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A Feasibility Study for Implementing and Evaluating an Internet-Based Cognitive Behavior Therapy Intervention in Rural School Settings and its Impact on Adolescent Mental and Behavioral Health

Katey Tuchscherer Franklin and Tamara Tribitt

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Abstract
Through a mixed-methods research design, the researchers explored the feasibility, acceptability, and efficacy of an internet-based Cognitive Behavioral Therapy (iCBT) program in a rural school setting. The program was developed to address the mental and behavioral health needs specific to adolescents in rural communities. In collaboration with a rural school district, students aged 13-18 participated in focus groups to provide insight into their experience of the youth iCBT program. Researchers also utilized results from the Beck Youth Inventories-Second Edition (BYI-2) and the Adolescent Substance Abuse Subtle Screening Inventory (SASSI-A2) to determine the efficacy of the youth iCBT program. Results of the study indicate that adolescents prefer to seek support services from a person in the school setting when they face challenges to their well-being. Additionally, results suggest there are no statistically significant changes to participants' levels of anxiety, depression, or substance use upon completion of the youth iCBT program.

Introduction

In collaboration with a select rural school system in the Rocky Mountain West, the research team of this feasibility study examined the receptiveness and efficacy of an internet-based Cognitive Behavior Therapy (iCBT) intervention designed to reduce symptoms of depression and anxiety for rural youth in a school setting. Researchers developed the iCBT intervention as a strategy to potentially mitigate substance use patterns in adolescents, too. Prior iCBT studies with adults in the Rocky Mountain West have shown internet-based interventions to be both acceptable to adult participants and effective at reducing depression and anxiety symptoms in addition to improving work and social functioning and resilience (Schure et al., 2018; Schure et al., 2019).

The research team conducting this pilot feasibility study aimed to assess participants' engagement and experience with the iCBT intervention program and understand trends in rural youth behavioral health data, including stressors rural youth encounter. This research significantly advances our understanding of the experience and impact of iCBT interventions designed to teach behavioral health skills to adolescents in rural communities. Additionally, the findings address current voids in iCBT receptiveness and efficacy studies among U.S. rural adolescents.

Literature Review

Adolescence is a critical developmental stage in which youth experience dramatic physical and cognitive changes that also greatly influence their socioemotional well-being (Dorn et al., 2019; Goldbeck et al., 2007; Steinberg & Morris, 2001). There are commonly known types of stressors that rural adolescents confront, including academics, peer pressure (bullying, relationship problems), family issues (interpersonal violence, substance abuse, grief/loss), and intrapersonal conflicts (self-esteem, personal expectations; Garbacz et al., 2022; Young & Lo Chau, 2017). Findings from several adolescent focus groups in rural high school communities confirmed these stressors while indicating how cell phone culture has added to the list of stressors and increased feelings of isolation and peer pressure (Schure et al., 2019). Adolescents who report a greater number of these types of stressors also report experiencing greater depression symptom severity (Young & Lo Chau, 2017), which places them at increased risk for substance use, self-harming, and other negative coping behaviors with notable health- and academic-related problems in later adolescence and early adulthood (Burns et al., 2004; Scaramella & Keyes, 2001; Schure et al., 2019; Wilkinson et al., 2016).

Moreover, access to behavioral health and mental health care remains a high priority for rural youth (Bolin et al., 2015; Garbacz et al., 2022). Suicide rates among youth have substantially increased, with rural youth rates being nearly two-fold more significant than that of urban youth (Fontanella et al., 2015). Researchers have also discovered that rural youth experience greater cumulative risk than urban youth (Spoth et al., 2001). For example, recent separate analyses conducted by the National Survey on Drug Use and Health found that rural adolescents have greater alcohol consumption, methamphetamine use, and prescription opioid misuse when compared to their urban counterparts; and the more rural the environment, the greater the prevalence of use (Carmona et al., 2020; Lambert et al., 2008; Monnat & Rigg, 2016). Recently, and in response to the COVID-19 pandemic, youth mental health across the United States seems to have catapulted to a state of emergency (Meyers, 2021). The stressors related to a lack of understanding and fear regarding the pandemic deprived children and adolescents of developmental and neurological stimulation, thus further impacting their mental well-being

(Meyers, 2021). Adolescents in rural communities contend with unique stressors that call for greater access to behavioral and mental health treatment opportunities.

Mental and behavioral health resources are lacking, and an unmet need exists for the youth living in those communities (Anderson & Gittler, 2005; Garbacz et al., 2022). Adolescents are challenged by personal, environmental, and systemic matters when seeking and obtaining adequate mental and behavioral health care in rural communities (Boydell et al., 2006). Barriers such as a lack of services, the absence of practitioners, the decreased use of evidence-based practices, and greater distance to care exemplify the minimal accessibility and availability that negatively impact rural areas (Substance Abuse and Mental Health Services Administration [SAMHSA], 2016). For example, outpatient substance use treatment services are almost four times less available in rural hospitals (12.1%) than in urban hospitals (43.7%; Freeman et al., 2015). Rural adolescents also perceive they have less access to school-based mental health services compared to their urban counterparts (65% compared to 71%; Croft et al., 2020). Additionally, adolescents in rural communities contend with rural residents' negative perceptions toward mental health treatment, therefore, accessing care becomes an issue for individuals living in small rural towns (SAMHSA, 2016). Adolescents in rural communities encounter multiple barriers that negatively impact their mental well-being.

