Supported internet-delivered cognitive behavior therapy programs for depression, anxiety, and stress in university students: Feasibility, acceptability, effectiveness, and satisfaction

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Abstract

Background
University campuses have limited mental health services that cannot cope with the high demand for treating depression and anxiety related conditions. One alternative is to use internet-delivered CBT (iCBT) as a way of tackling barriers such as stigma, lack of availability, and scheduling issues.

Objective
This study aimed to assess the feasibility, acceptability, effectiveness, and satisfaction of a supported iCBT intervention offering three distinct programs on depression, anxiety, and stress to students within a large university.

Methods
Participants were recruited from 3 counseling centers at a large midwestern University in the US. Those agreeing to take part chose one of three iCBT programs - Space from Depression, Anxiety, or Stress - all comprised of 8 modules of media-rich interactive content. Participants were supported on the use of the platform throughout the trial by a trained professional. The PHQ-9, GAD-7, and stress subscale of the DASS-21 were completed at baseline, 8 weeks, and 3-month follow-up. A satisfaction with treatment (SAT) questionnaire was completed at 8 weeks, and qualitative interviews were completed by a subsample of participants at 3 months.
Results
182 participants were recruited, 52 choosing Space from Anxiety, 31 Space from Depression, and 19 Space from Stress. Mixed effects models showed a significant decrease in symptoms of depression ($F = 6.36, p < .001$), anxiety ($F = 7.97, p < .001$), and stress ($F = 8.50, p < .001$) over time - with the highest decrease in PHQ-9 scores among those participants choosing the Space from Depression program (5.0 mean difference at 8 weeks and 4.3 at 3 months), the highest decrease in GAD-7 scores among those choosing the Space from Anxiety programme (2.5 mean difference at 8 weeks and 3.6 at 3 months), and a high decrease in DASS-21 stress subscale scores among those choosing the Space from Stress program (2.3 mean difference at 8 weeks and 3.5 at 3 months). The mean time spent using the platform per session was 27.4 minutes ($SD = 33.8$), and participants completed 53.4% ($SD = 37.6$) of the total program content on average. Most (69%) participants found the programs helpful/very helpful, and liked the convenience, flexibility, access, and ability to control the pace of the use of the intervention. Qualitative interviews indicated the intervention met students’ expectations, and they saw it as valuable complement to face-to-face treatment.

Conclusions
The iCBT programs tested in our study appear to be feasible, acceptable, and effective in a university environment. Participants described the benefits of having a flexible, supported online intervention available on campus. Larger trials should be conducted to further test the significance of supported online interventions that give students a choice of program depending on the symptom profile.

Keywords
Depression, anxiety, stress, iCBT, students

Trial registration
ClinicalTrials.gov Identifier: NCT02614443
Introduction

Within the university student population, depression and anxiety are among the most prevalent mental health conditions [1]. The 2017 American College Health Survey found that 61% of college and university students reported experiencing “overwhelming” anxiety on at least one occasion in the previous 12 months, and 39% reported feeling so depressed it was “difficult to function” at least once in the same time period [2]. These numbers reflect the difficulties young people may experience upon entering higher education, including academic pressure [3][4], managing social demands [5], and developmental changes that may give rise to mental health difficulties [1]. Mental health issues also appear to be increasing over time, leading to increases in the number of students seeking help from university mental health and counseling services [6].

Current mental health resources on campus often do not adequately address the needs of the student population [6]. For example, because of the increased demand for services, counseling centers often have long waiting lists [7]. In addition, many students with mental health issues do not seek services [8]; the primary barriers include stigma, lack of time, and scheduling concerns [9].

Internet-delivered mental health interventions may be one way to address the increased demand for mental health care. A recent meta-analysis of 48 studies supported the efficacy of Internet delivered mental health interventions in college student samples [10]. Most online mental health interventions are based on cognitive-behavioral therapy (CBT), which is an empirically-supported treatment for many mental health disorders [11]. Although interventions can be self-guided, those that are clinician-supported are generally more effective than those that are self-guided [10][12]. Online mental health interventions can be disseminated widely and therefore may address the limited availability of in-person counseling services. In addition, because these interventions can be accessed remotely and at the students’ convenience, they allow for flexibility in working around busy schedules and alleviate concerns about stigma.

Although internet-delivered CBT (iCBT) has been shown to be effective for college students [10], some gaps remain in our understanding of how best to implement these interventions on campuses. For example, most studies have used convenience samples such as students in psychology classes. Very few studies have tested the
feasibility and effectiveness of iCBT when implemented as part of a campus service delivery system. In addition, previous meta-analyses have highlighted the need for more user feedback from interviews and other qualitative methods to better tailor online interventions to the needs of college students [13]. For example, one qualitative study found that college student users of an online stress-management intervention liked the flexibility and anonymity of using the program but also would have liked greater individualization to the specific stressors faced by college students [14].

