

CBT-Based Skills Building via Multiple Formats Improves Mental Health and Healthy Behaviors in College Students

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ABSTRACT

Background: College students frequently struggle with their mental health, and digital interventions are an increasingly popular stepped-care approach. The effectiveness of such interventions by delivery format and facilitator inclusion is less understood.

Purpose: To evaluate the efficacy of the MINDSTRONG[®] cognitive behavioral skills building program delivered in different formats on the mental health and healthy lifestyle beliefs/behaviors of university students.

Method: Students ($n = 283$) from a large public midwestern university were included. This three-arm randomized clinical trial assigned participants to one of three study arms that varied by delivery format and facilitation: virtual delivery, one-on-one with a facilitator; asynchronous delivery with a web-based program and facilitator check-in points; or asynchronous delivery with a web-based program and no facilitator. Students completed mental health (depression, anxiety, stress, resiliency, and burnout) and healthy lifestyle belief/behavior measures at baseline, post-intervention, and three months post-intervention.

Results: Significant positive change in all measures occurred from baseline to post-intervention, regardless of study arm, and sustained at three months. Higher participation occurred with facilitator involvement.

Conclusion: MINDSTRONG[®], regardless of delivery mode, effectively improves mental health and healthy beliefs/behaviors in university students. Including a facilitator can improve participation.



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INTRODUCTION

College represents a transitional period where students gain independence from their parents and become more self-reliant, which includes the need to balance healthy lifestyle behaviors with the stress of rigorous coursework. During this critical phase in development, college students tend to have poor dietary habits and low physical activity levels that may contribute to obesity and related health conditions in later life (Lonati et al., 2024). The Fall 2024 National College Health Assessment (NCHA), which included 33,736 college students from across the United States, reported that 41% of respondents were overweight or obese (American College Health Association [ACHA], 2025). At the same time, student mental health is also declining. Over a third (34.35%) of college students have an anxiety disorder, while a quarter have a depressive disorder (ACHA, 2025). Factors associated with depression and anxiety include fewer than seven hours of sleep per night, worse general health, lower healthy lifestyle beliefs, lower healthy lifestyle behaviors, higher stress, and a perceived lack of control (Hoying et al., 2020).

With increased rates of mental health conditions comes increased use of campus mental health services. Over a 10-year period, mental health treatment utilization on U.S. college campuses increased from 19% to 34% (Lipson et al., 2019). Historically, mental health treatment has focused on intensive psychotherapy and psychiatric support. However, these approaches are resource intensive and not every student may need such a high level of care (National Academies of Sciences, Engineering, and Medicine [NASEM] et al., 2021). Further, a nationally representative survey with 3,000 undergraduate students reported that half of the students with a mental health condition did not seek mental health services, highlighting a need to reach students in another manner (Flaherty, 2023). To address these limitations and improve overall student well-being, a 2021 report from NASEM recommended using a multi-pronged approach including “a focus on prevention, identification of high-risk students in a thoughtful way, effective community-based approaches, treatment services for identified cases, and relapse prevention and post-treatment support” (NASEM et al., 2021). Recently, digital mental health interventions delivered via the Internet or mobile applications have become a growing area of interest due to their promise of increased accessibility and ability to address both prevention and treatment (Harith et al., 2022). The interventions are most frequently based on cognitive behavioral theory, which posits that our thoughts affect how we emotionally feel and behave (Harith et al., 2022; Lattie et al., 2019). By addressing patterns of automatic negative thinking, skills building and goal setting, mood and healthy lifestyle behaviors can improve (Chand et al., 2024). Delivery of these interventions can vary, with some offerings being self-delivered (i.e., the user reviews the material themselves) and other offerings, including a facilitator. While these digital mental health inventions have demonstrated improvements in anxiety, depression, and well-being, they struggle with attrition, and the studies reviewed did not compare outcomes based on the presence of a facilitator (Harith et al., 2022; Lattie et al., 2019).