To overcome some challenges in rural communities when adolescents seek mental and behavioral health services, practitioners might explore creative means to provide services. Internet-based Cognitive Behavioral Therapy interventions have the promise to address many of the aforementioned challenges associated with mental and behavioral healthcare access. These interventions are evidence-based and have been shown to be effective in general populations as well as rural populations (Andersson & Cuijpers, 2009; Andersson et al., 2014; Andrews et al., 2018; Vallury et al., 2015). Fully automated (no in-person assistance) iCBT interventions also address the accessibility and availability of service challenges for rural communities. Recently, researchers focusing on the state of Montana suggested that fully automated iCBT programs are also acceptable to rural adult residents (Schure et al., 2018). Findings from a randomized controlled trial with adult Montana residents indicated substantial 8-week improvements in depression and anxiety symptoms, social functioning, and resilience with sustained positive impact one year later after implementing the fully automated iCBT program (Schure et al., 2018; Schure Lindow, & Greist, 2019). These results, combined with increasing broadband access in U.S. rural communities (Armstrong, 2017), suggest that effective iCBT interventions may expand the availability of low-cost, effective depression and anxiety care. Interventions like iCBT programs may provide an appealing alternative or complementary behavioral health care for rural populations (Berry & Lai, 2014; Karyotaki et al., 2017; Lorenzo-Luaces et al., 2018). Internet-based Cognitive Behavioral Therapy interventions may be as effective for adolescent populations in rural areas.

To date, there is a scarcity of studies focusing on the acceptability and efficacy of iCBT interventions for youth, particularly adolescents. For this study, acceptability is defined as a participant's perception of whether or not mental or behavioral health resources are acceptable for their ease of use. One study in Sweden showed computerized CBT (cCBT) to be acceptable to both children and adolescents (Vigerland et al., 2014). Another study in Australia examined the efficacy of an iCBT intervention for anxiety disorders among children aged 7-12 years and found

significantly greater reductions in anxiety symptoms among the treatment group versus the waitlist control group (March et al., 2008). Similar results were found for adolescents aged 12-18 (Spence et al., 2011). It is worth noting that participants in both Australia-based studies had either parent or therapist support in addition to access to the iCBT intervention (March et al., 2008; Spence et al., 2011). A systematic review of the efficacy of cCBT and iCBT interventions in addressing depression and anxiety symptoms among rural residents concluded that these types of interventions are equally effective among rural users and urban users (including adolescents and/or adults) and may have greater acceptability among rural users (Vallury et al., 2015). Yet, this review did not include any U.S. rural residents. Few identified studies have examined the acceptability and efficacy of iCBT interventions among U.S. adolescents and rural residents. The only known U.S.-based iCBT study included children aged 7-13 years and demonstrated both the acceptability and efficacy of these types of interventions (Khanna & Kendall, 2010). However, Khanna and Kendall's study (2010) was not specific to rural communities. Research has not focused solely on adolescents in rural communities and their distinct needs.

Conceptual Framework

The purpose of this study was to investigate the feasibility, acceptability, and efficacy of an iCBT program specific to rural adolescent populations. The youth iCBT program was developed using a Cognitive Behavior Therapy (CBT) approach of psychotherapy and data was collected from adolescent focus groups. The research team customized a youth iCBT program to be developmentally appropriate for youth ages 13-18. To date, this is the only youth iCBT program intended to address the simultaneous presentation of substance use behaviors and depression/anxiety in adolescents living in rural communities.

Development and Design Content of the Youth iCBT Program

The research team created the youth iCBT Program using a CBT theoretical orientation. Cognitive Behavior Therapy is a structured form of psychotherapy that seeks to replace dysfunctional thought patterns and behaviors with more adaptive ones. It identifies and challenges negative thinking patterns and targets areas for improving behaviors. By changing the interaction of thinking and behaviors, people are more likely to feel better about themselves (Corey, 2019). Because CBT is a structured form of therapy, practitioners can emulate this approach by using software in the form of iCBT programming (Schure et al., 2019). If the youth iCBT program can facilitate a change in the interaction of adolescents' thinking patterns and behaviors, a CBT lens would say there is likely to be a change in levels of anxiety, depression, and substance use.

To ensure the content of the youth iCBT program was developmentally appropriate, the research team conducted in-depth preliminary focus groups with youth ages 13-18 in rural school communities in the Rocky Mountain West in an unpublished study (Schure, O'Neil, & Franklin, 2019). The researchers collected data from participants regarding relevant stressors, their perception of available behavioral health resources, their attitudes/thoughts about addiction, and their acceptability of an online behavioral health program (Schure, O'Neil, & Franklin, 2019). Qualitative data was used to develop content for the youth iCBT program.

