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# The Use of an Evidenced Based Mobile App for PTSD Treatment: A Randomized Controlled Trial of STAIR Coach

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THE USE OF AN EVIDENCED BASED MOBILE APP FOR PTSD TREATMENT:  
A RANDOMIZED CONTROLLED TRIAL OF STAIR COACH

by

JASON BROOKS

(Under the Direction of Dorthie Cross)

ABSTRACT

Many individuals experience traumatic events within their lifetime and between 7 and 9% will be diagnosed with PTSD (Kilpatrick et al., 2013; National Center for PTSD, 2018); however, many will not receive treatment due to a variety of barriers, including stigma, limited mental health literacy, high cost, lack of transportation, and other factors (Blais et al., 2014; Chikovani et al., 2015; Hom et al., 2017; Gavrilovic Kantor et al., 2017; Kulesza et al., 2015). Mobile apps may offer a way to overcome some these barriers (Kantor et al., 2017). Prior research demonstrated the feasibility and efficacy of mobile apps for mental health (Firth et al., 2017; Linardon et al., 2019), including a small but promising body of research demonstrating the efficacy of PTSD apps (Goreis et al., 2020; Wickersham et al., 2019). One of these apps is *STAIR Coach*, based on Skills Training in Affective and Interpersonal Regulation (STAIR), an evidenced based PTSD treatment with findings that its skills interventions alone can result in a clinically significant reduction in PTSD symptoms (Cloitre et al., 2010). The current study examined the potential clinical benefit of *STAIR Coach*. Participants ( $N = 50$ ) were recruited from the community and through social media and completed an online assessment of lifetime trauma exposure, PTSD symptoms, emotion dysregulation, and psychosocial functioning. Participants were randomly assigned to either the intervention condition (asked to download *STAIR Coach*;  $N = 25$ ) or a waitlist control condition ( $N = 25$ ). No other intervention was provided for the treatment group other than downloading the app. Measures of PTSD, emotion dysregulation, and psychosocial functioning were administered again at three and six weeks. When compared to wait list controls, participants in the *STAIR Coach* condition reported significantly greater reductions in PTSD symptoms and improvements in emotion dysregulation; however, although scores improved, there was not a significant difference in psychosocial functioning between the two conditions. Study results are limited by small sample size.

INDEX WORDS: Posttraumatic stress disorder, Intervention, Mobile apps, STAIR, STAIR Coach

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A RANDOMIZED CONTROLLED TRIAL OF STAIR COACH

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the Requirements for the Degree

DOCTOR OF PSYCHOLOGY

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## DEDICATION

I want to dedicate this to my family and friends who have encouraged and supported me in my decision to return to school and while completing this degree. It would not have been possible without them. This is especially true for the amazing members of my cohort and of course my dog, Bowie.

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## CHAPTER 1

### INTRODUCTION

In the United States, an estimated 89% of people will experience a traumatic event within their lifetimes, and between 7% and 9% will develop posttraumatic stress disorder (PTSD; Kilpatrick et al., 2013; National Center for PTSD, 2018). PTSD is a trauma-related disorder, impacting roughly eight million people in the United States every year (National Center for PTSD, 2018), and associated with a range of negative health issues, such as cardiovascular disease, substance misuse, suicide, and early mortality due to these and other conditions (Beristianos et al., 2016; Gradus et al., 2015, Spitzer et al., 2009; Vaccarino et al., 2013).

PTSD is treatable (Asmundson et al., 2012; Bisson et al., 2013; Moldovan et al., 2019; Powers et al., 2010; Tran & Gregor, 2016), but despite the availability of effective treatments and the negative impacts of PTSD, a substantial discrepancy between the number of individuals with PTSD and the number receiving treatment persists (Shiner et al., 2013). Barriers to accessing treatment include stigma, limited mental health literacy, high cost, lack of transportation, and other factors (Blais et al., 2014; Chikovani et al., 2015; Gavrilovic Kantor et al., 2017; Hom et al., 2017; Kulesza et al., 2015). In addition, the treatment drop-out rate is relatively high (Gutner et al., 2015; Hembree et al., 2003; Imel et al., 2013; Najavits, 2015). It is important to adapt existing treatments to be more accessible to people who need them.

The purpose of the current research was to study the potential clinical benefits of a mobile app delivery of a treatment for PTSD, specifically Skills Training in Affective and Interpersonal Regulation (STAIR; Cloitre et al., 2006). STAIR is an evidenced-based treatment for PTSD with greater treatment effect sizes and lower dropout rates compared to other evidenced-based PTSD treatments (Cloitre et al., 2010; Jackson et al., 2019). Delivering STAIR through a mobile app may increase treatment accessibility.

## Literature Review

### Posttraumatic Stress Disorder

#### *Diagnosis*

A PTSD diagnosis requires that a person meet five broad criteria, including exposure to a potentially traumatic event and experience of four symptom clusters. These four clusters are intrusive reminders of the traumatic event, avoidance of cues related to the event, negative changes to cognitions and mood related to the event, and changes to arousal or reactivity (American Psychiatric Association, 2013). These symptoms must last at least a month and cause impairment in work, school, or relationships.

#### *Negative Health Outcomes*

In addition to the impact of PTSD symptoms themselves, PTSD is associated with experiencing a range of other negative health conditions. In a study of the general population, Spitzer et al. (2009) found that, even when adjusting for demographics, weight, alcohol use, smoking, or comorbid mental health disorders, individuals with PTSD had increased odds of heart failure, angina, bronchitis, liver, and arterial diseases. A longitudinal study with a sample from the general population found participants with PTSD had a higher risk than participants without PTSD of cardiovascular diseases, including myocardial infarction, strokes, and venous thromboembolism (Gradus et al., 2015). Beristianos et al. (2016) found similar results among veterans over the age of 55. Even when demographics and other comorbidities were controlled for, veterans with late-life PTSD had an increased risk for cardiovascular diseases. In a study examining twins of Vietnam era veterans, participants with PTSD had more than double the incidence of coronary heart disease than those without PTSD (Vaccarino et al., 2013).

PTSD is also associated with a reduced lifespan overall, related to the above health conditions and to other causes. Even when other factors such as demographic or disposition were controlled for, Boscarino (2006) found that trauma and PTSD in a veteran sample were associated with increased mortality from external causes, such as homicide, suicide, and substance abuse. These findings are consistent with studies based on the general population, finding an increase in all-cause mortality and suicide among trauma survivors with PTSD or other trauma-related diagnosis, such as acute stress

disorder (see Gradus et al., 2017). Notably, Gradus et al. found the increased risk of mortality due to suicide was even stronger when comorbid depression was present.

## **Treatment Barriers and Outcomes**

### ***Barriers to Treatment Initiation***

Despite the negative impact of PTSD, there is a substantial discrepancy between the number of individuals with PTSD and the number receiving treatment (Shiner et al., 2013). To increase mental health service utilization, researchers have tried to determine what factors influence treatment seeking. Kantor et al. (2017) completed a meta-analysis of perceived barriers and facilitators for engaging in PTSD treatment based on studies with veteran and general population samples. Kantor et al. found that stigma, shame and rejection, fear of negative social consequences, low mental health literacy, and limited knowledge regarding treatment and treatment outcomes were among the most significant barriers for receiving treatment. These barriers were present across types of trauma survivor populations and are consistent with research on active-duty service members and veterans showing stigma negatively correlates with receiving treatment for PTSD (Blais et al., 2014; Gavrilovic, 2005; Hom et al., 2017).

Stigma is not the only factor in treatment underutilization. Lower mental health knowledge and negative beliefs about treatment are also associated with less treatment use (Chikovani et al., 2015; Hom et al., 2017; Johnson & Possemato, 2019). Johnson and Possemato (2019) found mental health knowledge and beliefs about treatment were more closely related to mental health utilization than any other factor examined, including stigma, self-efficacy, or external barriers to treatment. The researchers recommend interventions to educate individuals regarding problem/symptom recognition and improve beliefs regarding treatment. Chikovani et al. (2015) also found that lower mental health knowledge was a barrier to receiving treatment among trauma survivors. A third of their participants did not know that their symptoms could be treatable via professional help.

Kulesza et al. (2015) identified other barriers to treatment, including limited access to care based on being un- or underinsured, having low income, and being less able to take time off work. Kantor et al. (2017) identified rurality as a potential barrier to treatment based on their finding that people in rural

areas had lower mental health utilization for PTSD treatment compared to their urban counterparts. This difference may be due to barriers related to treatment access, such as those described by Kulesza et al. (2015). Rural areas, compared to non-rural areas, have greater mental health provider shortages (HRSA, 2017), which contributes to reduced availability of mental health services and poorer mental health outcomes for people living in rural areas. In addition to issues of access, rural areas are associated with other treatment barriers, including decreased engagement in available psychotherapy and increased levels of mental health stigma (Mott et al., 2015; Smalley & Warren, 2012). These findings demonstrate how rurality exacerbates PTSD treatment barriers.

Facilitators to receiving care are less often studied, and some researchers consider this area neglected and in need of more attention (Kantor et al., 2017); however, some common facilitators identified across studies and populations include social support, greater impairment, and previous experience in therapy. Social support and encouragement from significant others can facilitate treatment seeking (Hom et al., 2017; Kantor et al., 2017). In addition, Gavrilovic et al. (2005) found that treatment seeking was facilitated by higher levels of psychopathology. Hom et al. (2017) had similar findings that having greater functional impairment due to symptoms and having prior treatment experience were treatment seeking facilitators. Kantor et al. (2017) found in their meta-analysis that positive experiences with prior mental health use increased the likelihood of treatment seeking behavior. These facilitators are consistent with the need for interventions that increase education regarding symptoms, information about treatment, and result in positive mental health treatment experiences.

### ***Treatment Outcomes***

Individuals who overcome barriers and engage in treatment have better outcomes overall than those who do not engage in treatment. When PTSD treatment is completed, clients experience benefits in terms of reduction of symptoms and no longer meeting diagnostic criteria (Asmundson et al., 2012; Bisson et al., 2013; Moldovan et al., 2019; Najavits & Anderson, 2015; Powers et al., 2010; Tran & Gregor, 2016). PTSD specific treatments are superior to treatment as usual, with effect sizes typically in the moderate to high range (Bradley et al., 2005; Najavits & Anderson, 2015). Bradley et al. (2005)

completed a meta-analysis of PTSD treatment studies examining multiple forms of psychotherapy for PTSD. They found that treatment effects were significant and substantial when compared to waitlist controls. They also found that 67% of participants who completed PTSD treatment no longer met criteria for PTSD. In a more recent meta-analysis, Bisson et al. (2013) found that across multiple forms of therapies for PTSD, treatment effects were significantly stronger compared to waitlist control groups. Notably, many of studies included in the meta-analysis either did not compare treatments head-to-head or, when they did, found no significant differences between PTSD treatments; however, other research focused on comparing treatments, with particular attention paid to trauma focused versus non-trauma focused PTSD treatments.