The aims of this mixed-method study were to assess feasibility, acceptability, effectiveness, and satisfaction with internet-delivered CBT interventions embedded within the care delivery system of a large university. Feasibility was defined in terms of the number of students recruited and the percentage of those that started a program. Acceptability was measured using data on usage and engagement with the intervention acquired via the online system. Effectiveness was assessed using standard measures of symptoms of depression, anxiety, and stress completed at baseline, endpoint (8 weeks), and follow-up (3 months). Finally, satisfaction was measured via a questionnaire at the end of the 8-week intervention period, as well as via semi-structured phone interviews at follow-up.

**Methods**

The trial protocol containing the complete methodology has been published [15], and was approved by the University of Minnesota Institutional Review Board (code number: 1503S64741). This was an open trial in which recruited participants were asked to choose between three interventions targeting depression, anxiety, or stress. Recruitment took place from October 2015 to September 2017 at the University of Minnesota-Twin Cities through three centers: the student counseling center, a mental health clinic associated with the student health service, and the international student office. Interested students were emailed a link with more information about the program and an invitation to participate in the study. In addition, they completed the following screening measures: the Patient Health Questionnaire (PHQ-9), the Generalized Anxiety Disorder Questionnaire (GAD-7), and the stress subscale of the Depression, Anxiety, and Stress Scale (DASS-21). Students were provided with scores on these measures along with explanatory text [e.g. “your score on the PHQ-9 would indicate mild depressive symptoms”] so that they could make an informed decision as to
which of the three programs they wanted to select. Upon choosing, they were assigned a supporter. The intervention was intended to last for 8 weeks, with measures taken at initial assessment (screening), after 8 weeks, and at a 3 month follow-up. At 8 weeks, a satisfaction with treatment (SAT) questionnaire [16] was also sent as part of the follow-up. Finally, participants were also invited to complete a follow-up interview at 3 months on their perceptions, attitudes, and experiences of the intervention.

Inclusion and exclusion criteria

All students over 18 years of age enrolled at the University of Minnesota were eligible for recruitment. Upon completion of screening measures, students had to meet the threshold for mild depression (score of 5+ on the PHQ-9), anxiety (5+ on the GAD-7), or stress (15+ on the DASS-21 stress subscale, after multiplying score by 2). Students below the threshold could still use the program but were not included in the final analyses.

Clients attending in-person therapy, either individually or in a group setting, were excluded from the study. Students at particular risk, identified via self-harm questions, were referred to a clinician for further assessment. Throughout the trial, there was a ‘Help’ button on the program that could be accessed at any time and that directed students to available resources.

Intervention

The three iCBT programs (Space from Depression, Space from Anxiety, and Space from Stress) were delivered via a Web 2.0 platform and were comprised of 8 modules of media-rich interactive content. These programs were developed by SilverCloud Health, a multi-disciplinary clinical, design, and development team. The SilverCloud platform employed several strategies aimed at improving the user experience, including personal, interactive, supportive, and social tools. Space from Depression included concepts such as behavioural activation, cognitive restructuring, and challenging core beliefs. Space from Anxiety incorporated problem-solving strategies, empowerment, and mindfulness. Space from Stress primarily focused on improving positive well-being, addressing stress in university settings, and developing a more balanced and meaningful life. All content of these programs followed evidence-based CBT principles. Each program incorporated introductory quizzes, videos, informational content (including stories from other users), interactive activities, and a personal journal. More detailed information on the content of the platform can be found in the published protocol [15] and in previous research
The standard recommendation was to complete one module per week over the 8-week period, with weekly reviews provided by the supporter.

**Support**

Each study participant was assigned a staff member from the office through which they were recruited to act as a supporter throughout the trial. These supporters received training in the program and how to give feedback through the online system. The supporter initially sent a welcome message to the participants encouraging their use of the program and highlighting key aspects such as potential benefits and navigation through the different modules. Thereafter, the supporters logged in each week, reviewed the participants’ progress, and left feedback that included a response to the work the participants had completed that week. Participants were also able to share more information via journal entries, although this was not obligatory. The feedback given by the supporter typically took between 10-15 minutes per participant per session.