Youth iCBT Program

Using CBT techniques, the researchers created the youth program to be an innovative iCBT program that teaches coping strategies and addresses symptoms of depression and anxiety in

youth ages 13-18 years old and is applicable in rural communities. The program delivers CBT skills through a fully automated, structured, and guided curriculum consisting of interactive tools and sophisticated algorithms that automatically adjust the course to meet adolescents' needs as they move through the program. Moreover, the program uses asynchronous, didactic video segments, averaging 80 seconds in length, to deliver CBT skills content. The use of videos in iCBT may improve participant engagement (Gega et al., 2004). The videos in the youth program explain CBT concepts, demonstrate skills, provide feedback and recommendations, and portray developmentally appropriate case histories of characters who used CBT to combat depression, anxiety, and substance use. To ensure the youth program remains developmentally appropriate, the research team wrote scripts for the videos that do not exceed the 6.5-grade reading level.

The technology used in the youth iCBT program is metamorphic and responds to participants' cues. The program recommends a module based on the participant's reported symptoms. Modules in the youth iCBT program include,

I. Assertive Communication: Informed by the social skills training technique, participants learn how to speak with others clearly and with confidence in this module.
II. Constructive Thinking: Grounded in the cognitive restructuring technique, participants learn to spot unreasonable thinking patterns affecting their mood and how to replace them with more constructive thoughts when engaged with this module.
III. Rewarding Activities: Similar to the behavioral activation technique, this module offers participants the opportunity to learn how to overcome challenges preventing them from engaging in hobbies, social activities, and exercise.
IV. Comorbid Conditions (the presence of depression/anxiety and addictive behaviors): This module focuses on identifying underlying stressors and the normative experience of stress. Participants identify coping strategies that are adaptive to sustainable well-being. It also provides developmentally appropriate information about maladaptive or avoidant coping strategies such as potential behavioral process addictions (e.g., overuse of electronics, excessive video gaming, preoccupation with social media, over-exercising, shopping, binging, gambling, etc.). Content regarding substance abuse as a maladaptive coping strategy for normative adolescent stress is also included in this module to better support the participant.

The youth iCBT program provides safeguards and guidance if the program is not working effectively. For example, if the participant indicates no improvement, a scripted message will inform them to consider switching modules or suggest they pursue personalized help outside the program. If the participant indicates having thoughts of suicide, the program automatically asks whether they can stay safe, provides pertinent resources, and instructs the user to seek immediate help. This program is innovative and the first known type of a tailored, interactive iCBT program to address comorbid (the presence of addiction and depression/anxiety) conditions for adolescents.

Methods

As this is a pilot feasibility study, the research team employed a mixed-methods design with two complementary research components. Mark and Shotland (1987) suggested that one reason researchers choose to implement a mixed-methods approach is to address complementary

purposes by utilizing different methods to achieve the study's goals. A form of complementary purposes "involves alternative tasks, where the two methods do not address the same research question but rather focus on distinct but conceptually related questions" (Mark & Shotland, 1987, as cited in Hesse-Biber & Johnson, 2015, p. 25). The conceptually related research questions for this study are: 1) Is it feasible and acceptable to implement an iCBT intervention designed for adolescents to address symptoms of depression and anxiety and to reduce substance use tendencies in rural school settings and 2) Is a youth iCBT program effective in reducing symptoms of anxiety and depression and to reduce substance use tendencies for adolescents in rural school settings?

To address these research questions, the research team focused on two complementary aims. To address the first aim, the researchers utilized generic qualitative inquiry (Percy et al., 2015). Researchers implemented student focus groups to collect data from participants about their perspectives and experiences of the iCBT intervention designed specifically for adolescents in a rural setting. Researchers also examined participants' experience of both stress and coping strategies in the first aim (hereafter referred to as Aim One). Generic qualitative inquiry allows researchers to investigate participants' "reports of their subjective opinions, attitudes, beliefs, or reflections on their experiences of things in the outer world" (Percy et al., 2015, p. 78). The research team was more interested in collecting "a broad range of opinions, ideas, or reflections" rather than conducting a deep examination of participants' lived experiences (Percy et al., 2015, p. 79). As such, generic qualitative inquiry was a suitable methodology for Aim One. Additionally, this methodology may have practical implications for mental and behavioral health needs in the rural school environment.

To address the second aim of the study, the researchers utilized a quasi-experimental, within-subject, time series research design to collect self-reported data on symptoms of depression, anxiety, and substance use behaviors before and during engagement with the youth iCBT program at baseline, 2-, 4-, and 6-week periods (hereafter referred to as Aim Two). A quasi-experimental, within-subjects, time series research design offers several advantages when studying youth participants in the school setting as each participant serves as their own control, which allows for greater statistical power, greater control over the experiential conditions, and increased internal validity (Heppner et al., 2008; Scantlebury et al., 2017). Also, the within-subject design allows for a smaller participant population in the rural school setting. The results from the data collected may inform future dissemination, collaboration, and implementation of such interventions in rural school settings.

Participants

The research team partnered with two rural high schools in the Rocky Mountain West and requested that students associated with the research sites participate in this study. All participants were assigned a pseudonym to maintain anonymity. The researchers used purposive sampling methods to recruit participants with inclusion criteria defined as 1) enrolled in a health enhancement class in one of the selected high schools; 2) aged 13-18 years; 3) fluent in English; 4) have access to an active email account; and 5) have regular access to broadband internet. A total of 67 students participated, of which 33 self-identified as female and 34 self-identified as male. All participants were between the ages of 13 and 18. Student participant incentives included a $50 Amazon gift card for all who completed each element of the study.