*Trauma focused treatments* are characterized by focusing on the traumatic memory or memories, as well as thoughts and emotions that are specifically trauma related. *Non-trauma focused treatments* do not focus on the trauma directly and instead draw on a range of other interventions to target domains related to symptom reduction, e.g., improving emotional regulation or interpersonal skills. Tran and Gregor (2016) found in a meta-analysis that trauma focused treatments had a slight advantage and appeared more efficacious when compared to non-trauma focused treatments, although these differences were not clinically significant. Other research shows more clear conclusions in favor of trauma focused treatment. Lee et al. (2016) found that trauma focused treatments have a greater effect size and are more beneficial than either non-trauma focused therapy or medications for PTSD. Moldovan et al. (2019) found in their meta-analysis that two trauma focused treatments in particular, Prolonged Exposure (PE) and Cognitive Processing Therapy (CPT), were more effective than other PTSD treatments.

PE and CPT have been recognized as especially efficacious with a significant body of literature to support their benefits. The American Psychological Association (2020) listed them among their treatments with strong evidence and strongly recommends their use for the treatment of PTSD. The Department of Veterans Affairs (VA) also strongly recommends the use of PE and CPT, issuing practice guidelines identifying PE and CPT as first line treatments for PTSD (VA/DoD Management of Posttraumatic Stress Disorder Work Group, 2017). Cusack et al. (2016) found that PE and CPT were

among highly efficacious treatments found within a meta-analysis of PTSD treatments with the strength of evidence for these treatments justifying their first line status.

PE has ample support within the literature for its treatment efficacy for PTSD in civilian and veteran populations. Foa et al. (2005) conducted a randomized controlled trial (RCT) with a civilian population and found statistically and clinically significant reduction in PTSD symptoms by the eighth session. In a study of both combat- and terror-related PTSD, PE was more effective than treatment as usual (Nacasch, 2011). PE was also studied in a VA setting and used to treat PTSD in combat veterans of the wars in Afghanistan and Iraq (Tuerk, et al., 2011). Compared to the waitlist control, treatment completers showed significantly greater improvements, and treatment effect size was large. The authors noted that the results were comparable to those found in RCTs of PE among civilian populations (Tuerk, et al., 2011). In a meta-analysis of PE studies, Powers et al. (2010) found that when compared to patients on waitlist controls, PE patients fared better by 86%, concluding that PE demonstrated substantial treatment gains and was highly effective.

CPT is another common first line treatment and is supported by a large body of literature demonstrating its efficacy for the treatment of PTSD. Asmundson et al. (2012) found in a meta-analysis that individuals receiving CPT fared better by 89% at post treatment than participants in inactive controls. Chard et al. (2005) found in an RCT within a community setting that CPT reduced symptoms of PTSD significantly when compared to the control and that this reduction held for at least a year based on post treatment measures. In an RCT with veterans, Forbes et al. (2012) found that those being treated for military-related PTSD with CPT had significantly greater improvements compared to treatment as usual, and that these results were significant at post-treatment and three months follow-up. CPT also results in lasting change beyond a few months. Resick et al. (2012) found that PTSD symptom reduction among participants was maintained five to 10 years later for those who received either CPT or PE.

These outcomes demonstrate that PTSD treatment has substantial empirical support. When individuals do overcome barriers to receive and complete treatment, research finds that they experience

superior outcomes than when they do not; however, treatment engagement and completion vary, for a variety of reasons, which impact outcomes.

### ***Barriers to Treatment Completion***

While treatment outcomes for PTSD treatments may be positive, treatment dropout rates in both the general population and among veterans are concerning. Imel et al. (2013) found in a meta-analysis of treatments for PTSD that the average dropout rate was 18% across all treatments and, when examining only trauma focused treatments, the average dropout rate rose to 36%. Hembree et al. (2003) found in a meta-analysis of trauma focused treatments that dropout rates averaged between 18% and 26% across treatment conditions with no significant difference based on the treatment type (e.g., exposure vs. non-exposure treatments). Gutner et al. (2015) found a somewhat higher dropout rate in their study of a civilian population being treated with CPT and PE. Their overall dropout rate was 39%, but the treatment condition did not significantly impact the dropout rate. Najavits and Anderson (2015) also found in a review of the literature similar dropout rates, average 28%, even within RCTs of gold standard therapies, suggesting that even higher dropout rates may occur in real world (non-RCT) clinical settings. The possibility that dropout rates are even higher in naturalistic settings has found only partial support in the literature. For example, among veterans receiving PTSD treatment at the VA, the discontinuation rate for treatment ranged from 12% to 39% (Steenkamp & Litz, 2013); however, another study of veterans receiving trauma focused treatment at the VA found a dropout rate comparable to that of civilian RCT with approximately 28% of participants terminating treatment before completion (Gross et al., 2013).

The reasons for early termination are varied. In a study of veterans, Myers et al. (2019) found that logistical barriers and treatment efficacy concerns were the most common reasons cited for early treatment termination. The researchers found that factors related to completion of treatment were typically not due to participant characteristics, except for co-occurring substance abuse disorders and family problems. In another study of veterans with PTSD, Gross et al. (2013) found that disability status of the veteran was a factor contributing to treatment discontinuation whereas increased social support reduced the chance of discontinuation. A veteran having treatment history, particularly having completed some

form of psychotherapy, improved the likelihood of PTSD treatment completion (Maguena et al., 2019). Factors for non-completion of treatment among the general population are similar to those for military/veteran populations, including logistical barriers, comorbid disorders including substance abuse, and the patient's environment/limited social supports (Schottenbauer et al., 2008). Despite the success of current evidence-based treatments, these barriers to treatment completion and success demonstrate the need for further research to improve outcomes for those with PTSD.

### **Skills Training in Affective and Interpersonal Regulation**

Another treatment for PTSD with promising research support is Skills Training in Affective and Interpersonal Regulation (STAIR), which is an evidenced-based, manualized, and multiphase treatment for PTSD. STAIR is shown to be an effective treatment for PTSD in multiple studies across individual and group modalities (Cloitre et al., 2006; Cloitre et al., 2010; Gudiño et al., 2014; Jackson et al., 2019; MacIntosh et al., 2014; Trappler & Newville, 2007). STAIR was originally designed to treat Complex PTSD resulting from repeated or prolonged trauma, particularly occurring during childhood (see Cloitre, 2021), but has been successfully adapted to treat PTSD resulting from a range of trauma types, clinical settings, and patient populations.

STAIR has two treatment phases: *STAIR Skills*, which places an emphasis on improving emotion regulation and interpersonal skills, followed by *STAIR Narrative Exposure*. The skills phase is typically eight sessions with topics ranging from how to identify and express feelings, ways to enhance mood regulation, and skills for improving interpersonal functioning. The second phase is based on a narrative form of exposure treatment (Cloitre et al., 2006).

The skills portion of STAIR is unique to PTSD treatment in that it specifically targets and works to improve emotion regulation and interpersonal skills. Having strong emotion regulation skills can help individuals respond to their experiences in adaptive ways, such as continuing to achieve goals even in the face of strong, potentially negative emotional experiences (Hallion et al., 2018). Prior research shows PTSD is associated with emotion regulation difficulties (Seligowski et al., 2015; Sippel et al., 2016) and that emotion regulation difficulties are associated with higher treatment dropout (Gilmore et al., 2020).

Similarly, strong interpersonal skills help individuals maintain social support, which previous research shows is associated with higher rates of treatment completion (Hom et al., 2017; Kantor et al., 2017). Price et al. (2018) found that exposure treatments alone did not lead to significant improvements in social support even when exposure treatments improved PTSD symptoms. The authors found that PTSD symptoms did not moderate improvements in social support. They did find, however, that social support moderated treatment outcomes, with higher social support associated with greater reduction in PTSD symptoms. These findings provide evidence for both the need and potential benefit of targeting emotion regulation and interpersonal skills when treating PTSD.

STAIR has demonstrated some advantages over other PTSD treatments. Jackson et al. (2019) found in a study of group STAIR that the effect size of PTSD symptom reduction was larger than the average effect size found in meta-analyses for current PTSD group treatments. In addition, while more research is needed, there is evidence that STAIR has a lower dropout rate than some PTSD treatments. Cloitre et al. (2010) implemented the full STAIR treatment, including both the STAIR Skills and Narrative Exposure phases, and found a dropout rate of only 15%. This rate is lower than the previously discussed dropout rates for other PTSD treatments, including PE and CPT. Cloitre et al. also compared the full STAIR to an exposure-only treatment condition and found that the dropout rate of the exposure-only condition was nearly 40%, significantly higher than the full STAIR treatment. This finding suggests that the multiphase model with the skills portion may be beneficial for both the treatment of PTSD and client retention during exposure treatment.

### ***STAIR Treatment Efficacy***

Although STAIR is a relatively new treatment for PTSD with a smaller body of research than PE or CPT, it shows promising results in a variety of populations and settings. STAIR has demonstrated efficacy in the treatment for PTSD in two RCTs. Cloitre et al. (2002) completed an RCT with a sample of 58 women, half receiving treatment for PTSD using STAIR for 16 weeks, while the other half were placed on a waitlist control. Those in the treatment condition showed significant improvements in terms of PTSD at the end of treatment when compared to the waitlist control. They also showed improvements

on scales measuring emotion regulation and on scales examining interpersonal problems and social functioning when compared to the control group. Not only were these improvements maintained when measured in post treatment, but at three and nine months some patients continued to improve. The study also found a link between therapeutic alliance and mood regulation as a potential predictor of success of the exposure phase, supporting potential benefits to a multiphasic model for treatment success.

A second RCT was completed by Cloitre et al. (2010). The study compared three treatment conditions: (1) STAIR skills + narrative exposure, (2) STAIR skills + supportive counseling, and (3) supportive counseling + exposure. The results of the study showed that participants who received both STAIR skills and narrative exposure demonstrated superior improvement of PTSD symptoms, compared to participants in the other two conditions, at three- and six-months post treatment. Participants in the STAIRS skills + exposure condition also demonstrated greater improvements in social functioning and emotion regulation compared to participants who received exposure without STAIR skills. This once again demonstrated STAIR potentially having superior long-term benefit over exposure alone. Also of note, STAIR skills without exposure resulted in similar PTSD improvements as the STAIRS skills with exposure, which may indicate at least some treatment benefit for STAIR skills alone without exposure. Cloitre et al. (2012) found that participants with higher levels of dissociation had significantly improved treatment outcomes in the STAIR skills with exposure condition than in any of the other treatment conditions. They also found that this treatment condition was effective for PTSD across all levels of dissociation.