**Measures**

All measures were completed on the SilverCloud platform. Sociodemographic data included age, gender, ethnicity, employment, relationship status, school year, and international student status. Measures gathered through active use of the platform were collected using the SilverCloud back-end data capture. These include logins, time spent on the platform (total and per session), modules completed, page views, and journal entries. Three primary outcome measures were used to assess effectiveness. The first was the PHQ-9 [18][19], a widely-used screening tool reflecting the diagnostic criteria for depression in the Diagnostic Manual of Mental Disorders, Fifth Edition [20]. The PHQ-9 is comprised of 9 items scored on a scale of 0-3, with total scores of 0 to 27. The second was the GAD-7 [21], a questionnaire designed to assess anxiety per the criteria for generalized anxiety disorder in the DSM-V. It is comprised of 7 items scored from 0-3 each, with total scores of 0 to 21. The third was the DASS-21 [22] stress subscale. Items are rated on a 0 to 3 scale, with total scores ranging from 0 to 21. On all three measures, higher scores indicate higher symptom severity. The SAT questionnaire included four quantitative questions regarding satisfaction with online treatment (e.g., “How did this online treatment compare to previous treatments?”) measured on a 5-point scale (0 =
Much better to 4 = Not at all good), as well two open-ended questions asking participants to describe what they most and least liked about the programme.

Structured interviews

In the second year of the trial, all students enrolled in the study were emailed to see if they were interested in completing a semi-structured interview regarding their perceptions of the program. A follow-up email was sent if no response was received after 1 week. Thirty participants were contacted and 14 were interviewed. Interviews were conducted via phone by a PhD student in Counseling Psychology. Interviews were recorded and then transcribed. Transcriptions were independently double-checked for accuracy. Interviews typically lasted 10-15 minutes. In one case, the student declined to be interviewed and instead submitted written responses to the questions.

The interview was intended to further explore the participants' perceptions, attitudes, and experiences regarding the intervention beyond the two open-ended questions on the SAT. Questions were derived by consensus among a group including intervention supporters, counseling center administrators, a faculty member, and a graduate student. Questions focused on how and why students accessed SilverCloud (e.g. “How did you hear about SilverCloud?”, “Why did you decide to use SilverCloud instead of in-person counseling?”), what they thought about specific aspects of it (e.g. “Did you like that you could complete the program in any order, or would you have preferred that the program had more structure?”), “What did you think about having a supporter?”), and a more general evaluation of how well it met their needs (e.g. “In general, how did you feel about using the Silver Cloud program?”, “If you have done in-person counseling before, how did it compare to SilverCloud?”)

Analytic Plan

Feasibility was measured by calculating the percentage of participants logging in to their chosen platform from those initially recruited and invited. Acceptability was assessed in terms of the total time spent on the programs, average number of log-ins, average time per session, modules completed, average page views, and average number of journal entries completed. Effectiveness was assessed using a linear mixed model to determine changes in depression, anxiety, and stress scores from baseline to 8 weeks to 3 months. The model used intent-to-treat analysis to account for any missing data (i.e.,
all participants who completed screening measures were included in analyses). This model was then expanded to include program type to measure changes in symptoms for each of the three programs. For those with at least moderate symptom scores (10+) on the PHQ-9 and GAD-7 [23][24], and 19+ on the stress subscale of the DASS-21 [22], recovery was calculated by a reduction of 50% (at 8 weeks and at 3 months) in the symptom scores reported at baseline for depression, anxiety, and stress [25].

For the SAT, following a descriptive analysis of the quantitative questions, a thematic analysis of the qualitative questions was used to establish common themes regarding what participants liked most and least liked about the iCBT interventions [26]. Following a comprehensive analysis and interpretation of raw data, initial themes were generated, coded, and these were then reviewed by a co-researcher.

The semi-structured phone interviews were analyzed using content analysis, which is a means of identifying and interpreting patterns within a qualitative data set. These patterns can be coded across participants and quantified [27]. All of the responses were reviewed by two of the researchers, who first independently developed codes, then met in person to agree on codes and resolve discrepancies, and finally sorted the responses accordingly. For example, responses to the question of why students chose to use SilverCloud were coded as “scheduling and convenience” or “level of comfort with in-person counseling.” The percentage of participants whose responses fell into each code was calculated.

**Results**

*Feasibility*

Participants were recruited between September 2015 and May 2017. Those who expressed interest (n = 182) were sent a link with more information and invited to use the online platform. Of those invited, 102 (56%) opted into the study (75 from student counseling services, 20 from the mental health clinic, and 7 from the international student office) and engaged in their chosen program. The majority chose *Space from Anxiety* (n = 52, 51%), a smaller percentage chose *Space from Depression* (n = 31, 30%), and a minority chose *Space from Stress* (n = 19, 19%). Among the 102 participants, 53 (52%) completed outcome assessments at 8 weeks. Of those 53, 42 (79%) completed
assessments at 3 months. A further 8 participants provided data at 3 months but not at 8 weeks.

