 10 items rated on a 5-point scale. An analysis of studies using the SUS found that it demonstrated strong reliability and validity.[32] Additional items were adapted from prior studies to assess aspects of program satisfaction such as helpfulness, ease of use, perceived fit, and similar dimensions.[11] These items were rated on a 6-point scale with 4 (*slightly agree*) or higher indicating a positive response.

Program Usage. Participants self-reported how many days they used the app in the past two weeks. Participants also reported their program usage data from the *Stop, Breathe, and Think* app, including their total time spent meditating and their "daily streaks," which is automatically tracked in the app and viewable through a user dashboard.

Results

Participant Flow and Missing Data

A participant flow chart is provided in Figure 1. Over the three semesters planned for recruitment (Spring 2018, Fall 2018, Spring 2019) only 23 participants were enrolled into the

study, with the majority enrolling in the Fall 2018 semester ($n = 17$). Of note, 21 participants

were screened ineligible, with 17 due to not being a college student or on the waitlist at CAPS

(and thus likely having come from non-CAPS sources to the lab website signup page). This

suggests a low response rate among college students at CAPS, which raises feasibility and

acceptability concerns.

With regards to missing data, 83% of participants ($n = 19$) completed the mid-intervention

assessment and 70% completed the post-intervention assessment ($n = 16$). Missing data rates

were equivalent between conditions ($p > .10$). Due to the sample size, rate of missing data, and

focus on descriptive analyses, a listwise deletion approach was used for each analysis (i.e., each

analysis only included participants with necessary available data).

Participant Characteristics and Preliminary Analyses

Consistent with the expected timing of assessments, only 11% of participants reported any

in-person treatment sessions over the past 2-weeks at mid-intervention assessment (in both cases

only receiving one session thus far). However, at post-intervention assessment when participants

were expected to have started in-person therapy, only 19% reported any in-person treatment

sessions over the past 2-weeks (in each case receiving two therapy sessions). Thus, both the mid-

and post-intervention time points largely represent participants who had not yet received

counseling services.

Participants ranged in age from 18 to 25 ($M = 20.43$ years, $SD = 2.46$ years). The sample was

100% female and 87% non-Hispanic, White (with 9% Hispanic, White and 4% American Indian

and White). Based on the Counseling Center Assessment of Psychological Symptoms (CCAPS-

34[19]), 96% of the sample met the lower cutoff on the CCAPS distress index, indicating some

degree of distress, and 52% met the elevated cutoff. In terms of specific CCAPS problem areas,

70% were elevated on depression, 57% on general anxiety, 57% social anxiety, 52% academic

distress, 44% eating concerns, 17% hostility, and 9% alcohol use. Participants indicated an

interest in self-help mobile apps at baseline using a 7-point scale with 5 (slightly agree) or higher

indicating interest: "I would personally benefit from using a self-help mobile app like the one

being tested in this study" ($M = 5.17$, $SD = 1.15$, 65% $\geq$ 4 "slightly agree") and "I am interested

in using a self-help mobile app" ($M = 5.43$, $SD = 1.16$, 78% $\geq$ 4). Demographics are listed by

condition in Table 1. There were no differences at baseline between conditions on outcomes,

processes of change, or demographics ($p > .05$).

Descriptive statistics and distributions were checked for each dependent variable. Of note,

74% scored 0 on the CCAPS alcohol subscale and 0% were elevated on the alcohol subscale in

the SBT condition. This is consistent with the specific University student population, which

predominantly belongs to a religion that prohibits alcohol use. The alcohol subscale was thus

excluded from analyses.

Program Satisfaction

Descriptive statistics were examined among the 6 participants in the SBT condition who

completed the post-intervention self-report assessment. On average, participants provided a

usability score of 77.00 on the SUS ($SD = 16.71$). A score of 77 is in the "good" range,[25] and

slightly lower, but within 1 SD, of SUS scores found for similar acceptance and mindfulness-

based apps evaluated with college students (e.g.,[11,33]).

Individual satisfaction items were rated on a 6-point scale, with 4 (*slightly agree*) or higher

indicating a positive response (see Table 2). Participants gave moderately positive ratings for the

app on various dimensions of satisfaction including perceived helpfulness, ease of use, and fit.