### ***STAIR for Co-occurring Disorders***

As discussed earlier, some treatments for PTSD have significant gaps between the results found in research using RCT models and “real world” effectiveness rates. These gaps call into question the true utility of these treatments in natural settings. One of the potential causes for this dissonance is the common practice within RCTs of screening out individuals with comorbid conditions. This demonstrates the need for studying treatments in multiple settings and with patients that have comorbid conditions. One

of the strengths of STAIR is that it has been studied in different treatment settings including studies of patients with comorbid conditions.

Cloitre et al. (2017) examined STAIR as a treatment for PTSD for participants with a dual diagnosis of depression. All participants in the study met criteria for PTSD, 73% also met criteria for some form of depressive disorder, and over one third met criteria for current major depressive disorder. Participants received either both portions or just one portion of the skills treatment phases. STAIR improved symptoms of depression and PTSD with no significant differences between the groups except those with severe depression were found to show more improvement from STAIR skills with STAIR narrative therapy when compared to the other groups. Trappler and Newville (2007) utilized STAIR skills in group treatment for patients with comorbid schizophrenia and PTSD in an inpatient hospital setting. These group members were compared to another treatment group receiving treatment as usual. When compared to treatment as usual, participants in the STAIR group had significantly greater reduction in positive psychotic symptoms, as well as anxiety, tension, depression, suspiciousness, and hostility.

### *STAIR Treatment Versatility*

While STAIR was initially developed to treat PTSD in adults who had traumatic childhood experiences, it was adapted to treat PTSD in a variety of settings and delivered in a variety of modalities. Multiple studies show STAIR is a versatile treatment model beneficial to a range of clinical populations and settings. For example, Gudiño et al. (2014) used an adapted form of STAIR to treat trauma in inpatient adolescents delivered by a group modality. The study found that group members had a significant decrease in symptom severity between pre and post treatment measures. They also found a significant improvement among group members in coping efficacy. MacIntosh et al. (2014) used STAIR in a community outpatient setting among civilian women with childhood trauma. They found significant reductions in trauma symptoms as well as improvements in emotion regulation and interpersonal problems.

Research on STAIR with veteran populations also has promising results. STAIR reduced symptoms of PTSD in a case study of three veterans with PTSD who experienced military sexual trauma

during their service. The participants completed the *PTSD Checklist for DSM-5 (PCL-5)* both immediately before and after treatment. All three participants experienced a clinically significant decrease in scores after treatment (Cloitre et al., 2016). Another study by Weiss et al. (2016) utilized a group modality of STAIR in a sample veterans. The group included men and women diagnosed with PTSD. After 10 weeks of the STAIR skills portion, participants had clinically significant reductions on measures of PTSD symptoms (the PCL-5). In that study, STAIR was also adapted to treat, via videoconferencing, rural women veterans diagnosed with PTSD and a history of Military Sexual Trauma (Weiss et al., 2016). After eight sessions, participants had improvements in social functioning, emotion regulation, and PTSD and depression symptoms compared to pretreatment. Participants also reported satisfaction with the treatment interventions. This is further evidence of STAIR's versatility. It can be beneficial even when only the skills portion is used, in both group and individual sessions, and in various modalities and means of delivery. Taken together, the research supports STAIR's potential in increasing access to PTSD-relevant care.

### **Mobile Applications**

Technology is a potential solution for overcoming barriers to engaging and completing treatment for PTSD (e.g., access to treatment, stigma, beliefs about treatment, and a lack of psychoeducation). A recent focus is on the use of mobile applications (apps) to deliver PTSD treatments. In the meta-analysis on treatment barriers for PTSD by Kantor et al. (2017), the use of mobile apps was specifically discussed as a potential solution. Given that stigma and social consequences are significant factors in most research on treatment barriers, the use of mobile apps may allow for greater anonymity, which could reduce these barriers. Mobile apps also increase access to treatment because they are often free, can sometimes be used on a smart phone without internet access, can be used at any time of day, and can even be used by military personnel while deployed (Nolan et al., 2018; Owen et al., 2018). The Pew Research Center reports an increase in smart phones in recent years with over 80% of individuals owning at least one. In rural areas more people report having a smart phone than broad band internet (Vogels, 2021).

Increasing clients' understanding of mental health conditions and their confidence in treatment can facilitate treatment engagement. Johnson and Possemato (2019) found that these two factors contributed to engaging in treatment more than any other factors, including stigma. These authors also advocated for the need of psychoeducation on these topics to increase treatment engagement. Olf (2015) found that mobile apps increased access to psychoeducational information, users' ability to self-identify symptoms, recognition of need for treatment, and engagement in treatment. Kuhn et al. (2014) found that, in addition to facilitating individuals to seek mental health treatment, their mobile app helped users manage their symptoms. Poropatich et al. (2013) also discussed the potential benefits of technology, including mobile apps, to increase access to care and change the delivery of treatment away from a fixed-point location. The potential benefits for mobile apps to address these barriers and improve both treatment and treatment outcomes overall demonstrates the need for increased research in this area.

The use of mobile apps in mental health is an emerging area of research. Most of this research has been conducted within the last five years. Two important areas of research for mental health mobile apps are feasibility and efficacy. It is important to show first that mobile apps are likely to be used by clients and clinicians. These studies often demonstrate the real-world utility and likelihood that individuals will be comfortable and engage in use of a mobile application. Evidence of comfort and engagement with the mobile apps is needed to show that any benefits from it might be gained by a user. It is also important to demonstrate they can in fact be useful for overcoming the previously mentioned barriers. Efficacy research for mobile apps is equally if not more important to demonstrate what if any benefits may be gained from engaging with them. Fortunately, the body of literature in both areas of research, while limited, is positive in finding mobile apps beneficial for clients.

***Feasibility: Will Clients Use a Mental Health Mobile App?***

In examining the feasibility of mobile apps, studies often center more on the satisfaction from clients and clinicians using the mobile app, and they provide evidence the mobile apps are user friendly, are likely to be used, and result in buy-in from clients and clinicians (Herbst et al., 2019; Kuhn et al., 2016). These studies are helpful in providing evidence of the feasibility of utilizing mobile apps to deliver

mental health treatments. The findings often support that those that have engaged with the mobile app would continue to use it or found it beneficial. These studies are often not an RCT and usually do not utilize clinical measures. The goal is often to capture the experience of the mobile app user or clinician.

An example of client satisfaction was found by Herbst et al. (2019), with *Stayquit*, a mobile app for smoking cessation. The authors examined 20 participants' experience of *Stayquit* following a period of use. The participants rated it helpful, convenient, and endorsed the format as appealing. In terms of clinician satisfaction, *CBT-I Coach*, a mobile app using cognitive-behavioral therapy features for insomnia treatment, demonstrated clinician satisfaction across multiple studies. Kuhn et al. (2016) examined clinicians' perceptions of *CBT-I Coach* in two surveys: one before the release of the app ( $N = 138$ ) and one after the release of the app ( $N = 176$ ). In the first survey, 87% of clinicians indicated they intended to use the app once it was available. In the second survey, two years later, 60% of clinicians reporting actually using *CBT-I Coach* and having favorable perceptions of it. Miller et al. (2017) completed a similar study of 108 clinicians' perception of *CBT-I Coach* after the app was available for a year. Half of the clinicians reported having used the app, and within that group, 98% reported that they would continue to use it going forward.

In addition to research on client satisfaction with *Stayquit* and clinician satisfaction with *CBT-I Coach*, there is also research examining both client and clinician satisfaction with mobile apps, such as *PE Coach*. *PE Coach* is a mobile app based on prolonged exposure (PE), an evidence-based treatment for PTSD, and client and clinician satisfaction with the app has been evaluated in multiple studies. In terms of client satisfaction with *PE Coach*, Reger et al. (2015) used a case study approach ( $N = 2$ ) where participants completed four sessions of traditional PE and then another four sessions while also using *PE Coach*. The participants reported high levels of satisfaction with *PE Coach* and rated treatment more positively when paired with the app than without it. In terms of clinician satisfaction, before *PE Coach* was released, Kuhn et al. (2014) asked 163 clinicians to evaluate a description of the app and found that most of the perceptions were positive. This is further evidence of a positive view of mental health mobile apps among clinicians. Kuhn et al. (2015) followed the previous study a year after the mobile app was

released with a survey of 271 clinicians and found that over half of PE clinicians reported using *PE Coach*. Among those who used the app, 93% indicated they would continue to do so.

Another mobile app, *PTSD Coach*, shows evidence of feasibility across multiple studies. Possemato et al. (2017) examined client and clinician reactions to *PTSD Coach* after using it in conjunction with treatment for a brief period. The researchers specifically reviewed satisfaction and the likelihood of clients and clinicians to use *PTSD Coach* in the future. This small sample study yielded positive feedback from both clinicians and clients in satisfaction and likelihood of continued use. Kuhn et al. (2017) had 45 veterans use *PTSD Coach* for several days and then rate their experience along measures of satisfaction and helpfulness with results indicating participants found *PTSD Coach* moderate to very helpful and they were very satisfied with it as a mobile application. Owen et al. (2015) examined satisfaction of the *PTSD Coach* app through the 153,834 downloads and 156 user ratings of the app. Examination of these data indicated users report a reduction in symptoms and satisfaction with the app overall. While the authors did not utilize clinical measures to determine symptom reduction, the results do indicate that users felt that *PTSD Coach* was helpful in terms of treatment.

Across multiple studies for a variety of treatment modalities, including for PTSD, mobile apps are feasible treatment tools. Studies provide evidence that both clients and clinicians are comfortable with the use of a mobile app for mental health treatment and have satisfactory experiences with them. Several of the studies also indicate that both clients and clinicians desire to continue to use the mobile application. This provides strong evidence that mobile apps are feasible for use in mental health treatment and may be beneficial for overcoming treatment barriers.

### ***Efficacy of Mobile Apps for Treatment***

In addition to being feasible, mobile apps have efficacy in the treatment and reduction of symptoms in clinical disorders. Firth et al. (2017) completed a meta-analysis of the literature that included 18 RCTs of smartphone mobile apps used by participants with depression. The researchers found that depressive symptoms were reduced significantly more by those using the smartphone apps than control conditions. Interestingly, interventions completed solely through the smartphone were more significant

than those incorporating other aspects of treatment with the smartphone, including human interaction. A similar meta-analysis using nine RCTs treating anxiety with mobile application-based interventions found participants using smartphone interventions through a mobile app had significantly greater reductions in anxiety scores than those in a waitlist or inactive control group (Firth et al., 2017).