Data Collection

The research team collected data utilizing complementary methods to meet the standards of a mixed-method research design. To collect data relevant to Aim One, the researchers relied on a qualitative approach using focus groups. The researchers implemented a quantitative approach to collect data specific to Aim Two. The data collected provided credible results regarding the feasibility, acceptability, and efficacy of the youth iCBT program.

Aim One

With approval from school leaders and students' parents/guardians, the research team disseminated the iCBT program as part of the participants' Health Enhancement class curriculum. The researchers conducted a generic qualitative inquiry (Percy et al., 2015) using several focus groups. Data supporting Aim One was collected, in person, when the participants completed the iCBT program.

The research team engaged five student focus groups and conducted one round of semi-structured interviews. Each focus group consisted of eight to twelve students and was approximately one hour long. Example questions asked of the participants included a) what are some examples of emotional stress that you or your peers typically deal with?; b) did you find the characters and the characters' stories in the iCBT program to be relevant or similar to your life?; and c) did you find any aspects of the iCBT program experience to be uncomfortable? Each focus group was recorded and transcribed for data analysis using secure strategies to ensure participant confidentiality.

Aim Two

To determine if the youth iCBT program influenced participants' symptoms of depression, anxiety, and substance use behaviors, the researchers utilized a within-subjects time series design. Participants were given the Beck's Youth Inventories-Second Edition (BYI-2) and the Adolescent Substance Abuse Subtle Screening Inventory (SASSI-A2) at baseline, 2-week, 4-week, and 6-week periods.

The research team used the BYI-2 to assess participants' experienced symptomatology of depression and anxiety. The BYI-2 consists of five self-report questionnaires, each 20 questions, that assess symptoms/experiences of depression, anxiety, anger, self-concept, and disruptive behavior (Beck et al., 2005). Each questionnaire takes approximately 10 minutes to complete, depending on the participant's age and reading level (Beck et al., 2005). The BYI-2 is intended for children and adolescents ages 7 to 18 and has demonstrated good reliability and moderate validity in this population (Community-University Partnership for the Study of Children, Youth, and Families, 2011). This assessment aligns with co-occurring symptom criteria specific to anxiety and depression from the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2013). The researchers focused on the subscores for depression (BDI) and anxiety (BAI) for the purposes of this study.

Additionally, the research team used the Adolescent Substance Abuse Subtle Screening Inventory (SASSI-A2) to assess participants' substance use attitudes and behaviors. The SASSI-A2 helps identify the probability of substance dependence and substance use disorders in

adolescents and provides clinical insight into family and social risk factors, level of defensive responding, and consequences of substance misuse (Miller & Lazowski, 2001). This assessment is composed of 100 items divided into 12 subscales and targets youth ages 12 to 18. Typically, the SASSI-A2 takes about 10 to 15 minutes to complete. The assessment has proven to have high test-retest reliability, and research indicates the results are highly accurate while aligning with clinical criteria and diagnosis of substance use disorders (American Psychiatric Association, 2013; Lazowski & Miller, 2001). The SASSI-A2 is a practical assessment for the student population in this study.

For participant safety, it was the academic research team's role and responsibility to promptly score participants' assessment results within 24 hours of completion. If any participants' assessment scores were in the "severe" or "clinically significant" categories for anxiety, depression, and/or addictive behaviors, the researchers enacted an established safety plan created in collaboration with the research site. The researchers promptly communicated with an identified school authority while maintaining confidentiality (e.g., student participant's name was shared as was an appropriate level of disclosure about a safety issue). If any student participant presented with safety concerns (e.g., suicidal ideation was reported), the parents/guardians were notified, and appropriate referrals were made to behavioral health clinicians in the community for further assessment or support.

Data Analysis

The researchers applied analytic processes appropriate for a mixed-methods research design. To analyze the data collected for Aim One, the researchers utilized thematic analysis compatible with generic qualitative inquiry. The data collected for Aim Two was analyzed using statistical tests appropriate for quantitative data analysis.

Aim One

Theoretical analysis was used to conduct the data analysis for Aim One. Theoretical analysis allows researchers to analyze pre-determined themes while remaining open to emergent themes (Percy et al., 2015). As this was a pilot study, the researchers were specifically interested in exploring the feasibility and acceptability of the youth iCBT program. Simultaneously, the researchers remained open to any themes that may have emerged outside of feasibility and acceptability. In alignment with the steps outlined by Percy et al. (2015), the procedure for analyzing that data contained two phases. The first phase included data familiarization and assigning data to the predetermined themes where appropriate. The second phase involved returning to the data to determine if there were any emergent themes. The results gleaned from the data analyzed in Aim One provide critical insight into participants' beliefs about and attitudes toward the youth iCBT program.