Participants agreed in general that the app would be helpful for those on the waitlist, that they did

not need more training to use the app, and that the app increased motivation to see a therapist.

That said, all participants would have preferred to see a therapist right away instead, and

disagreed that the app was helpful enough that they did not need to see a therapist. Participants

generally disagreed that the app would be a good replacement for seeing a therapist, and agreed

the app would be more helpful if used while actively seeing a therapist.

Program Usage

Program usage data was derived from self-report with instructions to review the app

dashboard that collected app usage data automatically. Among the 8 SBT participants reporting

app usage at mid-intervention assessment, they self-reported using the app on 7.44 days on

average (SD = 3.87), with 63% using the app 7 or more days and 100% using the app at least

once. Total time meditating over the first two weeks was 40.66 minutes on average (SD = 31.29).

Among the 5 participants reporting app usage at post, usage dropped to 5.80 days on average

over the past two weeks (SD = 5.32), with 40% using the app 7 or more days and 20% not using

the app at all. Total meditation over the entire 4 weeks was 89.20 minutes on average (SD =

58.17).

A subsample of 4 SBT participants self-reported reasons for not using the app at post-

intervention. The most frequent reasons were forgetting to use the app (n = 3), not having time (n

= 3), not feeling comfortable using the app around others (n = 2), and not seeming helpful (n =

1).

Mental Health Outcomes

Due to the small sample size obtained in this pilot study, a descriptive approach was

taken to examining effect sizes along with reporting 90% confidence intervals consistent with

recommendations for reporting pilot results.[34] Hedge's g effect sizes and 90% confidence

intervals were calculated between conditions from pre- to mid-intervention and pre- to post-intervention (see Table 3). Effect sizes were calculated using a listwise deletion approach for missing data: pre- to mid-intervention (SBT $n = 8$, Control $n = 11$) and pre- to post-intervention effects (SBT $n = 6$, Control $n = 10$).

Large effect sizes for SBT were found from pre- to mid-intervention between the SBT and control conditions on overall distress, depression, general anxiety, and hostility, with 90% confidence intervals not including zero and generally ranging from small to large favoring SBT. Small effect sizes from pre- to mid-intervention were found favoring SBT for academic concern and eating concerns, but with 90% confidence intervals ranging from small negative effects favoring the control condition to large effects favoring the SBT app. The effect size for social anxiety was approaching zero ($g = .11$) and a small negative effect size favoring the control condition was found for positive mental health.

Large effect sizes were found for SBT from pre- to post-intervention for overall distress and depression, with 90% confidence intervals ranging from near (but above) zero to large effects favoring SBT. Small to medium effect sizes from pre- to post-intervention favoring SBT were found for general anxiety, social anxiety, hostility, academic concerns, eating concerns, and positive mental health, but with 90% confidence intervals ranging from small negative effects favoring the control condition to large effects favoring SBT.

Process of Change Analyses

Hedge's g effect sizes and 90% confidence intervals were also calculated for process of change measures between conditions from pre- to mid-intervention and pre- to post-intervention (see Table 3). A large effect size was found from pre- to mid-intervention for acting with awareness, with the 90% confidence interval ranging from a small to large effect size favoring

SBT. Small to medium effect sizes were found from pre- to mid-intervention for describing, nonjudging, and values obstruction, but with confidence intervals ranging from small negative effects favoring the control to large effects favoring SBT. Negative small to medium effect sizes were surprisingly found for observing, nonreacting, and values progress from pre- to mid-intervention favoring the control condition, with confidence intervals generally ranging from a large negative effect favoring the control condition, to a near zero effect favoring SBT.

A large effect size was found from pre- to post-intervention for values progress, with the confidence interval ranging from a near zero negative effect, to a large effect favoring SBT. Small to medium effects were found from pre- to post-intervention for observing, describing, acting with awareness, nonjudgmental, and values obstruction, with confidence intervals generally ranging from a small negative effect favoring control to a large effect favoring SBT. A negative effect favoring control was found from pre- to post-intervention for nonreacting, with the confidence interval ranging between a large negative effect favoring control to a medium effect favoring SBT.