The efficacy of mobile apps was supported by Linardon et al. (2019) in a separate meta-analysis of the literature of mobile app use across multiple diagnoses and symptom types. The researchers found mobile apps had a significant effect on treatment, compared to control conditions, for symptoms of depression, generalized anxiety disorder, stress, generalized psychiatric distress, social anxiety disorder and improvement of positive affect; however, mobile apps did not improve symptoms of panic disorder or PTSD. These findings may be due in part to the limited number of studies examined for PTSD ( $N = 5$ ), which is much lower than the number for depressive symptoms ( $N = 54$ ) or for generalized anxiety symptoms ( $N = 39$ ). The types of treatment studies used may also be a factor with only one study utilizing a mobile app specifically designed for the treatment of PTSD and utilizing evidence-based treatment interventions, *PTSD Coach*. The other treatment studies utilized health or wellness-based interventions, such as mindfulness, for the treatment of PTSD.

A meta-analysis for treatment outcomes for PTSD interventions delivered by smartphone mobile apps, including *PTSD Coach*, found significant improvement from pre- to post-treatment in some studies but not others (Wickersham et al., 2019). In addition, though there was improvement, the degree of improvement was not significantly greater compared to control conditions. These findings may be due to both the limited number of studies and that this meta-analysis also included two studies that used non-PTSD specific mobile apps out of the five treatment studies examined. Goreis et al. (2020) had similar findings in a meta-analysis for self-managed mobile apps used to treat PTSD. The researchers examined only *PTSD Coach* research, six studies, but removed data or studies where the participants were in a condition receiving any support from a clinician. This included conditions where a brief check-in was provided to encourage use of the mobile app. They found a moderate effect size and clinically significant improvements in pre and post measures for the reduction of PTSD symptoms. The reduction of symptoms

when compared to control conditions was again not significant; however, the sample sizes in these studies were low and only two studies had a wait list control group.

Both Wickersham et al.'s meta-analysis (2019) and Kuhn et al.'s RCT (2017) using *PTSD Coach* provide promising support for using mobile apps for treating PTSD. Kuhn et al. (2017) found benefits of *PTSD Coach* compared to a waitlist control group. The treatment group showed significant reductions in PTSD symptoms and a reduction in symptoms in the secondary measures in comparison to the control. Possemato et al. (2016) found that 70% of participants in a clinician assisted treatment group had a clinically significant reduction in symptoms from pre- to post-treatment; however, these data were not used by Goreis et al. (2020) since it was a clinician assisted condition and were not used by either study in the RCT data since it did not utilize a waitlist condition. Additionally, both studies found the use of mobile apps to be promising. They advocated for more research in this area due to research supporting the use of mobile apps as feasible and potentially beneficial for overcoming barriers. In addition to an increase in research studies using mobile apps for PTSD, it may be beneficial to research different mobile apps. The only mobile app specifically designed for PTSD in prior research, and the most researched mobile app thus far, is *PTSD Coach*. Research on other evidence-based PTSD mobile apps would benefit the literature.

### ***STAIR Coach***

*STAIR Coach* is a mobile app based on Skills Training in Affective & Interpersonal Regulation (STAIR), an evidence-based treatment for PTSD. *STAIR Coach* contains interactive modules for enhancing distress tolerance, calming the body, adjusting thinking, and managing relationships. The modules correspond with the phase one (skills) of traditional STAIR and does not contain the narrative portion of the full STAIR treatment model. Information about *STAIR Coach* can be found at the Department of Veteran Affairs website (<https://mobile.va.gov/app/stair-coach>). As discussed earlier, previous research in multiple studies shows therapeutic benefit, including reduction of PTSD symptoms, from completing STAIR skills even without exposure. STAIR skills also may reduce treatment dropout rate due to client preference not to engage in exposure treatment (Cloitre et al., 2010; Cloitre et al., 2002).

Furthermore, strengthening social functioning can be a means of reducing perceived stigma and potentially increase the chances of continued or new treatment seeking (Blais et al., 2014).

Importantly, like *PTSD Coach* and *PE Coach*, *STAIR Coach* was developed by VA clinical researchers. Varghese and VandenBos (2019) noted in their review of mental health mobile apps that those researched and created by the Department of Veterans Affairs have greater clinical benefit compared to those created by others. Additionally, apps created by the VA are free, widely available, and their programming and functioning are stable due to maintenance by the VA.

The need to overcome barriers and facilitate treatment for those with PTSD is clear and the potential for mobile apps to assist in overcoming these barriers is promising. Similarly, research shows that the delivery of interventions through a mobile app can be beneficial; however, there is currently limited research using mobile apps for PTSD and stronger support is needed. One area which can benefit from further exploration is the lack of efficacy research on available evidence-based mobile apps for PTSD, particularly *STAIR Coach*.

## **Current Study**

### **Aims**

The current study examined the potential clinical benefits of the *STAIR Coach* mobile app. One goal of the current study was to expand the literature for mobile app delivery of PTSD interventions. Relatively few studies have examined the benefits of mobile apps for those with symptoms of PTSD. In individual studies, *PTSD Coach* shows a potential benefit to those who use PTSD mobile apps to reduce symptoms of PTSD (Kuhn et al., 2017; Possemato et al., 2016); however, overall, the results for *PTSD Coach* are mixed, particularly in RCTs. The need for more research in this area and particularly the need for RCTs utilizing control groups was indicated in two meta-analyses (Goreis et al., 2020; Wickersham et al., 2019). In both meta-analyses, only two RCTs were available for comparison for a PTSD mobile app. In both meta-analyses, as well as in Linardon et al.'s meta-analysis (2019), there were still a limited number of studies examining mobile apps to draw from. Given the potential benefits of mobile apps,

previously discussed, there remains a need for increased research in this area and in particular for mobile apps based on evidenced based treatment such as *STAIR Coach*.

Given the dearth of RCTs of mobile apps for PTSD treatment, this study sought to examine the clinical benefits of *STAIR Coach* as a standalone modality for treatment of PTSD. Consistent with some prior studies for other PTSD mobile apps (e.g., Kuhn et al., 2017; Possemato et al., 2016), those in the intervention group did not receive treatment outside of the use of the mobile app. To reflect real-world use, participants were provided limited guidance on how to use the mobile app and had free reign to use it in the manner and at the times they saw fit during the intervention period. This allowed for a clearer picture of how beneficial the mobile app can be as a standalone resource to those with PTSD, independent of treatment. Participants in the intervention group were given information about *STAIR Coach* and encouraged to use it during the eight-week intervention period, but they were not supported clinically in any way. Given that stigma is identified in multiple studies as a barrier to seeking treatment for PTSD (Blais et al., 2014; Gavrilovic et al., 2005; Hom et al., 2017; Kulesza et al., 2015), a lack of interaction with a clinician may allow for anonymity through the sole use of mobile apps. This allowed the current study to better explore *STAIR Coach*'s ability to deliver interventions for those who choose not to seek help due to stigma or other treatment barriers. It also demonstrated the potential efficacy of *STAIR Coach* for those with limited or no access to clinical treatment.

Lastly, the current study aimed to evaluate the potential benefit of using *STAIR Coach* (intervention) compared to not using it (waitlist control). Those in the intervention condition were compared to a waitlist control in terms of self-reported changes in PTSD symptoms, emotion dysregulation, and social functioning over the intervention period. As in many of the previously discussed *STAIR* treatment studies delivered by a clinician, this study evaluated both PTSD symptom severity as well as areas of emotion dysregulation and social functioning, the latter two being strongly associated with the skills *STAIR* aims to improve. As *STAIR Coach* does not contain a narrative portion of treatment used in some *STAIR* treatment studies, it is beneficial to determine the degree to which these skills can be

improved through the use of *STAIR Coach*; however, treatment conditions with only STAIR skills as an intervention have been shown to improve symptoms of PTSD (Cloitre et al., 2010).

## **Hypotheses**

***Hypothesis 1:*** Based on findings that demonstrate the effectiveness of STAIR for treating PTSD and the clinical benefits of mobile apps for therapy more broadly (Cloitre et al., 2010; Goreis et al., 2020), I hypothesized that participants in the intervention condition (those who used *STAIR Coach*) would report significantly greater reduction in PTSD symptoms from pre-intervention to post-intervention compared to the waitlist control (those who did not use *STAIR Coach*).

***Hypothesis 2:*** Based on research showing that STAIR is effective in reducing emotion dysregulation (Cloitre et al., 2010), I hypothesized that participants in the intervention condition would report significantly greater reductions in emotion dysregulation from pre-intervention to post-intervention compared to the waitlist control.

***Hypothesis 3:*** Based on research showing that STAIR is effective in improving interpersonal skills and functioning (Cloitre et al., 2010), I hypothesized that participants in the intervention condition would report significantly greater improvements in psychosocial functioning from pre-intervention to post-intervention compared to the waitlist control.

***Exploratory Research Question:*** Based on findings that people in rural areas experience more treatment barriers (Kantor et al., 2017), I also examined whether participants from rural areas would experience similar dropout rates and clinical benefit compared to participants from non-rural areas.

## CHAPTER 2

## METHOD

**Participants****Inclusion/Exclusion Criteria**

For the initial screening and baseline assessment, eligible participants were at least 18 years old, resided in the United States, and indicated their informed consent to participate. To be eligible for participation in the full study, participants experienced at least one potentially traumatic event in their lifetime, met criteria for current PTSD, owned a smartphone or other device capable of running *STAIR Coach*, and were fluent in English (the only language the app is available in at this time). Fifty individuals who completed an initial screening were eligible to participate in the full study and were randomly assigned to one of two conditions: intervention (*STAIR Coach*) and control (waitlist). See Table 1 for the number of participants for each condition and time point.

**Table 1***Number of Participants by Condition and Time Point*

Condition	Time 1	Time 2	Time 3
Intervention ( <i>STAIR Coach</i> )	25	17	14
Control (waitlist)	25	23	22

**Sample Characteristics**

Slightly more men ( $n = 26$ ) participated than women ( $n = 23$ ), and one participant identified as non-binary. Most participants described themselves as White ( $n = 39$ ), and among the other 11, six described themselves as Black or African American, four as Hispanic or Latino, and one as Pacific Islander. See Table 2 for all participant demographics for the sample and by study condition and time point. Mean age for the entire sample was 34.29 ( $SD = 7.14$ ; range: 21-54); for the intervention condition, mean age was 33.46 ( $SD = 9.05$ ; range: 21-54), and for the waitlist control condition mean age was 35.13 ( $SD = 4.57$ ; range: 28-46).