Aim Two

The research team employed a statistician to analyze the data collected in the quasi-experimental, within-subjects, timed series design. The BYI-2 and SASSI-A2 data were analyzed separately. For the BYI-2 analysis, the data was scrubbed, and the statistician utilized Stata statistical software to use a generalized mixed-effects regression model to understand the effects of the iCBT intervention on each outcome measure. This process used raw scores and t-scores for BAI and BDI, controlling for covariates that may be associated with each outcome. After initial

modeling efforts and visualization of data, there were no clear mean-variance relationships in the residuals when linear models were used for the scores. Instead, the statistician modeled log-transformed responses, which produced better diagnostic plots. For each model, a correlation structure for observations from the same student was engaged across each sample period. A simple random intercept mode (ANOVA) was used for comparison between an AR1 (autocorrelated with lag 1) model and an ARMA model with lag-2 autocorrelation. Once the correlation structure was established, an all-subsets regression was chosen to use the most parsimonious module among the covariates, their two-way interactions, and quadratic terms for continuous variables.

For the SASSI-A2 data sets, an initial visualization utilizing mosaic plots was used. Then, a Fisher's Exact test was used to deepen understanding of the data with a p-value of 0.1 and a 95% confidence interval.

Results

The results of this mixed-method inquiry have added to the existing literature in a manner that verifies findings from other studies and furthers the body of knowledge related to rural adolescents.

Aim One

The analysis of the data collected from the focus groups provided insight related to the feasibility and acceptability of the youth iCBT program. Through the coding process, three themes emerged from the data.

Acceptability: Preference for In-Person Support. Most participants reported a preference to engage with a trusted person when addressing mental health issues rather than seeking assistance via an internet-based application. Most participants declared they preferred in-person counseling, or support, when they are stressed over an online option. John, age 17, stated, "Having a counselor, or just having someone there to listen, would be a big advantage for teenagers." Also, the youth participants described a preference for this trusted person as part of the school community, as communication with parents/guardians can be challenging. Most participants listed a lack of understanding and communication from adults in their lives as one of their primary stressors and hurdles toward their own mental health. Sally, age 14, stated that when she goes "to [her parents] with a problem, it turns into a lecture when I really just want them to listen to me." Most participants voiced that they would prefer a personalized one-on-one experience with trusted school personnel when discussing their problems rather than an online option for support. Sage, age 14, said, "I would definitely rather talk to someone in person. Just having a real person to listen would be a real advantage because half of the time (teens) don't even want someone to talk back or tell them what to do, to help their problems. They just want someone to listen to them, to what they're going through. I have been there- I never wanted an opinion. I just wanted someone to listen to how I was feeling and what was happening to me".

Acceptability: Improvements to the Application. When examining if participants accepted the use of the youth iCBT program, the data suggest improvements to the youth iCBT program to increase its acceptability. Several participants suggested adding an integrated option to incorporate personalized feedback either through a chat option or question submission. This

addition could create feelings of connection and decrease the perception of artifice within the interface.

Some participants were ready to point out the youth iCBT program's utility in mitigating real-world situations and recognizing in themselves a need for further care and attention. Steven, 18, reported that the program helped normalize his experience because "it's a really big eye opener, because there's a lot of people that think 'oh it's just been a rough day, I'm fine,' and they're really not fine." Further, participants reported the youth iCBT program helped them understand their own experiences of anxiety and depression. Cedar, age 14, said, "I live with this every day, it was weird to see the scores and how bad I was actually feeling."

Participants strongly recommended that the application content needed significant improvements to make it more relevant and appealing to rural students, including more interactive elements (such as the chat feature), more pertinent content, shorter videos, and less repetition. Common areas listed as drawbacks were the repetitive nature of the lessons. Many stated the repetition featured in the interface proved to be boring. Markus, 15, shared that this repetition was a factor that made him reluctant to recommend the program to his friends, he was looking for a "more wide variety of things to do."

Other participants shared differing reactions to the content. Jane, one of the older students surveyed, age 17, responded that she found the situations depicted in the application to be relatable and appropriate. However, a younger student, age 14, claimed that all the videos were redundant and "were the same thing as the last one." Another participant, Sam, age 15, felt far less connected to many of the scenarios and even found some of them "awkward and hard to watch." While the reactions to the content varied, all participants offered ideas for improvement that would increase the youth iCBT program's acceptability.

Feasibility: Shortcomings of the iCBT Application. While participant's suggestions for improvements can be linked to the feasibility of implementing the youth iCBT program in school districts, they provided data that can be directly associated with the focus of this study. Participants made it clear that introducing the application as an additive component in their class rather than integrating it into a pre-existing curriculum made it far more difficult to engage with because it represented further work added to an already busy schedule. They also noted that it would be helpful if the application had specific instructions and was more user-friendly. Deven, a senior and 17 years old, suggested that a formalized approach to the material would facilitate engagement with the program "so that everyone could do it at the same time and get it done." Few students reported engaging with the application outside of designated class time.

The qualitative exploration in this mixed-methods study yielded three themes that capture participants' thoughts, attitudes, and feedback about the youth iCBT program. Although the specifics varied across the focus groups, the consensus was that the application had some utility amongst the participants. Most participants saw implementation as feasible and acceptable if major adjustments were made to the program. However, when considering acceptability only, participants were more in favor of seeking support from a trusted adult in the school building.