Discussion

This study sought to conduct the first pilot randomized controlled trial evaluating the feasibility and acceptability of a widely available mindfulness app (*Stop, Breathe and Think*) for college students waiting to receive services at a college counseling center. Consistent with predictions, participants provided high satisfaction ratings with the app and reported regularly use of the app, particularly in the first two weeks. However, the rate of recruitment was slow over three semesters, suggesting a low response rate that indicates acceptability and feasibility concerns. Due to the small recruited sample, a descriptive approach to reporting effect sizes with more liberal confidence intervals was used. These results provided very preliminary support for

the potential efficacy of the SBT app, particularly for depression, anxiety, and general distress.

Effect sizes were weaker and more mixed on mindfulness and values processes of change,

although they still generally favored the SBT condition, especially at post-intervention. Overall,

these results provide mixed findings suggesting the potential benefits, but also challenges in

using a mindfulness app for students waiting to receive counseling services.

College counseling centers face significant challenges in meeting the prevalent, growing

mental health needs of their students with the limited resources available. Mobile apps and

related technologies are promising in helping address current service gaps and increase mental

health resources without overburdening already taxed centers, but apps also introduce their own

set of challenges.[35] This study highlighted some of the barriers that need to be addressed in order

to meet the potential promise of mobile apps.

The students who did enroll in the study were satisfied with and reported using the app.

However, the response rate was low and students who did enroll were notably more enthusiastic

about using a mobile app than previous college student surveys would indicate (e.g.,[36]). This

suggests offering a mobile app for waitlisted students may only be of interest to a select

subsample. This is consistent with past surveys of students regarding interests in mobile apps

versus in-person resources[36] as well as a previous trial that also found a low response rate when

testing a mobile app for waitlisted students.[11] Of note, participants reported a preference to have

instead used the app during therapy, rather than while on the waitlist, which has also been found

in other surveys of both students[36] and therapists.[25] It is thus unclear if the target should be

increasing interest in using apps while on the waitlist *or* identifying the subgroup interested in

using an app on the waitlist, recognizing this is a more limited solution and other students might

not use apps until starting counseling. There are other barriers that might have also reduced

response rate including the research components that might have made enrollment less enticing or more burdensome as well as some counselors and staff potentially not providing recruitment information to all relevant students. Previous research testing online interventions with college students actively meeting with a therapist found low response rates that were likely due at least in part to counselors not inviting relevant clients.[37] Thus, the barriers to implementing these technologies are likely complex, multifaceted, and needing additional research and innovative solutions.

This study was innovative in evaluating a publicly available mobile app that is regularly used by and recommended to college students. Much of the existing research has focused on evaluating prototype apps developed for a research study and not publicly available, leading to a gap between apps known to be efficacious in research and apps that are popularly among students and counselors.[7] With the ever growing number of apps developed, not every one can be evaluated. However, it is critical that at least some of the most widely used and recommended mobile apps be tested to confirm their efficacy and inform evidence-based recommendations to clients.

The current study found very preliminary support suggesting the *Stop, Breathe and Think* mindfulness app might improve mental health among students waiting for counseling services. Large positive effects were found over time for the SBT condition relative to the control condition on distress, depression, anxiety, and hostility, with confidence intervals suggesting effect sizes likely fall within a small to large range favoring SBT. Weaker, but still positive effects, were generally found for other mental health outcomes. That said, results are based on a descriptive approach and liberal confidence intervals due to the low sample size enrolled in the pilot study. Thus, these findings should be interpreted with caution as an initial "signal" that

requires replication with a larger sample and appropriate methodological controls. If results replicated, they could guide evidence-based recommendations for using *Stop, Breathe and Think* (a publicly available and widely used app) with clients on counseling center waitlists.

Findings from this pilot trial also identified feasibility challenges that would need to be addressed in a future confirmatory efficacy trial. Most notably, future research will need to overcome recruitment challenges, which were likely due to a combination of factors including acceptability to student clients and engagement from counselors and staff recruiting participants.

A related issue was that most participants reported not yet starting in-person therapy four weeks after enrolling in the study. It is unclear whether this is due to participant choice (e.g., improving sufficiently on their own such that they no longer sought treatment), access to treatment (e.g., longer than expected waitlists at the counseling center), missing data (e.g., participants who started therapy did not complete later assessments), or a combination of these factors. In any case, this further highlights the potential need for self-guided resources that students can access while waiting to begin counseling, while also identifying feasibility issues for studying the effects of such apps for waitlisted clients. Future studies would benefit from integrating research more actively within counseling centers to clarify how these resources interact with and affect counseling services (e.g., effects of app assignment on subsequent participation in treatment, clarifying when participants begin in-person counseling or why in-person counseling is never initiated).