**Table 2**  
*Participant Demographics by Study Condition and Time Point*

Variable	Total Sample ( <i>N</i> = 50)	Intervention			Waitlist Control		
		Time 1	Time 2	Time 3	Time 1	Time 2	Time 3
<b>Gender</b>							
Men	26	9	8	7	17	17	16
Women	23	15	8	6	8	6	6
Non-Binary	1	1	1	1	0	0	0
<b>Race/Ethnicity</b>							
Black/African American	6	2	2	0	4	4	3
Hispanic/Latino	4	4	3	2	0	0	0
Pacific Islander	1	1	0	0	0	0	0
White/Caucasian	39	18	12	12	21	19	19
<b>Sexual Orientation</b>							
Asexual	1	1	1	1	0	0	0
Bisexual	7	4	2	1	3	3	3
Gay/Lesbian	1	1	0	0	0	0	0
Heterosexual	41	19	14	12	22	20	19
<b>Community Type</b>							
City or Urban	41	20	15	10	21	19	18
Rural	9	5	2	4	4	4	4
<b>Veteran Status</b>							
Yes	10	6	5	3	4	4	4
No	38	18	11	10	20	18	17
Prefer not to say	1	1	1	1	0	0	0
<b>Marital Status</b>							
Single	7	7	3	4	0	0	0
Married	40	15	12	9	25	23	22
Never Married	0	0	0	0	0	0	0
Divorced	2	2	1	1	0	0	0
Separated	1	1	1	0	0	0	0

Pearson  $\chi^2$  analyses determined that participants assigned to the intervention condition did not differ from the control in terms of race/ethnicity, sexual orientation, veteran status, or rural status; however, there was a notable but non-significant higher likelihood for women to be assigned to the intervention condition,  $\chi^2(2) = 5.59, p = .06$ . Additionally, there was a significant difference for marital

status in that married participants were more likely to be assigned to the intervention condition,  $\chi^2(3) = 12.50, p = .01$ . Finally, independent T-tests were conducted and determined that participants assigned to the intervention condition did not differ from those in the control condition in terms of age or any of the baseline measures.

In terms of time 1 to time 2 attrition, there was no difference in age, race/ethnicity, sexual orientation, community type, or military veteran status; however, those who dropped out were significantly more likely to be women,  $\chi^2(2) = 9.75, p = .01$ , and to be single,  $\chi^2(3) = 8.12, p = .03$ . There was no difference in time 1 baseline measures for people who did or did not drop out at time 2. Between time 1 to time 3 attrition, there was no difference in age, race/ethnicity, sexual orientation, marital status, community type, or military veteran status, but those who dropped out were again significantly more likely to be women,  $\chi^2(2) = 8.37, p = .02$ . There was no difference in time 1 baseline measures for people who did or did not drop out at time 3.

## **Materials**

### **Measures**

#### ***Demographics Form***

Participants completed a demographics questionnaire once at baseline. It included questions regarding the participant's age, gender, race/ethnicity, sexual orientation, community type, veteran status, and rural status. See Appendix A for a copy of the Demographics Form.

#### ***The Life Events Checklist for DSM-5 (LEC-5; Weathers et al., 2013b)***

Participants completed the LEC-5 once at baseline. The LEC-5 is a 16-item self-report checklist of traumatic events with a seventeenth question for "other." It uses a six-point nominal scale for each of the items to assess whether and how someone experienced a potentially traumatic event (*happened to me, witnessed it, learned about it, part of my job, not sure, doesn't apply*), and can be used to determine if a person meets the first PTSD diagnosis criterion regarding exposure to a potentially traumatic event (Weathers et al., 2013b). For the current study, the LEC-5 was administered as part of the screening

process for study eligibility. Individuals who had not been exposed to a qualifying traumatic event based on the LEC-5 were excluded. All participants reported at least one potentially traumatic event.

***PTSD Checklist for DSM-5 (PCL-5; Weathers et al., 2013c)***

Participants completed the PCL-5 three times: at baseline, mid-intervention, and post-intervention. The PCL-5 is a 20-item self-report measure of PTSD. Items are on a Likert scale of 0 (*not at all*) to 4 (*extremely*). The PCL-5 can be used to screen for likely diagnosis of PTSD, assess symptom severity, and monitor symptom change. A PCL-5 cutoff score between 31 and 33 is recommended for determining likely PTSD diagnosis (Bovin et al., 2015). In this study, consistent with the literature, those with scores of 31 or above when screened were invited to participate further. When used for progress monitoring, a change of 10 points or more is considered clinically significant (Bovin et al., 2015).

In prior research, the PCL-5 demonstrated excellent internal consistency with a Cronbach's alpha of .96, excellent test-retest reliability within a 30-day window ( $r = .86$ ), and strong evidence of convergent validity with the CAPS-5 and the PCL-C (Bovin et al., 2015). In the current study, internal consistency was excellent (see Table 3).

There were a few missing items (3 at baseline and 3 at the final follow-up). These items were missing at random and were replaced with the series mean. See Appendix B for a summary of missing items for the PCL-5, as well as the DERS-16 and B-IPF.

***Difficulties in Emotion Regulation Scale (DERS-16; Bjureberg et al., 2016)***

Participants completed the DERS-16 three times: at baseline, mid-intervention, and post-intervention. The DERS-16 is a 16-item self-report measure of emotion dysregulation and is an abbreviated version of the DERS-36. The measure uses a Likert scale ranging from 1 to 5, with anchors of *almost never*, *sometimes*, *about half the time*, *most of the time*, and *almost always*, respectively. Research shows that the longer form DERS-36 is an accurate measure of emotion dysregulation and demonstrates good psychometric properties and that the shorter form DERS-16 was not inferior to the long form (Hallion et al., 2018). In previous research, the DERS-36 demonstrated excellent internal consistency ( $\alpha = .94$ ; Hallion et al., 2018). Internal consistency in the current study was also excellent (see Table 3).

There were a few missing items (3 at baseline, 2 at the mid-point follow-up, and 1 at the final follow-up). These items were missing at random and were replaced with the series mean (see Appendix B).

***Brief Inventory of Psychosocial Functioning (B-IPF; Bovin et al., 2018)***

Participants completed the B-IPF three times: at baseline, mid-intervention, and post-intervention. The B-IPF is a seven-item self-report and abridged version of the 80-item *Inventory of Psychosocial Functioning*, which is a measure of psychosocial functional impairment. Items are on a Likert scale of 0 (*not at all*) to 7 (*very much*). In previous research, the measure strongly correlated with PTSD-related psychosocial functional impairment, measures of mental health impairment and quality of life, and measures of other internalizing disorders (Kleiman et al., 2018). It also showed very good internal consistency ( $\alpha = .84$ ) and acceptable test-retest reliability ( $r = .65$ ). In the current study, internal consistency was excellent (see Table 3).

There was one missing B-IPF item at the final follow-up. The item was missing at random. Because missing one item on a 7-item scale meant that more than 10% of the post-intervention B-IPF was missing for that participant, this case was excluded from analyses with post-intervention B-IPF scores. See Appendix B for a summary of missing data decisions.

**Table 3**  
*Internal Consistency ( $\alpha$ ) for Each Study Variable and Time Point*

Variable	Time 1	Time 2	Time 3
PCL-5	.863	.915	.917
DERS-16	.923	.929	.927
B-IPF	.848	.854	.893

**Equipment**

*STAIR Coach* Version 2.0.0 was used for this study. It was available for devices operating on iOS 12.1 or later or Android 6.0 or later, which included compatible iPhone, iPad, iPod Touch, and Android devices. *STAIR Coach* required 125.5 MB of memory space or more to be available on a device to which it was downloaded. Participants needed internet access to download *STAIR Coach*, but the app does not

require a user's device to be connected to the internet for a user to engage with the app. Participants in both the intervention and waitlist control condition did, however, need internet access and an email account to complete baseline and follow-up assessments (via Qualtrics) for the current study.

### ***Download and Use Instructions***

Participants assigned to the intervention condition read basic information about STAIR and about the app. They then downloaded *STAIR Coach*. Participants answered two questions to check that they had downloaded *STAIR Coach* and could operate the mobile app in a way allowing them to answer basic questions about the mobile app. Two similar questions about the app were included at both follow-up assessments. After answering these two questions, participants were given limited guidance on how to use the app and only a suggestion regarding frequency. Participants were then able to use the app, or not, as they found fit with no additional incentive based on the use of the app. For a copy of participant instructions, see Appendix C.

Participants assigned to the waitlist control condition were not asked to do anything other than respond to follow-up assessments mid-study and post-study. They were given no additional information until the end of the six weeks.

## **Procedure**

### **Recruitment**

Between May and June 2021, prospective participants were recruited through a flyer distributed within the local community (i.e., rural college town in the southeastern United States) and on social media (i.e., Facebook and Twitter). The flyer announced an opportunity to participate in a study of individuals who self-identified as having PTSD and a smartphone. Prospective participants had the chance to win a \$10 Amazon gift card in one of five random drawing if they completed an initial screening survey and provided their email address. If eligible to continue, they were compensated with a \$10 Amazon gift card at each follow-up assessment.

Prospective participants used a QR code on the flyer to navigate to Qualtrics, a third-party survey hosting website, where they read an informed consent document. Prospective participants were made

aware of risks and benefits, confidentiality and its limits, and their ability to withdraw from any portion of the study at any point. They were also informed that only some individuals who agreed to be in the study and completed the initial screening would be invited to participate further.

### **Initial Screening and Baseline Assessment**

After reviewing the informed consent document, everyone who agreed to participate was immediately presented with the Demographics Form. At the end of the Demographics Form, participants could enter their email address to be entered to win a gift card. This was optional, and participants had the choice to continue the initial screening without providing their email address. Next, participants completed the LEC-5, followed by the PCL-5, DERS-16, and B-IPF. Only individuals who reported experiencing at least one trauma on the LEC-5 and had a score of 31 or higher on the PCL-5 were eligible to continue further in the study. LEC-5 and PCL-5 scoring was automated by Qualtrics. Those who did not meet these criteria were redirected to a page thanking them and explaining that they were ruled out from further participation. In total, 362 individuals completed the initial screening, but only 50 were eligible to participate in the full study.

Everyone who was not screened out was considered eligible to participate in the whole study. They were given basic information about what would be involved in the study (i.e., follow-up assessments three and six weeks later) if they agreed to continue.

### **Study Condition Assignment**

Everyone who agreed to continue in the study was then randomly assigned to either the control (waitlist) or intervention (*STAIR Coach*) condition. Participants in the control condition were given the opportunity again to provide their email so that they would receive an email 3 weeks later and 6 weeks later reminding them to complete follow-up assessments and including a link to the Qualtrics survey. To continue in the study, participants had to provide their email at this point.

Participants in the intervention condition were immediately provided a brief overview of *STAIR* as a treatment modality for PTSD as well as information on *STAIR Coach* and provided instructions for how to download and use the app. This included very brief instructions on how to use and operate *STAIR*

*Coach* (e.g., what modules are available, topics covered, and a suggested order to use modules). These instructions were similar to the information provided on the VA website. Participants were encouraged to use *STAIR Coach* at least once a week during the six-week intervention period and to complete at least a module per week in *STAIR Coach*. Participants in the intervention condition were given the opportunity again to provide their email so that they would receive an email 3 weeks later and 6 weeks later reminding them to complete follow-up assessments and including a link to the Qualtrics survey. To continue in the study, participants had to provide their email at this point. See Appendix C for a copy of control and intervention participant instructions.