MINDSTRONG[®], also known as Creating Opportunities for Personal Empowerment (COPE[®]) in the literature, is an evidence-based, cognitive skills-building program consisting of seven weekly sessions aimed to reduce stress, anxiety, and depression and improve overall mental health and healthy lifestyle behaviors. The manualized sessions are followed by skills building activities to help students put the content that they are learning into practice to

ultimately form positive thinking and behavior habits. The MINDSTRONG[®] program promotes well-being and mental health by providing evidence-based strategies based on CBT for those who have anxiety and depressive symptomatology. Findings from more than 20 research studies support the program's positive findings in lowering depression, anxiety, stress, and suicidal ideation among those with elevated symptoms and improvements in healthy lifestyle behaviors (Buffington et al., 2016; Hart Abney et al., 2019; Hoying & Melnyk, 2016; Hoying, Melnyk, & Arcoleo, 2016; Hoying et al., 2023; Hoying et al., 2024; Kozlowski et al., 2015; Lusk & Melnyk, 2011a, 2011b, 2013, 2018; Lusk et al., 2018; Melnyk, Jacobson et al., 2013; Melnyk, Kelly et al., 2013; Melnyk, Kelly, Jacobson et al., 2014; Melnyk, Kelly, & Lusk, 2014; Melnyk, Amaya et al., 2015; Melnyk, Jacobson et al., 2015; Melnyk, Hoying, Hsieh et al., 2022; Melnyk, Hoying, Tan, 2022; Price et al., 2023; Sampson et al., 2019, 2020). The program has been studied in a variety of student populations. Given the success of the manualized program, MINDSTRONG[®] was digitized to expand its access to students, anytime of the day or evening.

Aims

The primary aim of this three-ARM randomized clinical trial was to compare and determine the effects of MINDSTRONG[®] on the mental health (depression, anxiety, perceived stress, resiliency, and burnout), healthy lifestyle behaviors, and healthy lifestyle beliefs of interprofessional undergraduate and graduate university students' over time when delivered via three different methods:

1. Manualized MINDSTRONG[®] delivered virtually by a trained facilitator (Intervention ARM 1)
2. Digitized MINDSTRONG[®] with trained facilitator support at baseline, and sessions 2 and 4 (Intervention ARM 2), and
3. Digitized MINDSTRONG[®] alone with no trained facilitator (Intervention ARM 3)

METHODS

Ethical Considerations

The corresponding author's Institutional Review Board reviewed and approved this study (2021B0059). Informed consent was collected from the participants digitally. Participants identified as having moderate to severe depression or thoughts of self-harm received a follow-up referral to additional counseling services and hotline information.

Study Design

This study used a three-arm randomized clinical trial design. Each arm represented a variation in delivery of the MINDSTRONG[®] intervention.

Sample and Setting

This study took place at a large midwestern, public land grant university and included interprofessional undergraduate and graduate students from the main campus or one of the five satellite campuses within the same state. Inclusion criteria were 18 years of age or older and having active enrollment in undergraduate or graduate studies at any of included university campuses.

Interested participants were excluded from the study if they were previously enrolled in MINDSTRONG[®] between May 2020 and July 2021 or were currently enrolled in MINDSTRONG[®].

Study Procedures

Recruitment

Convenience sampling was used, and participants were recruited using various approved methods: social media websites; communications from the deans, graduate student, and interprofessional council newsletters; university wide newsletters, and website postings on the university's Chief Wellness Officer homepage.

Randomization

Following baseline data collection, participants were randomly assigned by REDCap 1-1-1 into one of the three intervention arms stratified by college status (undergraduate or graduate).

Data Collection

The primary outcomes of interest were student reported healthy lifestyle behaviors, healthy lifestyle beliefs, depressive symptoms, anxiety symptoms, perceived stress, level of burnout, and level of resilience. This data, in addition to demographic information, was collected with an online survey hosted on REDCap (a secure electronic data capture tool) at three time points: baseline, immediately after completing MINDSTRONG[®], and three months after completing MINDSTRONG[®]. The survey took no longer than 20 minutes to complete.

Additionally, for participants enrolled in ARMs 2 and 3, activity data (number of clicks on additional resources and time spent on sessions) was collected from the Carmen Canvas platform. This data was collected in aggregate form without identifiers.

Incentive for Participation

Participants were compensated with a \$25 electronic Amazon gift card for completing the baseline survey and an additional \$25 Amazon gift card for completing the three-month follow-up survey.

Measures

Patient Health Questionnaire-9 (PHQ-9)

The PHQ-9 is a nine-item instrument that uses a summative rating scale to assess depressive symptoms (Kroenke et al., 2010). Participants rank their depressive symptoms from the previous two weeks on a scale of 0 (*not at all*) to 3 (*nearly every day*). Scores range from 0–27, with higher scores indicating higher levels of depression. Scores are categorized based on depression severity of none (0–4), mild (5–9), moderate (10–14), moderately severe (15–19) and severe (20–27). Additionally, question 9, on the instrument assesses suicide ideation. The psychometric properties of the instrument have been tested in a variety of populations and settings across time, with good sensitivity (.88) and specificity (.88) (Kroenke et al., 2010). The Cronbach's alpha with this sample was 0.86.