**Baseline characteristics**

The sample of 102 participants was mostly female (74%), white (80%), and in the 18-21 age group (55%). A small percentage were international students (12%). Most were undergraduate students (60%), working part time (50%), and single/dating (65%). The mean baseline PHQ-9 score was 9.5 (SD = 5.1), the mean baseline GAD-7 score was 9.4 (SD = 4.6), and the mean baseline DASS stress score was 8.5 (SD = 4.3).

**Acceptability**

The mean number of logins per participant was 14.3 (SD = 12.1). Mean total time spent on the platform was 295.7 minutes (SD = 377.3) and the mean time spent using the platform per session was 27.4 minutes (SD = 33.8). The mean number of page views was 110.7 (SD = 92.5); mean modules completed was 4.4 (SD = 2.6); and mean number of journal entries was 6.0 (SD = 8.2). Participants completed a mean 53.4% (SD = 37.6) of the total program content.

**Effectiveness**

Table 1 shows the means and standard deviations for each of the three measures at all three timepoints, along with the effect sizes (Cohen’s d) comparing 8-week and 3-month scores to the baseline scores. The linear model showed a significant decrease in mean PHQ-9, GAD-7, and stress subscale of the DASS-21 scores from baseline to 8 weeks, and from baseline to 3 months.

<table>
<thead>
<tr>
<th></th>
<th>Baseline mean (SD)</th>
<th>8 week mean (SD)</th>
<th>Cohen's d (95% CI)</th>
<th>3 month Mean (SD)</th>
<th>Cohen's d (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHQ-9</td>
<td>9.5 (5.1)</td>
<td>6.5 (4.1)**</td>
<td>0.63 (0.28 – 0.96)</td>
<td>7.1 (4.8)**</td>
<td>0.48 (0.13 – 0.82)</td>
</tr>
<tr>
<td>GAD-7</td>
<td>9.4 (4.6)</td>
<td>6.9 (4.8)**</td>
<td>0.54 (0.20 – 0.87)</td>
<td>6.1 (4.1)**</td>
<td>0.74 (0.39 – 1.09)</td>
</tr>
<tr>
<td>DASS-21</td>
<td>8.5 (4.3)</td>
<td>6.3 (4.2)**</td>
<td>0.52 (0.18 – 0.85)</td>
<td>5.2 (3.9)**</td>
<td>0.79 (0.44 – 1.14)</td>
</tr>
</tbody>
</table>
Table 1: mean (standard deviation) scores for PHQ-9, GAD-7, and stress subscale of DASS-21 at baseline, 8 weeks, and 3 months. **P < .001 for difference between means.

Analysis by program type

The means and standard deviations by program type, for baseline through 3 months, can be seen in Table 2, alongside the effect sizes (Cohen’s d) for the difference between 8-week and 3-month means compared to baseline.

<table>
<thead>
<tr>
<th></th>
<th>Baseline mean (SD)</th>
<th>8 week mean (SD)</th>
<th>Cohen's d (95% CI)</th>
<th>3 month Mean (SD)</th>
<th>Cohen's d (95% CI)</th>
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<tbody>
<tr>
<td>Space from Depression</td>
<td></td>
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<tr>
<td>PHQ-9</td>
<td>11.3 (5.8)</td>
<td>6.2 (4.3)**</td>
<td>0.96 (0.60 – 1.30)</td>
<td>7.3 (6.5)**</td>
<td>0.66 (0.31 – 1.01)</td>
</tr>
<tr>
<td>GAD-7</td>
<td>7.2 (4.3)</td>
<td>5.4 (4.8)*</td>
<td>0.40 (0.07 – 0.73)</td>
<td>5.2 (3.6)*</td>
<td>0.49 (0.14 – 0.83)</td>
</tr>
<tr>
<td>DASS-21</td>
<td>7.3 (4.8)</td>
<td>4.8 (3.2)*</td>
<td>0.58 (0.24 – 0.91)</td>
<td>3.4 (2.2)**</td>
<td>0.94 (0.58 – 1.29)</td>
</tr>
<tr>
<td>Space from Anxiety</td>
<td></td>
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</tr>
<tr>
<td>PHQ-9</td>
<td>8.4 (4.4)</td>
<td>6.1 (4.1)*</td>
<td>0.53 (0.20 – 0.87)</td>
<td>7.3 (4.3)</td>
<td>0.25 (0.09 – 0.59)</td>
</tr>
<tr>
<td>GAD-7</td>
<td>10.9 (4.3)</td>
<td>7.5 (4.9)**</td>
<td>0.75 (0.41 – 1.09)</td>
<td>6.7 (4.6)**</td>
<td>0.95 (0.59 – 1.30)</td>
</tr>
<tr>
<td>DASS-21</td>
<td>9.0 (3.9)</td>
<td>6.8 (4.6)*</td>
<td>0.53 (0.19 – 0.86)</td>
<td>6.0 (4.9)**</td>
<td>0.71 (0.35 – 1.05)</td>
</tr>
<tr>
<td>Space from Stress</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHQ-9</td>
<td>9.3 (5.0)</td>
<td>7.9 (4.0)</td>
<td>0.30 (0.04 – 0.63)</td>
<td>6.3 (2.8)*</td>
<td>0.68 (0.33 – 1.02)</td>
</tr>
<tr>
<td>GAD-7</td>
<td>9.0 (4.2)</td>
<td>8.0 (4.2)</td>
<td>0.24 (0.10 – 0.57)</td>
<td>6.3 (4.1)*</td>
<td>0.65 (0.30 – 0.99)</td>
</tr>
<tr>
<td>DASS-21</td>
<td>9.3 (4.1)</td>
<td>7.4 (4.5)*</td>
<td>0.45 (0.11 – 0.78)</td>
<td>5.9 (3.0)**</td>
<td>0.90 (0.54 – 1.25)</td>
</tr>
</tbody>
</table>