### **Follow-Up Assessments**

After three weeks, participants in both the intervention and waitlist conditions received an email with a link to a Qualtrics survey where they again completed the PCL-5, DERS-16, and B-IPF. The timeframe in the instructions for each of the measures were adapted for participants to report on the last three weeks. Participants in the intervention condition also answered two questions about their use of *STAIR Coach* as a form of manipulation check. They were then encouraged to continue to use *STAIR Coach*. All participants were compensated with a \$10 Amazon gift card for completing the mid-intervention assessment.

At the conclusion of the six-week intervention period, all participants received another email with a link to a Qualtrics survey where they were again completed the PCL-5, DERS-16, and B-IBF. The post-intervention assessments were completed within one week or less of the end of the six-week intervention period. Participants in the intervention condition again completed questions about their use of *STAIR Coach* as a final manipulation check. At the end, all participants were debriefed, and participants in the waitlist condition were provided information regarding *STAIR Coach* and an opportunity to download it. All participants were compensated with a \$10 Amazon gift card for completing the post-intervention assessment.

### **Data Collection**

To link anonymous participant data across the three study time points, each participant was randomly assigned a unique code number to enter each time they completed an assessment. Data were stored on a secure server until the completion of the intervention portion of the current study. After the completion of the intervention period, data were transferred to a secure password protected hard drive and deleted from the server. Data were analyzed and reported in an aggregate, de-identified manner in a way that prevents individual participants being identified.

**Ethics Statement**

All study materials and procedures were reviewed and approved by the Institutional Review Board of Georgia Southern University (H21376).

## CHAPTER 3

### RESULTS

#### Primary Analyses

The primary outcome evaluated is a reduction in PTSD symptoms based on PCL-5 scores within the intervention condition and occurring at a more significant level in the intervention condition when compared to those in the wait list control. Additional outcomes examined were based on changes in scores for the DERS-16 and B-IPF of the intervention condition as compared to the control condition.

To estimate the sample size needed to detect the hypothesized effects a power analysis was conducted using G\*Power Version 3.1 a computer software program designed to compute the necessary sample size for a range of statistical analyses commonly used in research (Faul et al., 2009). As previously discussed, independent studies on PTSD mobile apps and meta-analyses show a moderate effect size. In G\*Power this corresponds with an effect size  $f$  of .27 (or a partial  $\eta^2$  of .07) with a 5% chance of a type I error which indicated the need for a total sample size of 38 participants. In order to account for attrition, an additional 30% of individuals were targeted for recruitment, totaling a recruitment of 50 participants. The participants were randomized equally to each group with 25 in each condition.

#### Hypothesis 1

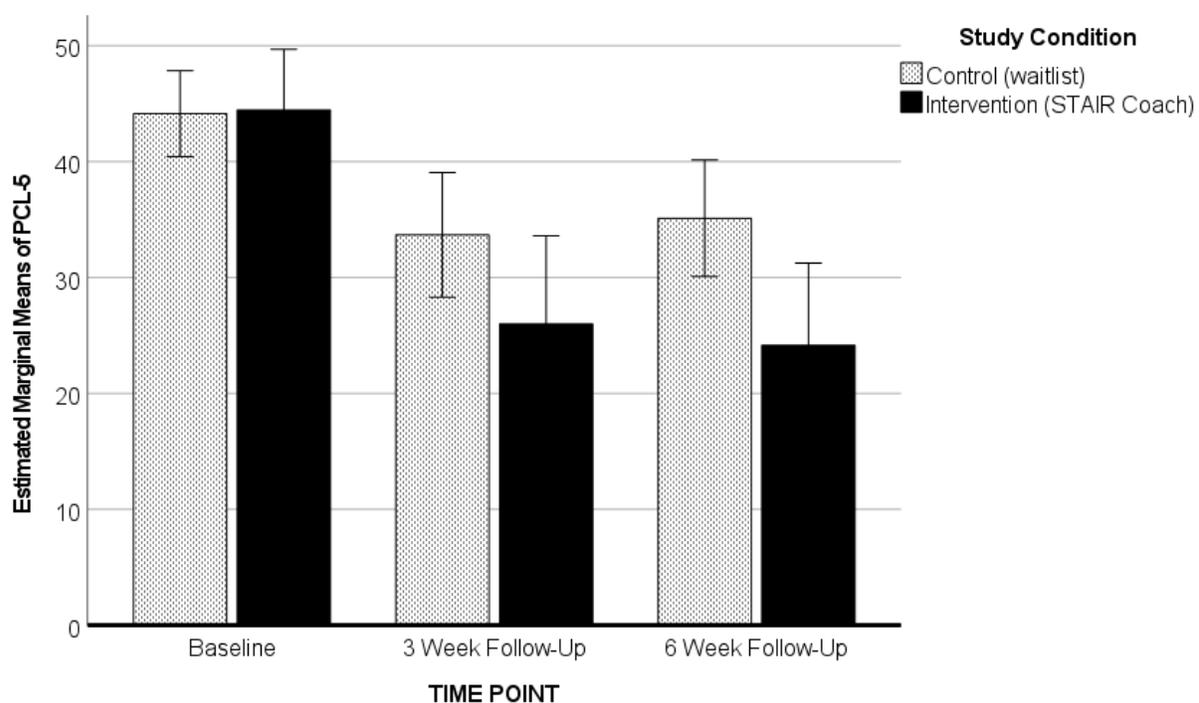
The first hypothesis, that participants in the intervention condition (those who used *STAIR Coach*) would report significantly greater reduction in PTSD symptoms from pre-intervention to post-intervention compared to the waitlist control (those who did not use *STAIR Coach*) was investigated using a 2 x 3 repeated measures ANOVA. PTSD symptoms (PCL-5 total score) served as the dependent variable. Study condition (intervention vs. waitlist) served as a between-subjects independent variable, and time point (baseline/pre-intervention, mid-intervention, and post-intervention) served as a within-subjects independent variable.

Results revealed a significant effect of time,  $F(2, 62) = 32.13, p < .001, \text{partial } \eta^2 = .51$  (large effect). Specifically, for both conditions PCL-5 scores were significantly lower at the two follow-up times compared to baseline. The main effect for condition was not significant,  $F(1, 31) = 3.57, p = .07, \text{partial}$

$\eta^2 = .10$  (medium effect), with participants in the intervention condition showing marginally lower PCL-5 scores than the control group. This result may have been underpowered with an observed power of only .45. Even so, there was still a significant interaction between time and condition on PCL-5 scores,  $F(2, 62) = 3.83, p = .03$ , partial  $\eta^2 = .11$  (medium effect), in that participants in the intervention condition compared to the control condition saw significantly greater reductions in PCL-5 scores from baseline to the 3-week follow-up assessment and significantly lower scores at the 6-week follow-up (see Figure 1).

**Figure 1**

*Changes in PCL-5 Scores Over Time for Intervention and Waitlist Groups*



*Note:* Error bars represent 95% Confidence Intervals

Of the 14 intervention participants who completed the entire study, 11 (79%) reported clinically significant improvement based on having at least a 10-point reduction in PCL-5 scores, and 10 intervention participants (71%) were classified as no longer having PTSD based on having a PCL-5 score less than 31. Of the 22 control participants who completed the whole study, 11 (50%) reported clinically significant improvement and 7 (32%) were classified as no longer having PTSD.

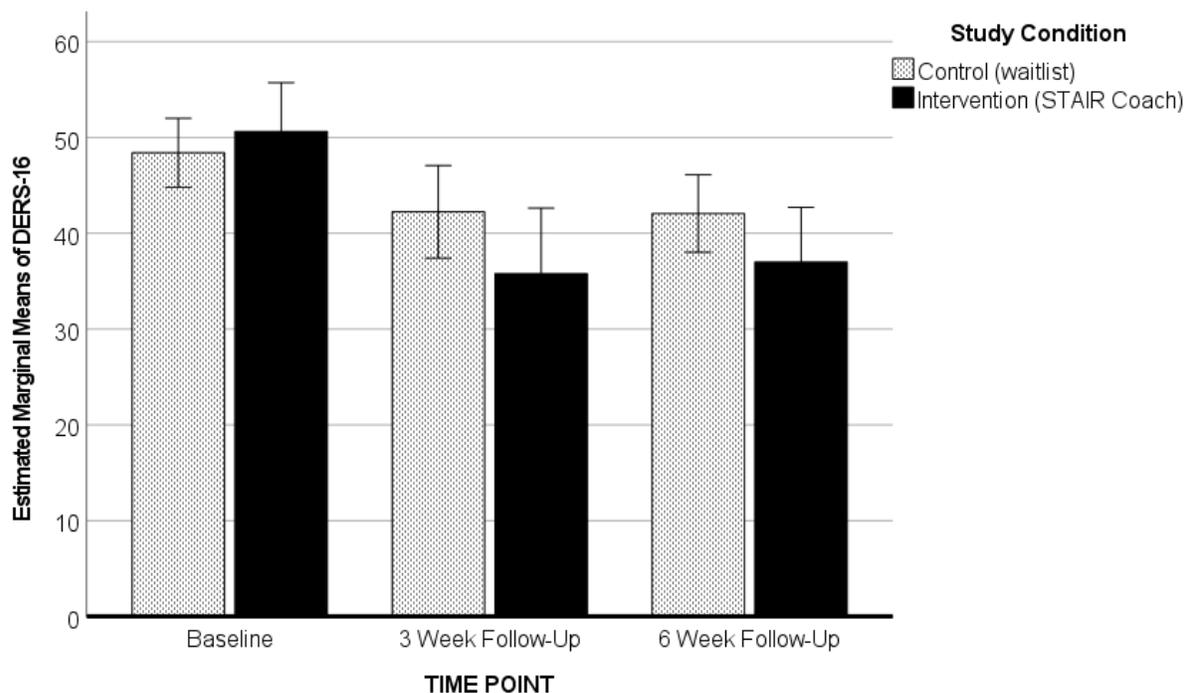
## Hypothesis 2

The second hypothesis was that use of *STAIR Coach* would result in significantly greater reductions in emotion dysregulation from pre-intervention to post-intervention compared to the waitlist control. The analysis for hypothesis 1 was repeated with DERS-16 scores as the dependent variable. It was predicted that the main effects of condition and time point, as well as the interaction between condition and time point, would be significant. It was predicted that those in the intervention condition would have a significantly greater reductions in emotion dysregulation over time but not those in the waitlist control condition.

Results revealed a significant effect of time,  $F(2, 62) = 25.24, p < .001$ , partial  $\eta^2 = .45$  (large effect). Specifically, for both conditions DERS-16 scores were significantly lower at the two follow-ups compared to baseline. The main effect for condition was not significant,  $F(1, 31) = 1.07, p = .31$ , partial  $\eta^2 = .03$  (small effect). There was, however, a significant interaction between time and condition on DERS-16 scores,  $F(2, 62) = 3.91, p = .03$ , partial  $\eta^2 = .11$  (medium effect), in that participants in the intervention condition saw significantly greater reduction in DERS-16 scores from baseline to the 3-week follow-up assessment compared to those in the control condition (see Figure 2).