General Anxiety Disorder-7 (GAD-7)

The GAD-7 is a seven-item instrument that uses a summative response scale to assess individual anxiety levels (Spitzer et al., 2006). Participants rank their anxiety levels from the previous two weeks on a scale of 0 (*not at all*) to 3 (*nearly every day*). Scores range from 0–21, with higher scores indicating higher levels of anxiety. Scores are categorized based on anxiety severity of minimal (0–4), mild (5–9), moderate (10–14) and severe (15–21). The psychometric properties of the instrument have been tested in a variety of populations and settings across time with good sensitivity and specificity for generalized anxiety disorder (.89) (Spitzer et al., 2006). The Cronbach's alpha with this sample was 0.90.

Perceived Stress Scale-4 (PSS-4)

The PSS-4 is a four-item instrument that uses a five-point Likert scale to assess perceived stress (unpredictability, feeling out of control, and overloaded) (Cohen et al., 1983). Participants rank their perceived stress from the previous month on a scale of 0 (*never*) to 4 (*very often*). Scores range from 0–16, with higher scores indicating higher levels of stress. Items 2 and 3 are reverse scored and are positively-slated items. Literature demonstrates good internal consistency for the four-item scale (Cohen et al., 1983). The Cronbach's alpha with this sample was 0.77.

Brief Resilience Scale

The Brief Resilience Scale is a six-item instrument used to assess an individual's ability to recover from stress (e.g., "I tend to bounce back quickly after hard times" and "I tend to take a long time to get over set-backs in my life"). Participants use a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Scores range from 1–5, with higher numbers indicating a higher level of resilience. The BRS is a reliable means of assessing resilience as the ability to recover from stress (Smith et al., 2008). The Cronbach's alpha with this sample was 0.86.

Single Item Measure of Burnout

This one-item measure asks participants: "Overall, based on your definition of burnout, how would you rate your level of burnout?" Participants are asked to rank their answer based on 5 responses options ranging from 1, "I enjoy my work. I have no symptoms of burnout," to 5, "I feel completely burned out and often wonder if I can go on. I am at the point where I may need some changes or may need to seek some sort of help." Responses are rated on a five-

point scale. This single item measure was correlated at $r = 0.64$ ($p < 0.0001$) with emotional exhaustion. Scores range from 1-5, with higher numbers indicating a higher level of burnout (Dolan et al., 2015).

Healthy Lifestyle Behaviors Scale

The Healthy Lifestyle Behaviors Scale is a 15-item instrument which uses a five-point Likert scale to assess healthy lifestyle behaviors (e.g., "I exercise regularly," "I talk about my worries or stressors," and "I made choices that lead to a healthy lifestyle") (Melnyk, 2003). Responses range from 1 (*strongly disagree*) to 5 (*strongly agree*). Scores range from 15-75, with higher scores indicating a higher level of healthy lifestyle behaviors. Cronbach alphas have been consistently above .80 (Melnyk, 2003); the Cronbach's alpha with this sample was 0.79.

Healthy Lifestyle Beliefs Scale

The Healthy Lifestyle Beliefs Scale is a 16-item instrument which uses a five-point Likert scale to assess beliefs about maintaining a healthy lifestyle (e.g., "I believe that I can be more active" and "I am sure that I will do what is best to lead a healthy life"). Responses range from 1 (*strongly disagree*) to 5 (*strongly agree*). Scores range from 16-80, with higher scores indicating a higher level of healthy lifestyle beliefs. Cronbach alphas have consistently been above .80 (Melnyk et al., 2021); the Cronbach's alpha with this sample was 0.89.

Intervention

The MINDSTRONG[®] program contains all key concepts of cognitive-behavioral therapy within each of the seven sessions addressing the main content and skills building (Table 1).

Table 1

MINDSTRONG[®] Session Descriptions

| Session Number – Title | Topics Reviewed |
|---|--|
| 1 – Thinking/Feeling/Behaving and Restructuring Negative thinking | CBT thinking-feeling-behaving triangle; understanding the ABCs; identifying cognitive distortions, and practicing mindfulness |
| 2 – Self-Esteem and Positive Thinking/Positive Self-Talk | Building self-esteem, intentional gratitude, healthy habits |
| 3 – Stress and Coping | Identifying signs of stress, anxiety, and depression (physical, emotional, & behavioral); coping behaviors (healthy vs unhealthy); relaxation techniques |
| 4 – Problem Solving and Goal Setting | 4 step problem solving; accomplishing goals and “dreams”; overcoming barriers and identifying solutions on the path to goals |
| 5 – Dealing with your Emotions in Healthy Ways | Self-control strategies, effective communication, and mental imagery; identifying healthy coping skills when faced with anxiety or anger |

| | |
|---|--|
| 6 – Coping with Stressful Situations and Valuable Sleep | Sleep habits and chronic sleep loss; creating healthy solutions in response to stressful life situations |
| 7 – Pulling it all Together for a Healthy YOU! | Full review |