Table 2: mean (standard deviation) scores for PHQ-9, GAD-7, and stress subscale of DASS-21 at baseline, 8 weeks, and 3 months, according to program type. *P < 0.05  **P < 0.01 according to linear mixed model.

The mixed effects linear model for depression as measured by the PHQ-9 (Figure 1) showed highly significant changes in scores over time for those who chose the Space from Depression program (F = 13.7, P < .001) with positive changes from baseline to 8-weeks (mean difference 5.0, 95% CI 3.0 – 7.1) and 3-month (mean difference 4.3, 95% CI 2.1 – 6.4) follow-up. Those who chose the Space from Anxiety program had non-significant decreases in PHQ-9 scores over time (F = 2.4, P = .09), with scores at 8 weeks
(mean difference 1.9, 95% CI 0.2 – 3.6), and 3 months (mean difference 1.1, 95% CI -0.7 – 2.9) decreasing slightly. The decrease in depression symptoms in those who chose the Space from Stress program was significant ($F = 3.0, P = .04$), and changes at 8 weeks (mean difference 2.0, 95% CI -0.7 – 4.7), and 3 months (mean difference 3.1, 95% CI 0.3 – 5.7) higher than those in the Space from Anxiety program. The overall effect for depression according to the model was $F = 6.36, P < .001$.

Figure 1: Linear mixed model adjusted PHQ-9 scores over time, by program type

The GAD-7 scores for all three program types significantly decreased over time according to the linear mixed model (Figure 2). The largest effect was among those who chose the Space from Anxiety program ($F = 13.6, P < .001$), with decrease in scores at 8 weeks (mean diff. 2.5, 95% CI 1.1 – 3.9) and 3 months (mean diff. 3.6, 95% CI 2.1 – 5.0). Those in the Space from Depression program had a significant decrease over time ($F = 5.9, P = .01$) and scores decreasing at 8 weeks (mean diff 2.6, 95% CI 0.3 – 3.9) and 3 months (2.7, 95% CI 1.0 – 4.4). Finally, those in the Space from Stress program also showed significant decrease over time ($F = 4.3, P = .01$) and lower scores at both 8 weeks (mean diff 1.4, 95% CI 0.7 – 3.6) and at 3 months (mean diff. 3.0, 95% CI 1.0 – 5.0). The overall effect for anxiety according to the model was $F = 7.97, P < .001$. 

11
The DASS-21 stress scores in the linear model also showed significant decrease over time among all program types (Figure 3). Space from Stress ($F = 6.0, P = .01$) users decreased stress scores at both 8 weeks (mean diff. 2.3, 95% CI 0.2 – 4.5) and 3 months (mean diff. 3.5, 95% CI 1.4 – 5.5). Space from Anxiety ($F = 6.7, P = .01$) users decreased their scores at 8 weeks (mean diff. 1.7, 95% CI 0.3 – 3.0) and 3 months (mean diff. 2.6, 95% CI 1.1 – 4.0). Finally, Space from Depression ($F = 12.8, P < .001$) users also decreased scores at both 8 weeks (mean diff. 2.8, 95% CI 1.1 – 4.4) and 3 months (mean diff. 4.3, 95% CI 2.6 – 6.0). The overall effect for stress according to the model was $F = 8.50, P < .001$. 