**Figure 2**

*Changes in DERS-16 Scores Over Time for Intervention and Waitlist Groups*



*Note:* Error bars represent 95% Confidence Intervals

### Hypothesis 3

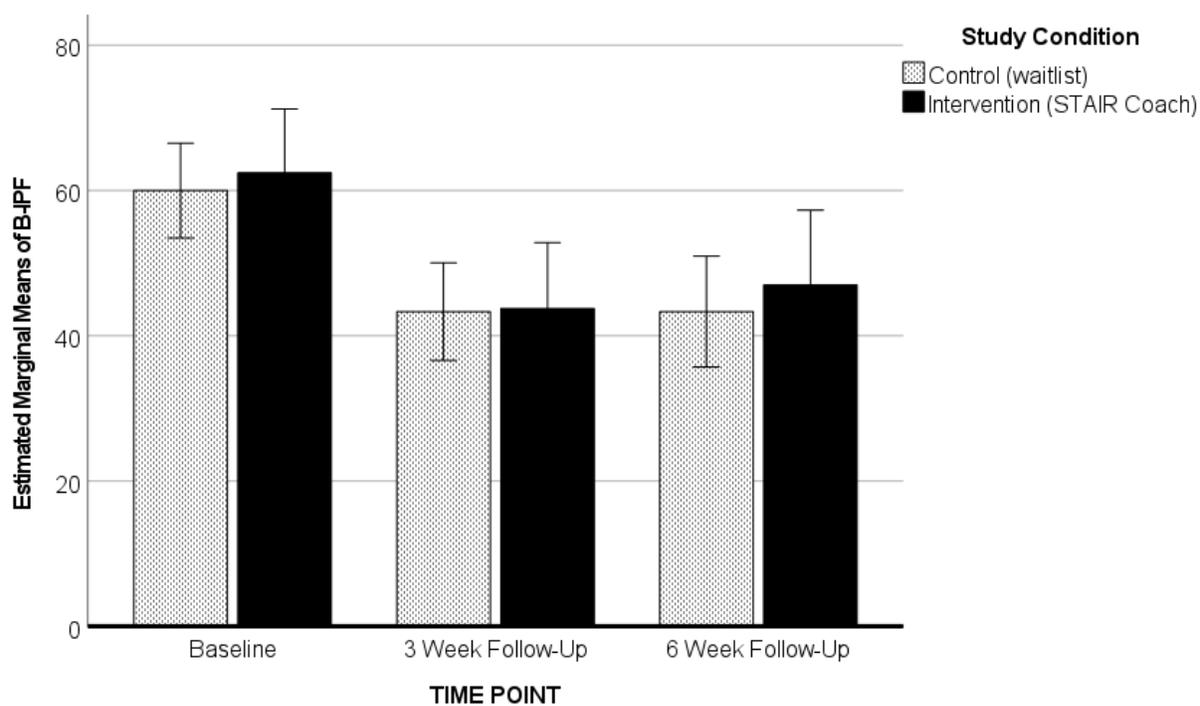
I hypothesized that participants who use *STAIR Coach* would report significantly greater improvements in psychosocial functioning from pre-intervention to post-intervention compared to the waitlist control. The analysis for hypotheses 1 and 2 was repeated with B-IPF scores as the dependent variable. It was predicted that the main effects of condition and time point, as well as the interaction between condition and time point would be significant. It was predicted that those in the intervention condition would have significantly greater improvements in psychosocial functioning over time but not those in the waitlist control condition.

The assumption of sphericity for the standard repeated measures ANOVA was violated, Mauchly's  $W(2) = 41.59, p < .001$ , so the Greenhouse-Geisser test was used for within-subjects effects. Results revealed that there was a significant effect of time,  $F(1.13, 32.70) = 16.86, p < .001$ , partial  $\eta^2 = .37$  (large effect). Specifically, in both conditions B-IPF scores were significantly lower at the two follow-

ups compared to baseline. The main effect for condition was not significant,  $F(1, 29) = .27, p = .61$ , partial  $\eta^2 = .009$  (very small effect). There was not a significant interaction between time and condition on B-IPF scores,  $F(1.13, 32.70) = .12, p = .76$ , partial  $\eta^2 = .004$  (very small effect). Participants reported significantly improved psychosocial functioning from baseline to follow-ups, but there was no difference between conditions (see Figure 3).

**Figure 3**

*Changes in B-IPF Scores Over Time for Intervention and Waitlist Groups*



## Secondary Analyses

### Exploratory Research Question

This study also examined whether participants from rural areas would experience similar dropout rates and clinical benefit compared to participants from non-rural areas. Unfortunately, only nine of the 50 participants (four in the control condition, five in the intervention) indicated that they lived in a rural area, making statistical comparisons difficult. See Table 4 for a breakdown of drop-out, clinically significant change, and recovery for rural and non-rural participants.

**Table 4**

*Number of Rural Participants Who Participated at Each Time Point, Reported Clinically Significant Change, or Were Classified as Recovered by the End of the Study*

Variable	Control		Intervention	
	Rural	Non-Rural	Rural	Non-Rural
Time 1 Participation	4	21	5	20
Time 2 Participation	4	19	2	15
Time 3 Participation	4	18	4	10
% Dropout from Time 1 to 3	0%	29%	20%	50%
Clinically Significant PCL-5 Change ( $\geq 10$ )	2	7	3	8
Recovered Based on PCL-5 Total ( $< 31$ )	4	5	3	7

## CHAPTER 4

### DISCUSSION

#### **Summary of Findings**

The goal of the current study was to examine the clinical benefits of *STAIR Coach* as a standalone modality for treatment of PTSD. Participants were randomly assigned to an intervention condition, in which they were asked to download and encouraged to use *STAIR Coach*, or a waitlist control condition. Their PTSD symptoms, as well as their emotion dysregulation and psychosocial functioning, were assessed at baseline, mid-way through the study (three weeks later), and at the end of the study (six weeks later). It was hypothesized that participants in the intervention condition would report a significantly greater reduction in PTSD symptoms and emotion dysregulation and significantly greater improvements psychosocial functioning compared to the waitlist controls. Findings offer partial support for these hypotheses.

The results of current study supported the hypothesis that participants using *STAIR Coach* would experience greater reductions in PTSD symptoms over time compared to the waitlisted participants. Participants in the intervention condition did have a significantly greater reduction in PTSD symptoms from baseline to follow-up. Furthermore, a change of 10 on the PCL-5 is considered to reflect clinically significant change (Bovin et al., 2015). Scores in the intervention condition on the PCL-5 were on average 20 points lower after six weeks (at the conclusion of the study) compared to an average nine-point decrease in the waitlist control group. Roughly three in four intervention participants saw both clinically significant improvement and were no longer classified as having PTSD at the end of the study, whereas only half the waitlist control participants experienced clinically significant improvement and just a third were no longer classified as having PTSD.

Results also supported the hypothesis that participants using *STAIR Coach* would report significantly greater reductions in emotion dysregulation over time compared to participants in the waitlist control. Contrary to the hypothesis that intervention participants would report significantly greater improvements over time in psychosocial functioning compared to control, participants in the intervention

group were not significantly improved over time when compared to participants in the waitlist control group.

### **Theoretical Implications**

The implications of the current study build upon a body of research for both mental health mobile apps and PTSD treatment. This study further demonstrates the feasibility and clinical benefits of mobile apps for mental health (Firth et al., 2017; Linardon et al., 2019). Specifically, it adds to a much smaller body of research demonstrating the clinical benefits of PTSD apps and is also one of only a few RCTs to do so (Goreis et al., 2020; Wickersham et al., 2019).

The current findings also support prior research demonstrating the benefits of non-trauma focused treatment such as STAIR (Cloitre et al., 2006; Cloitre et al., 2010; Gudiño et al., 2014; Jackson et al., 2019; MacIntosh et al., 2014; Trappler & Newville, 2007), including supporting findings in prior studies demonstrating the skills portions of STAIR can result in a clinically significant reduction in PTSD symptoms (Cloitre et al., 2010). This is also the first study demonstrating the potential feasibility and efficacy of the skill-based interventions from STAIR being delivered through a mobile app.

### **Clinical Implications**

As previously discussed, a significant number of individuals experience a traumatic event within their lifetime and between 7 and 9% will have a diagnosis of PTSD (Kilpatrick et al., 2013; National Center for PTSD, 2018). Many will not receive treatment due to a variety of barriers, including stigma, limited mental health literacy, high cost, lack of transportation, and other factors (Blais et al., 2014; Chikovani et al., 2015; Gavrilovic Kantor et al., 2017; Hom et al., 2017; Kulesza et al., 2015). It has been suggested that mobile apps may offer a way to overcome some these barriers (Kantor et al., 2017). The current study provides additional evidence supporting the potential clinical benefits of using mobile apps, such as *STAIR Coach*, for individuals experiencing symptoms of PTSD. The use of *STAIR Coach* in this study, and other research on using mobile apps more broadly to deliver evidenced based treatment interventions, could be beneficial in increasing access to interventions for individuals facing barriers to care. Additionally, mobile apps can be an alternative, or middle way, for individuals who do not want to

engage in therapy at that time. Although more research is needed, the positive experience provided by *STAIR Coach* and psychoeducational components may serve to reduce some barriers to seeking therapy in the future.

While the current study found clinical benefit for *STAIR Coach* when used outside of therapy or other treatment, mobile apps are commonly used in conjunction with therapy. The clinical benefits found in this study for *STAIR Coach* indicate that it may also be beneficial to utilize *STAIR Coach* as a supplement to traditional therapy, e.g., to assign homework or deliver specific STAIR interventions.

The current study also supports previous findings that there are clinical benefits for clinicians using the skills portion of STAIR. Even without engaging in trauma focused activities, participants using *STAIR Coach* reported clinically significant reductions in PTSD symptoms and emotion dysregulation. Though trauma focused work may be overall more effective than non-trauma focused treatments (Lee et al., 2016; Moldovan et al., 2019), the potential benefit of a non-trauma focused work is that it is likely easier to implement in an app-based environment and still produces real change, at least over the course of the six weeks studied.

### **Rural Implications**

Only a small number of rural participants were in this study, so it is difficult to make any strong conclusions specifically about the adoption or clinical benefit of *STAIR Coach* for rural populations when compared to those in non-rural areas. Nevertheless, the use of *STAIR Coach* could still benefit rural populations, and the use of mental health apps in rural areas remains an important area for research. Individuals who live outside of metropolitan areas have a greater shortage of mental health providers (HRSA, 2017). Among other barriers, stigma is also higher in rural compared to non-rural areas impacting treatment utilization (Smalley & Warren, 2012). Mobile apps offer greater anonymity and a potential alternative resource to therapy. Though telehealth can improve access, smart phones are more common than broad band internet in rural areas (Vogels, 2021). The current study contributes to the growing body of evidence offering support for mobile apps as a potential resource for the barriers to care in rural and non-rural areas.