Participants completed the seven session MINDSTRONG[©] intervention weekly for seven weeks. Participants enrolled in Intervention ARM 1 participated in MINDSTRONG[©] delivered 1:1 virtually via Zoom by a staff or faculty member trained as a MINDSTRONG[©] facilitator. Participants enrolled in Intervention ARM 2 participated in a digitized version of MINDSTRONG[©] delivered via the online platform Carmen Canvas with the support of a staff or faculty member trained as a MINDSTRONG[©] facilitator. Using a scripted response template, the facilitator met with participants 1:1 at baseline and after sessions two and four, to reinforce the material covered in prior sessions. Participants enrolled in Intervention ARM 3 participated in a digitized version of MINDSTRONG[©] via the online platform Carmen Canvas without an assigned facilitator.

Analysis

Descriptive statistics were used to summarize the demographics and each scale. Cohen's d was used to determine effects between interval measurements. To assess the program impact and the ARM impact, a repeated measure ANOVA model was used on each scale with Bonferroni multiple comparison procedures being used to determine any differences between ARMs and interval measurements. Activity on the Carmen Canvas platform was analyzed using descriptive statistics on the page views of each resource within Carmen Canvas. All analyses were conducted using R 4.3.1.

RESULTS

Demographics

The total number of unique participants was 283 ($n_{ARM\ 1} = 94$, $n_{ARM\ 2} = 96$, $n_{ARM\ 3} = 93$). At week seven, the response rates by ARMs were ARM 1 = 40.4%, ARM 2 = 54.2%, and ARM 3 = 39.8%. At three months, the response rates by ARMs were ARM 1 = 30.9%, ARM 2 = 35.4%, and ARM 3 = 30.1%. Most participants were White (66.78%) and female (81.27%). Thirty-nine percent of the participants were between 18–22 years of age (39.22%), and 26% were from the College of Arts and Sciences (26.15%). Most participants indicated their health was good or higher (77.7%) (Table 2).

Table 2

Demographics

| Level ARM | All Baseline (n = 283) | | Those with Baseline and 7 Week (n=127) | | Those with Baseline, 7 Week and 3 Month Responses (n=82) | |
|--------------|---------------------------|---|---|---|---|---|
| | n | % | n | % | n | % |
| Level | | | | | | |
| ARM | | | | | | |