As a pilot evaluation of a publicly available app this study had notable limitations. There was limited power due to a low response rate over three semesters of recruitment. Consistent with recommendations for pilot research,[34] a descriptive approach to reporting effect sizes with a more liberal 90% confidence interval was used, which should be interpreted with notable caution

given the potential for Type I error. In addition, the sample was homogenous in terms of gender,

race/ethnicity, and university, which limits generalizability of results. The study was also limited

in that app usage was measured by self-report rather than objective data tracking, which has been

found to be less accurate.[38] This was a necessary limitation due to the use of a publicly available

app, but resulting usage findings should be interpreted with caution given the potential biasing

from self-report. Feasibility and acceptability data were also limited due to the focus on

quantitative assessment methods. Qualitative and formative evaluation steps would have helped

to further clarify the barriers and facilitators to using a mindfulness mobile app with counseling

center clients (e.g., focused interviews with clients or counselors).

Overall, this study provides the first pilot randomized controlled evaluation of the *Stop,*

Breathe and Think mobile app and of any mobile app for college students waiting for counseling

services. Given the challenges faced by counseling centers and the opportunities mobile apps

afford, it is critical that research continue to research the efficacy of apps and how to effectively

implement them to meet the mental health needs of college students.

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Table 1. Participant baseline demographics by condition.

	SBT App Condition $M(SD)$ or %	Control Condition $M(SD)$ or %
Age	19.90 (2.18)	20.85 (2.67)
% Female	100%	100%
Ethnicity		
Hispanic/Latinx	10%	8%
Not Hispanic/Latinx	90%	92%
Race		
White	100%	100%
Asian	0%	0%
Black/African American	0%	0%
American Indian/Alaska Native	10%	0%
Native Hawaiian/Pacific Islander	0%	0%
Other	0%	0%
Elevated on CCAPS [a]		
Overall distress	70%	38%
Depression	90%	54%
General anxiety	50%	62%
Social anxiety	50%	62%
Academic concerns	70%	38%
Eating concerns	50%	38%
Hostility	30%	8%
Alcohol use	0%	15%
"I would personally benefit from using a self-help mobile app like the one being tested in this study" [b]	5.40 (1.08)	5.00 (1.23)
"I am interested in using a self-help mobile app" [b]	5.50 (1.35)	5.38 (1.04)

[a] Based on validated cutoff scores for each CCAPS subscale.[26]
[b] Rated on a 7-point scale with 5 (slightly agree) or higher indicating interest in using an app.

Table 2. Post-intervention self-report items assessing satisfaction and therapy usage factors in the SBT condition.

Item	M (SD)	≥ 4 "slightly agree"
General Satisfaction Items		
Overall, I was satisfied with the quality of SBT	4.20 (1.64)	60%
SBT was helpful to me.	4.20 (2.05)	60%
SBT was easy to use.	5.00 (1.23)	80%
SBT was enjoyable to use.	4.80 (1.10)	80%
I felt SBT was made for someone like me	3.80 (1.92)	60%
I would like to use SBT again in the future	4.60 (1.67)	60%
I would recommend SBT to a student struggling with a mental health problem	4.60 (1.67)	80%
Use in Therapy Items		
I think SBT would be helpful for students waiting to receive therapy	4.20 (2.05)	60%
My counseling center should recommend SBT to students on the waiting list	4.40 (1.82)	60%
SBT helped me to get more out of therapy	3.50 (1.29)	60%
SBT increased my motivation to see a therapist	4.00 (.71)	80%
I would have preferred to see a therapist right away rather than use SBT first*	5.20 (1.10)	100%
SBT was helpful enough I didn't need to see a therapist anymore after using it	1.80 (1.10)	0%
SBT could be a good replacement for seeing a therapist for some students	2.60 (1.34)	40%
SBT would be more helpful if it was used while students actively see a therapist*	5.00 (.71)	100%
I needed more training on how to use SBT before I started using it*	2.20 (1.64)	40%

Note: Items were rated on a 6-point scale with 4 (*slightly agree*) or higher indicating a positive response with the exception of reverse scored items indicated with an *.