Rural Youth Experiences of Stressors. Another major theme that emerged from the data is related to the various sources of stress experienced by participants. Participants identified academic pressure as a primary stressor. The specifics of these stressors varied across participants, but the stressors consistently discussed were pressure to succeed, stressful extracurricular schedules, and time management skills. Time management specifically appears to be an area of great need for high school students both inside and outside academic institutions. Maria, 15 years old, reported, “There have been times that I have been up to twelve, or one o’clock just trying to get my homework done after I’ve done sports and my chores.” Additionally, participants described the school environment as a source of stress, specifically due to peer relationships, pressures, and bullying behaviors that happen in school or online. Shannon, a 9th grader, said, “The people in the school are stressful…I feel pressure to do things I don’t really want to do.” Participants also emphasized social dynamics and social media as significant stressors, specifically as they pertained to unrealistic beauty standards and drug use. McKenzie, a freshman, indicated “Kids are so mean to each other online, and say awful things about each other and constantly comment on each other’s appearances”.

Familial financial stress emerged as a theme among the participants. They described the need to work outside the home and financially contribute to the family income, which added to their experience of stress and difficulty managing school/work/life balance. One participant indicated, “My mom expects me to do everything around the house. She says that I do nothing all day at school- and that is not true! I sit through seven hours of school, go to work, do chores, and have homework. I’m exhausted at the end of the day”. Many participants described the strong influence of parental financial stress on their mental health and well-being, and cited themselves as their parents’ confidantes. Jaz, a 9th grader, said “My mom tells me everything about the drama in her life, and loves to hear about teenage drama.” Another sophomore youth participant indicated, “More often than not, I feel like the parent at home. My mom comes to me for advice with all her relationship and financial stress, I just have to listen to her.”

Participants also described a pervasive lack of empathic understanding between youth and adults, both in the personal and academic settings. They saw these relationships as detrimental to their mental health. To further highlight this disconnect between adults and participants, most participants listed a lack of understanding and communication from adults in their lives as one of their primary stressors. A sophomore stated of a current teacher, “They don’t understand all the obligations that I have outside their class and expect that I have time that I do not have to do all my homework. Teachers think our lives revolve around their class”. A 9th grader stated of her parents, “they compare our lives to theirs when they were young, and that’s just not relevant to us- we just want them to listen to us. Take the time out of their day to just listen”. Zeb, a freshman, added “I just want to yell back at my mom and say shut up, listen, don’t say a word- I don’t care to hear your opinion, just shut your mouth and listen for once”.

Aim Two

The data collected regarding youth participants' symptoms of depression and anxiety was based on scores compiled from both the Beck Anxiety Index (BAI) and the Beck Depression Index (BDI). Results of the ANOVA reveal a minor shift in scores over the course of the data collection and intervention implementation, though they showed no statistically significant difference between

genders or by age. For both BAI and BDI, there do not appear to be significant differences in average trajectory by age; it is best not to over-interpret the 16+ age group, as the sample size is relatively small. There is substantial variability in t-score levels across students, but there does appear to be a tendency for female students to have higher anxiety and depression indices.

The trajectory of the scores showed a general improvement in BDI scores over the course of the program, which amounts to a 31.5% improvement in t-scores. This indicates that although those students who began the program with what would be considered “normal” scores remained within those general parameters, the students whose scores may be considered to be outliers showed significant “normalization” and regression toward the mean. Similarly, the BAI t-scores recorded over the course of the program showed changes that pulled the outliers in toward the “normal” range that would indicate standardized mental health. Over six weeks, the outlier t-scores were reduced by 6.2%. Results of the full mixed-effects ANOVA model indicate a small but steady decline in youth participants' experience of anxiety symptoms over time.

Figures 1 and 2 depict a representation of the distributions of BAI and BDI t-scores over time. In each plot, a line represents an individual participant’s trajectory. The overall average trend is given in black with confidence bounds, and the average trend by gender follows the coloring of individual trajectories. For each outcome (BAI and BDI t-scores), we present the trajectories together and broken out by age. Figures 1 and 2 depict BDI and BAI trends throughout the duration of the study. We note that there do not appear to be significant differences in average trajectory by age.