| | | | | | | |
|--|-----|-------|-----|-------|----|-------|
| ARM 1 | 94 | 33.2 | 38 | 29.9 | 29 | 31.9 |
| ARM 2 | 96 | 33.9 | 52 | 40.9 | 34 | 37.4 |
| ARM 3 | 93 | 32.9 | 37 | 29.1 | 28 | 30.8 |
| Gender | | | | | | |
| Female | 230 | 81.27 | 111 | 87.40 | 77 | 84.60 |
| Male | 52 | 18.37 | 16 | 12.60 | 14 | 15.40 |
| No Response | 1 | 0.35 | . | . | . | . |
| Age | | | | | | |
| 18-22 | 111 | 39.22 | 47 | 37.00 | 36 | 39.60 |
| 23-30 | 96 | 33.92 | 41 | 32.30 | 29 | 31.90 |
| 30-39 | 51 | 18.02 | 24 | 18.90 | 14 | 15.40 |
| 40-49 | 11 | 3.89 | 8 | 6.30 | 7 | 7.70 |
| 50-59 | 1 | 0.35 | . | . | . | . |
| 60-69 | 3 | 1.06 | 2 | 1.60 | 2 | 2.20 |
| 70+ | 1 | 0.35 | 1 | 0.80 | . | . |
| No Response | 9 | 3.18 | 4 | 3.10 | 3 | 3.30 |
| Race | | | | | | |
| White | 189 | 66.78 | 83 | 65.40 | 59 | 64.80 |
| Asian | 48 | 16.96 | 21 | 16.50 | 16 | 17.60 |
| Black or African American | 26 | 9.19 | 11 | 8.70 | 6 | 6.60 |
| More Than One Race | 13 | 4.59 | 8 | 6.30 | 6 | 6.60 |
| Unknown / Not Reported | 4 | 1.41 | 2 | 1.60 | 3 | 3.30 |
| No Response | 2 | 0.71 | 2 | 1.60 | 1 | 1.10 |
| Native Hawaiian or Other Pacific Islander | 1 | 0.35 | . | . | . | . |
| Which college or institution are you affiliated with? | | | | | | |
| Arts and Sciences | 74 | 26.15 | 42 | 33.10 | 30 | 33.00 |
| Nursing | 29 | 10.25 | 12 | 9.40 | 5 | 5.50 |
| Social Work | 23 | 8.13 | 11 | 8.70 | 7 | 7.70 |
| Engineering | 22 | 7.77 | 8 | 6.30 | 5 | 5.50 |
| Business | 18 | 6.36 | 6 | 4.70 | 6 | 6.60 |
| Public Health | 18 | 6.36 | 7 | 5.50 | 3 | 3.30 |
| Food, Agricultural, and Environmental Sciences | 16 | 5.65 | 7 | 5.50 | 6 | 6.60 |
| Education and Human Ecology | 15 | 5.30 | 7 | 5.50 | 6 | 6.60 |
| Medicine | 15 | 5.30 | 6 | 4.70 | 4 | 4.40 |
| Health and Rehabilitation Sciences | 13 | 4.59 | 4 | 3.10 | 3 | 3.30 |
| Other | 10 | 3.53 | 3 | 2.40 | 3 | 3.30 |
| Public Affairs | 8 | 2.83 | 5 | 3.90 | 5 | 5.50 |
| Biomedical Science | 7 | 2.47 | 3 | 2.40 | 3 | 3.30 |
| Environment and Natural Resources | 7 | 2.47 | 4 | 3.10 | 3 | 3.30 |
| Law | 3 | 1.06 | . | . | . | . |
| Architecture | 1 | 0.35 | . | . | . | . |
| Dentistry | 1 | 0.35 | . | . | . | . |
| Optometry | 1 | 0.35 | 1 | 0.80 | 1 | 1.10 |
| Pharmacy | 1 | 0.35 | 1 | 0.80 | 1 | 1.10 |
| Veterinary Medicine | 1 | 0.35 | . | . | . | . |
| In general, how would you describe your overall health? | | | | | | |
| Poor | 3 | 1.06 | 1 | 0.80 | . | . |

| | | | | | | |
|-------------|-----|-------|----|-------|----|-------|
| Fair | 59 | 20.85 | 29 | 22.80 | 21 | 23.10 |
| Good | 124 | 43.82 | 53 | 41.70 | 35 | 38.50 |
| Very Good | 53 | 18.73 | 25 | 19.70 | 19 | 20.90 |
| Excellent | 43 | 15.19 | 19 | 15.00 | 16 | 17.60 |
| No Response | 1 | 0.35 | . | . | . | . |

Instrument Outcome Changes

Paired Cohen's d effect sizes found at minimum a small effect between baseline and seven-week responses for each scale, with all scales except burnout exhibiting positive changes (Table 3).