Table 3. Descriptive statistics for each outcome and process measure by condition and time point.

Variable	SBT App Condition			Control Condition			Hedge's *g* (90% CI)	
	Pre *M* (*SD*)	Mid *M* (*SD*)	Post *M* (*SD*)	Pre *M* (*SD*)	Mid *M* (*SD*)	Post *M* (*SD*)	Pre–Mid SBT vs Control	Pre-Post SBT vs Control
Outcome Measures								
CCAPS-Distress	2.25 (.32)	1.68 (.65)	1.46 (.67)	2.04 (.51)	2.00 (.74)	1.88 (.70)	.87* (.09, 1.70)	.92* (.06, 1.86)
CCAPS-Depression	2.48 (.59)	1.90 (1.05)	1.58 (.79)	2.04 (.89)	1.98 (1.20)	2.02 (.97)	.80* (.02, 1.62)	1.06* (.18, 2.02)
CCAPS-General Anx	2.27 (.65)	1.56 (.92)	1.36 (1.19)	2.19 (.81)	2.35 (.70)	2.00 (.87)	1.07* (.28, 1.93)	.56 (-.29, 1.45)
CCAPS-Social Anx	2.38 (.93)	2.25 (.81)	1.70 (.88)	2.69 (.86)	2.53 (1.18)	2.70 (1.02)	.11 (-.64, .89)	.72 (-.13, 1.63)
CCAPS-Academic	2.65 (.97)	2.41 (.93)	2.46 (.93)	2.31 (.98)	2.18 (1.09)	2.03 (.91)	.27 (-.49, 1.04)	.49 (-.36, 1.37)
CCAPS-Eating	1.37 (1.02)	1.25 (1.14)	1.28 (1.48)	1.15 (1.39)	1.36 (1.34)	1.73 (1.25)	.32 (-,44, 1.10)	.43 (-.41, 1.31)
CCAPS-Hostility	.77 (.85)	.44 (.45)	.31 (.32)	.47 (.46)	.56 (.48)	.50 (.44)	1.06* (.27, 1.92)	.79 (-.06, 1.71)
MHC-Positive Mental Health	46.20 (9.17)	40.75 (8.45)	48.17 (17.22)	45.69 (10.66)	48.00 (9.96)	49.70 (11.55)	-.40 (-1.19, .36)	.52 (-.31, 1.41)
Process Measures								
FFMQ-Observe	23.50 (4.62)	20.25 (4.74)	22.83 (6.24)	25.00 (4.58)	24.45 (4.97)	22.50 (6.06)	-.76 (-1.58, .01)	.21 (-.64, 1.07)
FFMQ-Describe	21.40 (7.34)	21.88 (5.99)	22.00 (10.20)	22.38 (6.49)	23.18 (5.64)	24.00 (6.78)	.62 (-.14, 1.43)	.69 (-.16, 1.59)
FFMQ-Act Aware	18.30 (2.16)	22.13 (4.64)	22.50 (5.79)	20.00 (5.23)	19.55 (4.72)	20.80 (4.21)	1.06* (.27, 1.91)	.68 (-.17, 1.58)
FFMQ-Nonjudge	17.70 (5.93)	22.75 (8.41)	25.33 (6.19)	19.46 (5.55)	21.81 (8.12)	21.90 (8.66)	.42 (-.34, 1.21)	.56 (-.28, 1.46)
FFMQ-Nonreact	19.10 (3.07)	17.63 (2.56)	17.42 (3.75)	18.23 (3.92)	18.82 (3.74)	18.50 (40.06)	-.43 (-1.22, .33)	-.31 (-1.17, .54)
VQ-Obstruction	26.20 (3.12)	25.13 (4.70)	20.40 (5.68)	22.85 (4.65)	23.36 (4.70)	21.00 (5.83)	.40 (-.36, 1.18)	.47 (-.42, 1.41)
VQ-Progress	18.10 (3.60)	19.00 (3.66)	24.00 (4.24)	17.85 (3.63)	21.18 (5.00)	20.40 (6.24)	-.61 (-1.42, .15)	.85 (-.06, 1.83)