Figure 2: Linear mixed model adjusted GAD-7 scores over time, by program type
Recovery

Among participants with 8-week follow-up data, 27 had clinically meaningful symptoms on the PHQ-9 at baseline (at least moderate depression) and thus were eligible for recovery (i.e., PHQ-9 symptom score reduction of more than 50%). Of these, 13 (48%) had recovered, 11 (41%) had less than a 50% decrease in symptoms, and 3 (11%) had increased symptoms. Of the 26 participants with at least moderate depression at baseline that had available data at 3 months, 10 (38%) had a 50% or more reduction in their PHQ-9 scores, 11 (42%) had less than a 50% decrease, and 5 (19%) had an increase in depression symptom scores.

Of those with GAD-7 scores reflecting clinically meaningful (moderate or severe) symptoms at baseline, 25 had 8-week data available, and of these, 8 (32%) had recovered, 11 (44%) had a less than 50% decrease in symptoms, and 6 (24%) had an increase in symptoms. At 3 months, data were available for 25 participants and 10 (40%) of these were in remission, 9 (36%) had a decrease that was less than 50%, and 6 (24%) had increased anxiety scores.
On the DASS-21 stress subscale, of those with at least moderate symptoms of stress at baseline and data at 8 weeks (n = 20), 9 (45%) were recovered, 7 (35%) had a decrease less than 50%, and 4 (20%) had an increase in stress scores. At 3 months, of those with available data (n = 19), 10 were still in recovery (53%), 8 (42%) had a decrease in symptom scores less than 50%, and 1 (5%) participant had an increase in stress scores.

**Satisfaction**

The SAT questionnaire was included as part of the 8-week follow-up and thus given to all 53 participants who responded to the other follow-up questionnaires at 8 weeks. Four quantitative questions produced the following results: Q1) ‘I was happy to use the computer to access treatment’: 83% agreed/strongly agreed, 13% were neutral, 4% disagreed; Q2) ‘I found the online treatment easy to use’: 82% agreed/strongly agreed, 13% were neutral, 5% disagreed; Q3) ‘I feel the treatment received will have a long lasting effect’: 45% agreed/strongly agreed, 38% were neutral, and 17% disagreed/strongly disagreed; and Q4) ‘Please rate how helpful you found the online treatment programme’: 69% found it helpful/very helpful, 27% found it not really/not at all helpful, and 4% had no opinion.

On the two open-ended questions, participants reported different helpful aspects of the iCBT intervention which were grouped into three categories: the delivery format (n=16), the content and CBT tools (n=13), and the supporter (n=1). In addition, participants indicated a number of unhelpful aspects grouped into the categories of format of support (n=8), lack of tailoring (n=6), and internal factors (n=4).

With regard to **format of the delivery**, participants reported the online format to be helpful owing to convenience, flexibility, time management, access, and feeling in control of the pace of the use of the intervention. The following example user quotes support these aspects of the format of delivery:

“I could do it on my time when I wanted to. If I felt anxious or nervous or I had a bad day, I could just log on for a few minutes and focus on myself.”

“As a student it makes it easier to focus on my mental health in my free time. Scheduling mental health appointments can be stressful, but I can do this whenever and it just makes it a lot easier.”
In addition, aspects of the content of the intervention and specific CBT tools were identified as helpful to participants. In general, participants noted how they learned from the intervention and that they used various tools to learn new skills. Specifically, participants indicated that the mood monitor, activity scheduling, and journal were particularly helpful tools.

“I really liked the online journal, which is what I mostly used to express my feelings.”

“I feel like I learned a lot more about each CBT technique than I did when I was enrolled in in-person counseling”

The Supporter was also important in the delivery of the intervention.

“I like supporter’s review the most. The fact that some professional is willing to invest their time in following my activities for the treatment means a great deal to me.”

Participants found two aspects of the format in which the support was delivered to be unhelpful. The first was that in person counseling would have been preferred:

“The fact that it’s online. I personally prefer in-person meetings”

“I felt like it was more difficult to convey how I was feeling on an online platform than it would have been in in-person counseling. This was due to a lack of a connection I felt with my supporter (in comparison to in-person counseling) and because there is only so much I could convey in writing (in comparison to face-to-face conversations).”

The second theme focused on the reviews that supporters gave to participants.

“I was hoping it would be a little more interactive, where I would have more feedback with a therapist about my individual problems and things that are specific to me.”

Some participants reported a lack of tailoring to their specific needs. For example, the content was perceived to be too generic, or not applicable for those who had done CBT before.

“Some of the activities were hard or didn’t really apply to my situation.”