Table 3

Scale Descriptives

| Arm | n | Baseline | | 7 Weeks | | 3 Months | | Baseline to 7 Weeks Effect Size | Baseline to 3 Months Effect Size |
|---|----|----------|-----|---------|-----|----------|-----|------------------------------------|-------------------------------------|
| | | Mean | SD | Mean | SD | Mean | SD | | |
| Healthy Lifestyle Belief Score (16-80) | | | | | | | | | |
| Arm 1 | 24 | 61.1 | 7.7 | 69.6 | 5.9 | 66.8 | 8.6 | 1.31+++ | 0.69++ |
| Arm 2 | 33 | 65.5 | 6.2 | 71.4 | 5.4 | 69.9 | 8.5 | 1.3+++ | 0.63++ |
| Arm 3 | 17 | 61.1 | 7.6 | 65.2 | 8.1 | 67.2 | 7.7 | 0.85+++ | 0.92+++ |
| Healthy Lifestyle Behavior Score (15-75) | | | | | | | | | |
| Arm 1 | 25 | 51.7 | 6 | 58.4 | 6.7 | 58.4 | 8.8 | 0.96+++ | 0.73++ |
| Arm 2 | 31 | 53.3 | 7.9 | 59.2 | 8.8 | 57.4 | 8.7 | 0.79++ | 0.51++ |
| Arm 3 | 20 | 52.5 | 7.6 | 56.8 | 8.9 | 57.8 | 7.8 | 0.96+++ | 0.95+++ |
| PHQ-9 Score (0-27) | | | | | | | | | |
| Arm 1 | 27 | 5.9 | 4.8 | 3.8 | 3.2 | 4.5 | 5 | -0.53++ | -0.41+ |
| Arm 2 | 32 | 6 | 4.7 | 3.7 | 4.5 | 4.1 | 4.1 | -0.44+ | -0.36+ |
| Arm 3 | 21 | 5.9 | 3.9 | 5.2 | 5 | 4 | 3.5 | -0.21+ | -0.64++ |
| GAD-7 Score (0-21) | | | | | | | | | |
| Arm 1 | 28 | 6.9 | 4.6 | 3.6 | 3.4 | 4.3 | 4.4 | -0.85+++ | -0.54++ |
| Arm 2 | 32 | 5.7 | 5.1 | 3.8 | 4.2 | 4.1 | 3.7 | -0.54++ | -0.32+ |
| Arm 3 | 22 | 6.9 | 4.8 | 4.9 | 5.4 | 4.2 | 4.1 | -0.38+ | -0.81+++ |
| PSS-4 (0-16) | | | | | | | | | |
| Arm 1 | 28 | 6.1 | 3 | 4.4 | 2.7 | 4.8 | 3.1 | -0.65++ | -0.42+ |
| Arm 2 | 32 | 6.2 | 2.9 | 4.8 | 2.4 | 4.9 | 2.4 | -0.4+ | -0.4+ |
| Arm 3 | 23 | 6.6 | 2.6 | 5 | 2.9 | 5 | 2.7 | -0.61++ | -0.58++ |
| BRS Score (1-5) | | | | | | | | | |
| Arm 1 | 28 | 3.2 | 0.7 | 3.7 | 0.7 | 3.6 | 0.8 | 1.13+++ | 0.72++ |
| Arm 2 | 30 | 3.2 | 0.5 | 3.7 | 0.7 | 3.6 | 0.7 | 0.79++ | 0.65++ |
| Arm 3 | 21 | 3.2 | 0.8 | 3.5 | 0.9 | 3.4 | 0.9 | 0.59++ | 0.4+ |
| Burnout (1-5) | | | | | | | | | |
| Arm 1 | 28 | 2.4 | 0.9 | 2.5 | 0.7 | 2.4 | 0.8 | 0.22+ | 0 |
| Arm 2 | 32 | 2.6 | 0.8 | 2.3 | 0.7 | 2.3 | 0.8 | -0.42+ | -0.31+ |
| Arm 3 | 22 | 2.6 | 0.9 | 2.4 | 1.1 | 2.3 | 1.1 | -0.21+ | -0.31+ |

Healthy Lifestyle Belief scores had large positive effects for each ARM (ARM 1 = 1.31, ARM 2 = 1.30, ARM 3 = 0.85). Healthy Lifestyle Behaviors had a medium positive effect for ARM 2 (ARM 2 = 0.79) while ARM 1 and 3 had large effects (ARM 1 = 0.96, ARM 3 = 0.96). The PHQ-9 showed ARM 1 with a medium positive effect (ARM 1 = -0.53) while the other two arms had small effects (ARM 2 = -0.44, - ARM 3 = 0.21). The single item question on burnout was the only scale with a small effect in the wrong direction in one of the ARMs with ARM 1 seeing a small effect (ARM 1 = 0.22) to a higher score; the other two ARMs saw a small positive effect (ARM 2 = -0.42, ARM 3 = -0.21). The effect sizes between baseline and three months suggested that the intervention effects observed at immediate post-intervention (seven weeks) sustained at three months.

Results from repeated measures ANOVA models did not find a significant interaction between ARM and time nor with the ARM main effect which suggests no specific change over time by ARM. A single ARM main effect was found to be statistically significant in healthy lifestyle belief scores ($p = 0.045$). Each model found a significant main effect of time that follows from the effect sizes displayed in Table 3, which further supports the positive MINDSTRONG[®] impact on each measure regardless of ARM.

Program Impact on Those with Mild Depression and Anxiety

Within the scales for depression (PHQ-9) and anxiety (GAD-7), an examination of the effect sizes from baseline to seven-weeks was looked at for those that had originally mild to severe symptoms (Table 4).