Scale ranges: CCAPS subscales = 0 – 4, MHC = 14 – 84, FFMQ Observe, Describe, Act with Awareness, Nonjudge = 8 – 40, FFMQ Nonreact = 7 – 42. VQ subscales = 5 – 35. Effect sizes calculated with available data using listwise deletion. * indicates 90% CI does not contain 0. Positive effect sizes = greater improvement in SBT vs. control.
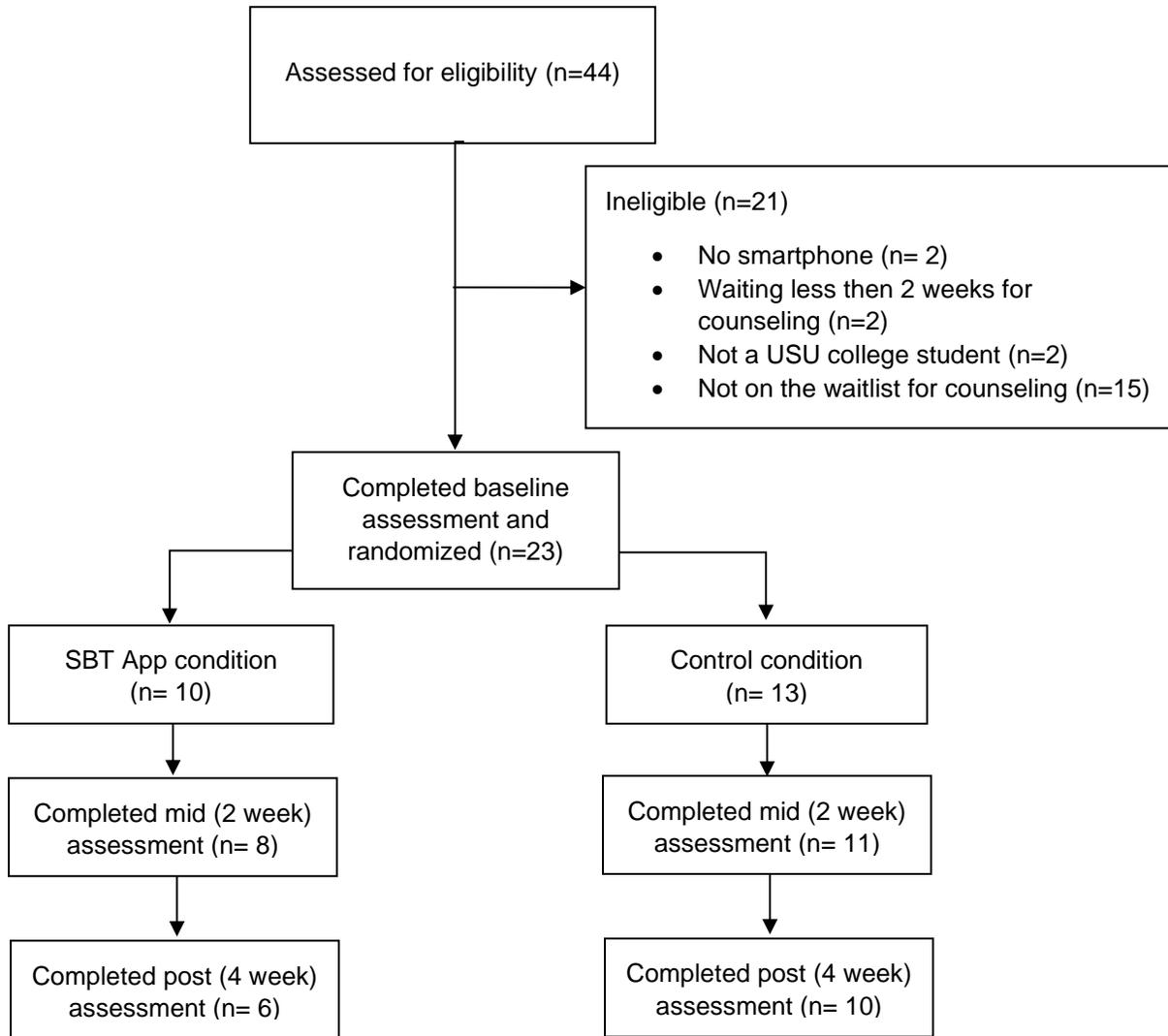
Figure 1. Participant flow diagram.