Lastly, internal factors including motivation and assuming responsibility for a self-administered intervention and being busy contributed to participants finding the experience unhelpful.

“Not quite as good at holding me accountable for doing it as an actual appointment.”
“Not a ton of motivation to finish a session every week, sometimes I would forget. Maybe reminder emails or an app would be helpful?”

Structured interviews

The structured interviews provide further information regarding how students perceived the SilverCloud programs. Their responses are grouped into three categories: accessing SilverCloud, specific aspects of SilverCloud, and satisfaction with the SilverCloud programs.

Accessing SilverCloud

The interviewer asked students how they found out about the program and why they chose to use it. Most students found out about the intervention on the internet (79%) in the process of looking for mental health treatment. All the participants mentioned scheduling and convenience as a reason for using the online programs over in-person therapy. Some also noted that they did not feel comfortable with the idea of in-person counseling, citing worries about confidentiality and intensity (29%). Only one had done anything like it before.

Students were also asked when they used the program. Their responses were divided: some scheduled specific times for it (71%); some used it when they were feeling depressed, anxious, or stressed (57%); and others worked on it when they had free time (29%). For those who used it on more than one of these occasions ($N = 7$), there were mixed results in terms of when it was perceived to be most effective. Some described being able to get more out of it when they were not distressed, as they could approach it with a clear mind; others noted that it was most helpful when they were feeling distressed. One student noted that it was particularly helpful to journal when they were feeling distressed, but that they read the informative parts of the modules when they were not feeling distressed.

Specific Aspects of SilverCloud

In general, students appreciated having choices about different aspects of the intervention. For example, students were asked what they thought about the ability to complete the intervention in any order. Most enjoyed this about the program (94%), as it allowed them to access the parts they wanted, and also allowed them to go back and
engage with previous parts of the program that they found helpful. However, one was
unaware that it could be completed in any order, and others completed it in order
anyway (21%). Students generally reported feeling positive about having a choice about
whether they used the stress, anxiety, or depression program (57%), although some
would have preferred to be assigned one (14%), and some were confused about the
process (14%). One student specifically expressed that they would have liked to access
multiple programs.

The interview also included questions about having a supporter. Almost all
participants appreciated having a supporter (93%), and some noted that they
specifically liked receiving feedback on the exercises (36%). Some participants also said
that the supporter helped them feel accountable (14%), so that they were more
motivated to continue the program. Almost all (79%) of the participants would have
liked more from the supporter. Participants specifically wanted more detailed and
personalized feedback and felt like they lacked a connection with the supporter. Some
participants would have liked to be able to speak directly with their supporter over the
phone or video chat service.

Satisfaction with SilverCloud programs

When asked how they felt about using SilverCloud, some participants noted that
they felt positive about the program and that it met their needs (43%), others expressed
more mixed feelings (43%), and others did not find it helpful (14%). Some students
with mixed feelings felt like it was helpful to some degree, but also felt like they would
need to seek other treatment to more fully address their concerns; another student
noted that they learned a lot, but had not yet noticed a change in symptoms.

Those who had experience with in-person therapy (57%) were asked how that
experience compared with using SilverCloud. They noted strengths and weaknesses of
both. In-person therapy was described as more personalized, specific, and flexible in
terms of content. Some specifically noted that SilverCloud could not replace in-person
therapy, and one noted that they felt like the program would have been more helpful for
them if they had not already done in-person therapy. Participants generally noted that
SilverCloud was more flexible in terms of time and was less intense than in-person
therapy, and one person specifically noted that they liked SilverCloud better than in-
person therapy. When directly asked, most participants (79%) had positive reactions to
the idea of completing SilverCloud in conjunction with in-person therapy, as this would help address the issue of personalization. Some suggested that they would like to see their supporter in person infrequently while using SilverCloud in between sessions. One student noted that, having used SilverCloud, they would be more likely to try in-person therapy. One participant sought additional mental health treatment while they used SilverCloud.

Discussion

The aims of this mixed-method study were to assess feasibility, acceptability, effectiveness, and satisfaction with internet-delivered CBT interventions embedded within the care delivery system of a large university. Below we discuss key findings along with limitations and future directions.

The feasibility of offering the iCBT interventions as part of service delivery at the university was evaluated primarily in terms of the number of students who expressed interest and began one of the programs. Approximately 100 students began a program, which was 56% of those who received an invitation and brief overview. Thus, it is feasible to incorporate iCBT into service delivery. It is important to note that most students who were referred to iCBT were seeking in-person counseling; the number recruited might be higher among students who were not already seeking this kind of care. In addition, more students likely would have been recruited if we had launched a larger marketing campaign. It is not clear whether fewer students were recruited from the international student office because of cultural differences related to the acceptability of help-seeking or some other reason, although that is something to explore in future research.