Table 4

Change in Those with Mild to Severe Depression and Anxiety Symptoms

| Arm | Baseline Level | n | Baseline | | 7 Week | | Cohen's D |
|---------------------------|-------------------|----|----------|-----|--------|-----|-----------|
| | | | Mean | SD | Mean | SD | |
| PHQ-9 Score (0-27) | | | | | | | |
| Arm 1 | Mild ¹ | 15 | 8.6 | 4.9 | 4.6 | 3.5 | 1.13+++ |
| | Min | 12 | 2.5 | 1.5 | 2.8 | 2.5 | 0.11 |
| Arm 2 | Mild ¹ | 18 | 10.4 | 5.5 | 5.4 | 5.4 | 0.68++ |
| | Min | 15 | 2.1 | 1.6 | 1.9 | 2.0 | 0.15 |
| Arm 3 | Mild ¹ | 12 | 8.4 | 3.3 | 7.3 | 5.4 | 0.28+ |
| | Min | 9 | 2.4 | 1.1 | 2.3 | 2.4 | 0.05 |
| GAD-7 Score (0-21) | | | | | | | |
| Arm 1 | Mild ² | 20 | 8.8 | 4.2 | 4.5 | 3.6 | 1.01+++ |
| | Min | 8 | 2.4 | 1.2 | 1.5 | 1.1 | 0.88+++ |
| Arm 2 | Mild ² | 17 | 9.6 | 5.0 | 5.6 | 4.8 | 1.09+++ |
| | Min | 16 | 2.1 | 1.4 | 2.1 | 2.5 | 0 |
| Arm 3 | Mild ² | 15 | 9.0 | 4.3 | 6.3 | 6.0 | 0.45+ |
| | Min | 7 | 2.3 | 1.5 | 2.0 | 2.2 | 0.17 |

+ small effect; ++ medium effect; +++ large effect

¹ Mild to severe depression symptoms (scores of 5 and higher).

² Mild to severe anxiety symptoms (scores of 5 and higher).

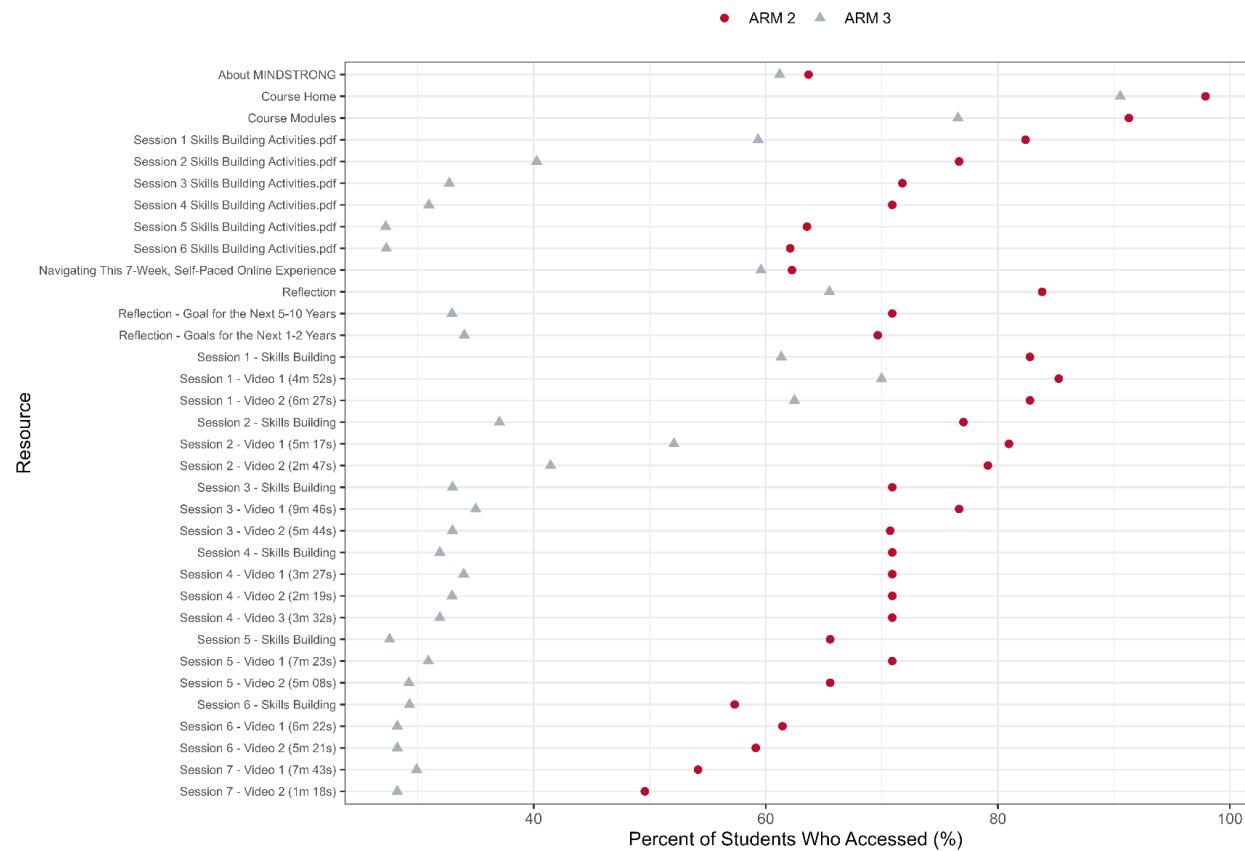
PHQ-9 scores from baseline to seven-weeks decreased with a minimum of a small positive effect (ARM 3, 0.28) with ARM 2 seeing a medium positive effect (0.68) and ARM 1 a large positive effect (1.13). GAD-7 scores also saw a decrease with a minimum of a small positive effect in ARM 3 (0.45) while ARM 2 (1.09) and ARM 1 saw large positive effects (1.01).