Figure 1 BDI Trends Throughout the Duration of the Study

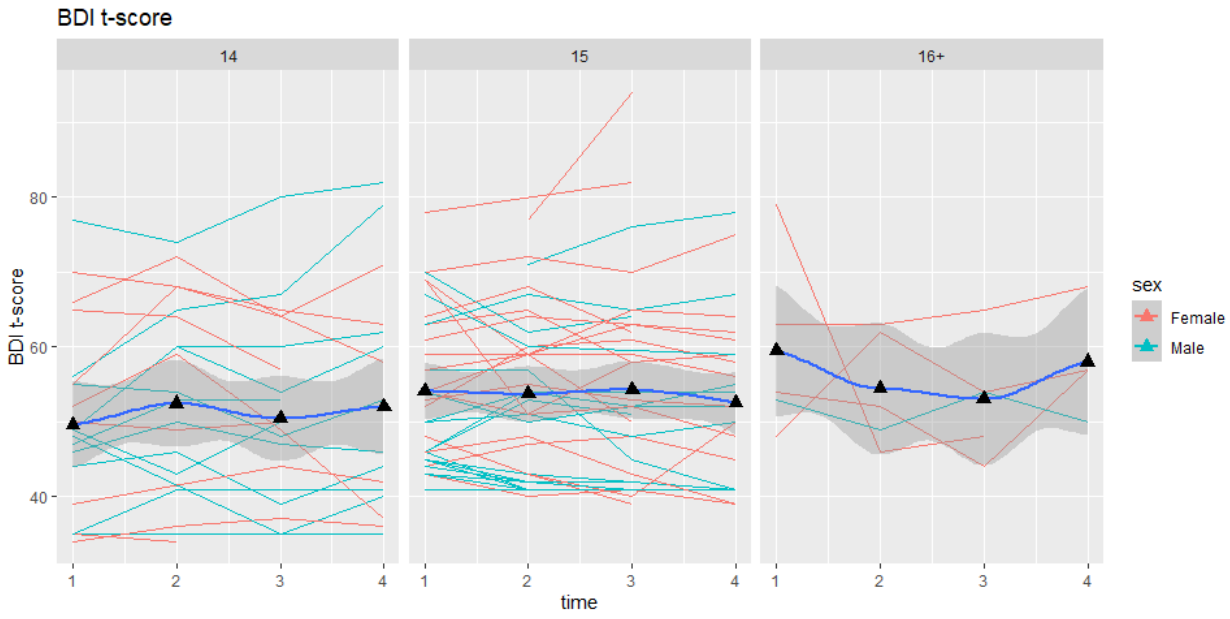
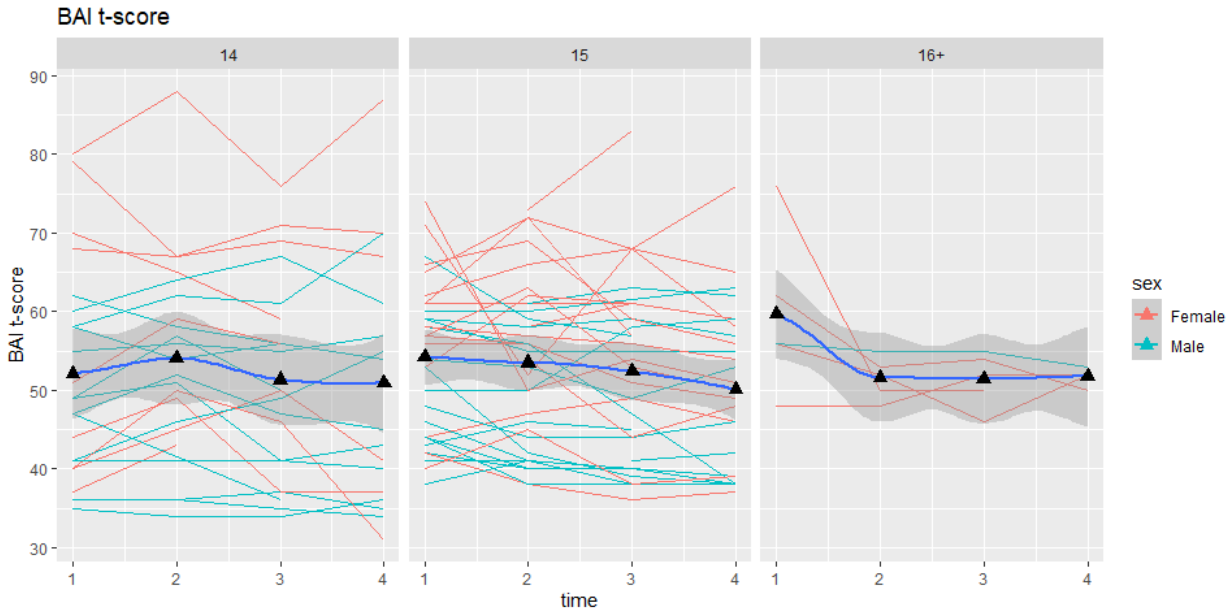
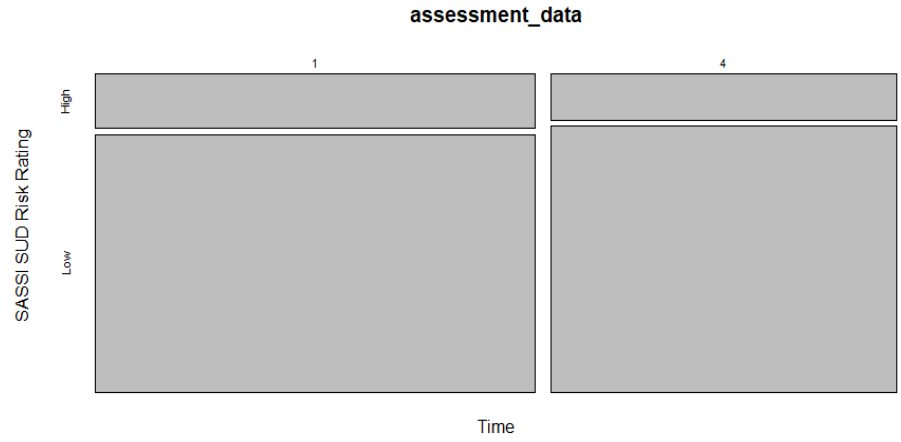


Figure 2 BAI Trends Throughout the Duration of the Study



As aforementioned, the SASSI-A2 assessment was used to assess the probability of the participants being at risk for a substance use disorder (Figure 3). To visualize SASSI-A2 scores, mosaic plots were used. The width of each tile is proportional to the fraction of the sample in the group on the x-axis. The height of each tile is proportional to the fraction of the sample with the given SASSI-A2 rating. Thus, the area of each tile is the proportion of the sample that falls in each pairing of categories.