Acceptability was assessed in terms of the extent to which participants used the program after they began. Participants logged in approximately 14 times and had an average of 110 unique page views, spent almost 300 minutes total and roughly 27 minutes per session on the platform, and completed roughly 4.5 modules. They also submitted an average of 6 journal entries. In total participants navigated through approximately 50% of the program content. One systematic review found similar results, with users completing 50-70% of the content in online interventions [28]. A possible reason behind the completion rates may be that users who have obtained a
desired outcome stop usage altogether. It would be beneficial to identify adherence thresholds needed to achieve desired outcomes in future research.

With regard to effectiveness, symptoms of depression, anxiety, and stress decreased over time in users of all three programs, with medium to large effect sizes. The results are in line with previous research on the SilverCloud *Space from Depression* program [29]. A recent RCT [30] measuring the effects on stress of an online and app-based intervention on college students found similar medium effect sizes (0.59 at 7 weeks) to the ones reported in our study for the stress subscale of the DASS-21 at 8 weeks (0.45 – 0.58), although our study had large (0.71 – 0.94) effect sizes at 3-month follow-up (vs a 3-month effect size of 0.67 in this RCT). In general, the largest decreases in symptoms occurred in the programs targeting those symptoms; for example, the largest reduction in anxiety symptoms was among those who used the *Space from Anxiety* program. This suggests the benefit of tailoring programs for the type of symptoms individuals present [31].

The recovery rates indicated large reductions in symptoms for many users, and the percentage of participants that achieved recovery at 8-weeks and at 3-months were similar. These results positively reflect on the clinical utility of the intervention and its ability to maintain clinical changes beyond the acute treatment period. However, slightly fewer subjects completed the measures at the 3-month follow-up, and it is unclear if those who dropped out maintained their gains. These results are similar to other research on SilverCloud [29] and previous work in the field of internet-delivered interventions. For instance, clinical recovery rates between 25% and 49% have been reported [32][33][12].

Finally, participants’ responses to the satisfaction questionnaire and the interviews suggested several strengths and limitations of the programs. Students generally found the programs to be helpful, with few saying that they found them unhelpful. Factors mentioned as helpful included flexibility, convenience, and having control over the pace of the intervention. Some students noted that they found the content of the interventions helpful, as well as the tools available to learn new skills. On the other hand, other students found that the content was not tailored enough to their specific needs. Participants also felt that having a supporter was helpful, although many wanted more contact with and feedback from the supporter. One solution is to offer students the opportunity to complete iCBT interventions along with less frequent (e.g.,
monthly) in-person therapy. Finally, despite having a supporter, some found it difficult to stay motivated to complete the program on their own, especially given busy schedules.

These results are consistent with another qualitative study of students’ perceptions of online interventions [14]. In both studies, participants used online interventions because of the scheduling flexibility. Additionally, participants from both studies called for interventions that were more personalized to their specific needs and life circumstances. Participants in the Fleischmann et al. study wanted greater flexibility in terms of the order in which they completed the program, and participants in the current study spoke positively of that flexibility. Future studies should examine whether this flexibility actually increases adherence, effectiveness, and satisfaction.

The current study also had strengths and limitations. Strengths include using both quantitative and qualitative methods to assess the feasibility, acceptability, effectiveness, and satisfaction of an online intervention as implemented within a campus service delivery system. The fact that students were able to choose the program they felt was the most appropriate for their needs was also a strength. Limitations include the lack of a control group and the lack of follow-up data on a sizable portion of the initial sample. Future trials could attempt to follow up with those dropping out altogether, as the reasons for dropout are important to understanding who benefits most from these interventions and what personal characteristics predict positive outcomes. Larger, controlled studies are merited to replicate these findings and to assess whether improving adherence improves outcomes.

In conclusion, we echo the call that online interventions are a useful addition to the list of solutions for addressing growing mental health service needs on campus [6]. Overall, the iCBT programs tested in our study appear to be feasible, acceptable, and effective in a university environment. Participants described the benefits of having a flexible, supported online intervention available on campus. Larger trials should be conducted to further test the significance of supported online interventions that also give students a choice of program depending on the profile of their symptoms of depression, anxiety, and stress. Improving the delivery and reach of these programs has the potential to positively affect students’ mental health at this key life stage.
**Competing interests**

JP is Clinical Researcher at SilverCloud Health. DR is Director of Clinical Research and Innovation at SilverCloud Health. The other authors declare no competing interests in relation to this study.

**References**