Carmen Canvas Activity in ARMs 2 and 3

Canvas interaction between Intervention ARM 2 and ARM 3 was analyzed by looking at the proportion of students that accessed each resource (Canvas page) within the course site. Intervention ARM 2 saw a higher proportion of students access each of its resources with all but two pages, “About MINDSTRONG” and “Navigating This Seven-Week, Self-Paced Online Experience,” saw at least a small effect size difference between the two ARMS (Figure 1).

Figure 1

Carmen Canvas Usage



DISCUSSION

This is the first study to compare different format deliveries of MINDSTRONG[®]. Findings from this clinical trial supported that, regardless of the format in which it was delivered, MINDSTRONG[®] was effective in reducing depression, anxiety, and stress as well as improving resilience, healthy lifestyle beliefs, and healthy behaviors in interprofessional undergraduate and graduate students. There is now a strong body of evidence that demonstrates the

efficacy of this CBT-based program in improving the mental health and healthy lifestyle behaviors in college students (Hoying et al., 2024; Melnyk, Amaya et al., 2015; Melnyk, Hoying, & Tan, 2022; Melnyk, Jacobson et al., 2015; Melnyk, Kelly et al., 2013; Price et al., 2023; Sampson et al., 2019, 2020; Wolgast et al., 2025).

This was the first test of the digitalized version of the CBT-based MINDSTRONG[®] program, which also was found to be effective in improving outcomes although there was variance in the manner and number of sessions that were accessed by the students. Although the positive effects of the MINDSTRONG[®] program are strongest when delivered 1:1 by a trained facilitator, the digitalized version of the program with a facilitator who touched base with participants also produced medium to large positive effects on the mental health and health behavior outcomes that sustained for three months after the program was completed. With the epidemic of mental health problems and unhealthy behaviors in college students, scalable evidence-based solutions should be integrated into required coursework, shortly after students enter college. Even if programs look appealing to students, they are often overwhelmed with their core coursework and will not typically take offerings that are optional. Nursing programs in particular are known for high demands, rigorous coursework and examinations, and extensive clinical experiences.

Implications and Recommendations

Currently, it takes 15 years to translate research evidence into real-world settings to improve outcomes (Khan et al., 2021). This is unacceptable given that mental health problems are a major contributor to students struggling academically and dropping out of college. Urgent emphasis needs to be placed on equipping students with evidence-based life-long skills, like those taught in MINDSTRONG[®]/COPE[®], so they will be equipped with protective factors and resiliency that will help them lead high quality productive lives. Colleges and Universities can address the student mental health crisis through policy, well-being programming, improving access to care, and reducing mental health stigma.

Limitations

Participation in the survey was voluntary, which could have resulted in selection bias. Those who participated in the survey may have had more positive experiences and outcomes. The attrition rate at seven weeks and three months was higher than anticipated resulting in fewer survey responses at those intervals. According to a systematic review with 89 studies, attrition is a common limitation in digital mental health interventions and can be related to early mood improvement or an unsatisfactory user experience, which includes interventions not addressing issues the user cares most about and not being useful in an emergency situation (Lattie et al., 2019). While higher than anticipated, assumption checks for the repeated measures were still corrected for or met. There was also not a significant difference between the ARMs based on the number of intervals for which the individual responded.

CONCLUSIONS

Digital mental health inventions are an increasingly popular approach to addressing the mental health epidemic on college campuses. However, a paucity of research in the literature exists concerning the effectiveness of such interventions by delivery type and inclusion of a facilitator. This three-ARM, randomized clinical trial demonstrated

that, no matter the delivery format, the MINDSTRONG[®] cognitive-behavioral skills building program was effective in reducing depression and anxiety and improving resilience, healthy lifestyle beliefs, and healthy behaviors in interprofessional undergraduate and graduate students. As each student is different in terms of how they learn and interact with mental health education and skills building, it is key to offer a variety of delivery options to meet their unique needs.

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