Figure 3: Mosaic Plot of SASSI SUD Risk Rating by Time



A fraction of participants rated as high risk for a substance use disorder (SUD) is smaller at follow-up than at baseline. However, it is important to note that the population who completed the SASSI-A2 at baseline and those who completed it at follow-up have limited overlap, so this could be due to a selection process over time. Additionally, a mosaic plot of SASSI-A2 score by sex (Figure 4) shows that rural females are slightly more likely than males to have a high risk of substance use disorders.

Figure 4: Mosaic Plot of SASSI SUD Risk by Gender

The results of the Fisher Exact Test indicate insufficient evidence to conclude there is a change in the proportion of the youth participants rated at high risk for an SUD before adjustment for baseline covariates. The data collected also indicated a strong correlation between the SASSI-A2 assessment and the BDI, showing a relationship between a one-point increase in BDI score and an additional 18% likelihood of risk for SUD.

Discussion

There is a clear need for mental and behavioral health services in rural educational systems. While it is encouraging that most participants scored in normal ranges for clinical symptoms of anxiety, depression, and substance use behaviors, the participants pervasively described experiences of stress in their lives and a lack of coping skills or helpful resources. The findings of this study support past literature describing the unique mental health needs of adolescents, specifically youth in rural communities (Dorn et al., 2019; Garbacz et al., 2022; Goldbeck et al., 2007; Steinberg & Morris, 2001; Young & Lo Chau, 2017). Participants reported needing support with academic pressure, financial stress, time management challenges, and a lack of empathic adult relationships. The findings also suggest that stress related to the school environment, specifically peer relationships, pressures, and bullying behaviors occurring in the school building and through social media were noteworthy concerns for rural youth. Rural Youth Experiences of Stressors emerged as a theme that highlighted the aforementioned stressors in addition to financial stress in the family and a lack of empathic relationships with adults. It is evident that rural youth are burdened with stressors that challenge their well-being.

To explore an intervention that could support the well-being of rural youth, the researchers examined the feasibility and acceptability of a youth iCBT program. Participants indicated that while they appreciate access to an asynchronous online iCBT program, they would prefer an individualized connection, a live chat feature, or would ultimately prefer to talk in-person with a trusted adult when they are navigating difficulties in their lives. Moreover, participants revealed that the youth iCBT program's content did not accurately reflect their experiences of stress and that the content should reflect time management skills and additional coping skills for peer/adult relationships and social media issues. Youth participants shared they learned from the constructive thinking and assertive communication modules in the program.

It appears that the characters, narratives, and video content in the youth iCBT program resonated with the older youth participants (eleventh and twelfth graders) but did not with the younger participants (ninth and tenth graders). Participants in the ninth and tenth grades disclosed that the scenes were awkward and difficult to watch, and the characters were not relatable to them. This disparity is most likely due to the large developmental variance in the sample population. It may be that the developmental appropriateness of this iCBT program is better suited for 16-18-year-olds rather than 14-18-year-olds.

Regarding the quantitative measures and analysis (BDI, BAI, & SASSI-A2), while minimal reduction of depressive and anxiety symptoms was observed over the study period, no statistically significant differences were found by time, gender, or age. These results were llimited due to the small study sample size and large percentage of missing data. Interestingly, participants who identified as female were slightly more likely than males to be at higher risk of a substance use disorder and experienced elevated symptoms of anxiety and depression. Also, it is important to consider the data indicated a strong correlation between elevated depression scores and an increased risk of substance use behaviors for participants.

Recommendations and Future Research

The need for mental and behavioral health resources in rural educational systems is evident. Given that students were somewhat receptive to the program, youth in rural schools seem interested in a systemic embedding of interventions rather than an individual-student approach to well-being and mental health issues in the school setting. It is possible an intervention that is systemic and ancillary to the educational system and academic curriculum may benefit a rural education community's experience of well-being. As the iCBT program did not demonstrate a statistically significant change in individuals' experience of depression and anxiety, a shift to an exploration of comprehensive rural school system well-being needs may be advantageous.

Finally, the rural youth's participant's resounding feedback regarding their mental and behavioral health needs is a desire to have a non-judgmental trusted adult in the school setting who is available to listen to them when they are struggling rather than an asynchronous online program. Rural school communities need school counselors and professional development targeted at empathic listening, making authentic connections with students, and understanding developmental student well-being. It may be that an exploratory study, in collaboration with rural school counselors and school communities, regarding systemic mental, behavioral, and well-being needs of the comprehensive educational system (students, staff, and administration) may illuminate an ancillary intervention that could support an entire rural school community. The results of this study may also be considered by teacher and school counselor educators or in the development of continuing education curricula.

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