## Limitations

The results of the current study are promising and demonstrate the feasibility and potential clinical benefits of *STAIR Coach*; however, the study does have limitations that must be considered when evaluating the results. The sample size of the study ( $N = 50$ ) is relatively small. The attrition rate of the intervention condition (44%) was also greater than expected. Both of these issues likely resulted in some study analyses being under powered and potentially impacts generalizability.

In this study, dropout rates in the intervention condition were relatively high (44%). This was initially surprising because studies of STAIR have found evidence of lower dropout rates compared to other treatments, especially trauma focused treatments (Cloitre et al., 2010); however, the adaptation of STAIR, or any mental health treatment, to a mobile app may present its own challenges. Apps may be helpful for reducing treatment barriers because they are easier to begin using compared to traditional therapy, but they are also easier to stop using. There may be ways to increase engagement in therapy apps using, for example, push notifications. Some research has examined gamification of therapy apps and found that it may not make a difference in terms of symptom reduction but may improve engagement (Cheng et al., 2019; Pramana et al., 2018).

Another limitation was the utilization of the PCL-5 as a screening measure, which, while strongly associated with a diagnosis of PTSD, is just that—a screener, not a diagnostic tool. A potentially better tool may be the *Clinician Administered PTSD Scale for the DSM-5*, a structured clinical interview and gold standard for PTSD diagnosis (Weathers et al., 2013a). Requiring that participants undergo structured interviews to participate, however, could create too great a barrier for some people to participate in the study for the same reason that people have difficulty accessing traditional mental health services. Still, there may be a need for more rigorous diagnosis in future studies.

Finally, another limitation was that the data were collected during the COVID-19 pandemic. In May and June 2021, when data were collected, many individuals were continuing to work from home or remained out of the workforce altogether, and the Delta variant began to spread just when many people and places had started to return to normal (Centers for Disease Control and Prevention, 2022). On the one

hand, this may have made people more interested in a mobile app option for mental health issues. On the other hand, it is unclear how the pandemic may have influenced scores or symptoms of the participants.

There was no impact of *STAIR Coach* on psychosocial functioning in the current study, and there are several reasons this may have occurred. The first is that the psychosocial functioning skills component of *STAIR* typically occurs in later modules. This means that participants may have only completed these portions at the end of the six weeks and likely had less time to practice these skills before completing the final measures. Another potential reason for this finding is that recruitment and data collection took place between May to July in 2021. It is unknown how the psychosocial functioning of the participants might have been impacted by pandemic conditions. It is possible that psychosocial functioning was suppressed across the board because it was harder to engage in work, school, with friends, and so on. Additionally, individuals in the intervention group may have experienced improved interpersonal skills but may still have had fewer opportunities to put them into practice because of continued need to socially isolate.

### **Future Directions**

Research on mobile apps is a recently emerging area of study but it is rapidly growing. Currently, clinical research on evidenced based psychology apps is still limited in many ways. Prior studies and meta-analyses have found clinical benefits for mobile apps for a variety of psychological conditions; however, much fewer research studies specific to PTSD mobile apps have been conducted. Specifically, only a few RCTs for mobile apps have been published and none for *STAIR Coach*. This study is the first to evaluate *STAIR Coach* and one of only a few RCTs for a PTSD mobile app. While the results for *STAIR Coach* are promising, the current study had a limited number of participants. Future research should not only attempt to replicate these findings, but also include larger samples. Research for *STAIR Coach* where a CAPS-5 is used to screen participants for PTSD and confirm a current diagnosis would also add weight to any future findings. Future research for *STAIR Coach* may benefit from examining more closely the relationship between attitudes toward mobile apps as well as reported mobile app use and treatment outcomes. If *STAIR Coach* is found to be clinically beneficial in future studies, it will be helpful to know how much time or at what “dosage” the use of *STAIR Coach* is needed for this clinical

significance to occur. In future *STAIR Coach* research, it may be beneficial to include a sample of participants receiving treatment as usual and/or *STAIR* in person to compare to participants using the mobile app alone. Many prior studies for mobile apps examined potential benefits of mobile apps used in conjunction with traditional therapy. Similarly, the potential benefits if any of *STAIR Coach* should be explored in this way to determine if any greater clinical benefit may occur with *STAIR Coach* being used as a supplement to *STAIR* delivered through therapy. In addition to clinical benefit, these studies may also examine potential benefits such as treatment completion, homework adherence, and qualitative clinical experiences of both clients and clinicians using *STAIR Coach* in conjunction with therapy.

### **General Conclusions**

The present study did find significant differences in scores on a measure of PTSD symptoms, PCL-5, and on a measure of emotion dysregulation, DERS-16, for participants who downloaded the *STAIR Coach* app when compared to a wait list control; however, there was not a significant difference in scores on a measure of psychosocial functioning for participants who downloaded the *STAIR Coach* app when compared to a wait list control. The present study did find support for *STAIR Coach* for improving symptoms of PTSD. This demonstrated the potential for mobile apps to both improve skills such as emotion dysregulation and reduce symptoms of PTSD. These findings are important for understanding the potential benefits of *STAIR Coach* and mobile apps overall so they may be best utilized to overcome barriers to mental health treatment for those who are currently underserved.

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## APPENDIX A

## MEASURES

**Demographics Form**

1. **What is your current age?** \_\_\_\_\_
2. **What is your gender?**
  - Male
  - Female
  - Other: \_\_\_\_\_
3. **What is your sexual orientation?**
  - Heterosexual
  - Gay/Lesbian
  - Bisexual
  - Asexual
  - Pansexual
  - Other: \_\_\_\_\_
4. **Which type of community do you live in?**
  - Suburban community
  - City or urban community
  - Rural community
  - Other: \_\_\_\_\_
5. **What is your marital status?**
  - Single
  - Married
  - Divorced
  - Separated
  - Never married
6. **Which of the following best describes your racial and ethnic background? Select all that apply.**
  - Asian
  - African American/Black
  - American Indian or Alaska Native
  - Pacific Islander
  - Hispanic or Latino
  - Multiracial
  - White/Caucasian
  - Other: \_\_\_\_\_
7. **Are you a military veteran?**
  - Yes
  - No
  - Prefer not to say
8. **If you would like to enter for a chance to win a gift card please enter your email below:** \_\_\_\_\_

## APPENDIX B

## SUMMARY OF MISSING DATA AND DECISIONS

	<b>Number of Missing Cases</b>	<b>Missing Completely at Random?</b>	<b>Missing Value Replacement (Series Mean)</b>	<b>Participant Study Condition</b>
<b>PCL-5 Time 1</b>				
Item 13	2	Yes	2.29	Intervention
Item 18	1	Yes	2.04	Waitlist
<b>PCL-5 Time 3</b>				
Item 13	1	Yes	1.60	Waitlist
Item 14	1	Yes	1.46	Intervention
Item 18	1	Yes	1.69	Intervention
<b>DERS-16 Time 1</b>				
Item 2	1	Yes	2.92	Intervention
Item 7	1	Yes	3.02	Waitlist
Item 12	1	Yes	2.98	Intervention
<b>DERS-16 Time 2</b>				
Item 1	1	Yes	2.74	Intervention
Item 5	1	Yes	2.41	Waitlist
<b>DERS-16 Time 3</b>				
Item 14	1	Yes	2.49	Waitlist
<b>B-IPF Time 3</b>				
Item 2	1	Yes	Did not replace	Waitlist

## APPENDIX C

## INSTRUCTIONS TO PARTICIPANTS

**FOR ALL ELIGIBLE PARTICIPANTS:**

Based on your answers you qualify for the full study. If you would like to participate in the full study, you may need to answer a few additional questions. You will also be contacted again by email, in three weeks and six weeks, to complete follow up surveys, these will each take about five minutes to complete. If you participate in those surveys you will receive a \$10 gift card for completing each of the follow-up surveys. Do you wish to continue?

- Yes  
 No

*---If 'Yes,' Random Assignment to Conditions---*

**FOR WAITLIST PARTICIPANTS ONLY:****Instructions for Follow-Up Assessments**

In order to contact you for the follow-up survey, please enter your email below. You will receive these emails in 3 weeks, and again in 6 weeks. You will also receive your gift cards at this email address after completing those surveys.

Email Address: \_\_\_\_\_

*---End of Baseline Survey---*

**FOR INTERVENTION PARTICIPANTS ONLY:****Description of STAIR and STAIR Coach**

In order to participate in the study, we are asking that you download the *STAIR Coach* app. Skills Training in Affective & Interpersonal Regulation (STAIR) is an evidenced-based psychotherapy that has been shown to be useful for individuals experiencing symptoms of trauma. The STAIR app includes tools and psychoeducational resources based on cognitive and behavioral interventions used in STAIR. One of the goals of these interventions is to assist with managing emotions and relationships. Although you are being asked to download the app in order to participate, you are free to use it or not, and at whatever frequency or in whatever way you want. Below are instructions for downloading *STAIR Coach*:

**Instructions for Downloading STAIR Coach**

1. Open the **App Store**. From the home screen, tap **App Store**.
2. To search within the **App Store**, tap **Search** (at the bottom right corner).
3. **Type** STAIR Coach in the search bar (top of the screen).
4. Hit the **Search button** (bottom right corner).
5. Tap **GET**, then tap **INSTALL**.
6. If prompted, sign in to the App Store to complete the install.

Were you able to successfully install *STAIR Coach* on your device?

- Yes
- No, and I do not want or can't participate in this study.



Please Open the *STAIR Coach* App on your device. The App may ask you some questions and allow you to take a tour of it. You may take your time now to do so if you choose. When you are done it will take you to the home screen. Pictured above is the home screen for *STAIR Coach*. The next few questions will require you to navigate from this screen in order to answer them. Can you see the home screen as pictured above?

- Yes
- No, I would like to go back to the download instructions.
- No, I do not want to continue participating.

Select the "Readings" tab at the bottom of the screen, then select "All" at the top of the screen. What is the third option under All Readings?

- Emotional Regulation
- Purpose of Emotions
- Negative Thinking
- Positive Emotions

Select the "Tools" tab at the bottom of the screen, then select "All" at the top of the screen. What option is the first option under All Tools?

- Emotion Surfing
- Deep Breathing
- Act the Opposite
- Relaxation Skills

**Instructions for Using *STAIR Coach***

Now that you have downloaded STAIR Coach you can use it in whatever way you see fit. However, it is recommended that you complete at least one of the six modules per week. The recommended order is Understanding Trauma, Calm My Body, Adjust My Thinking, Change My Behavior, Tolerate Distress, and Manage Relationships.

**Instructions for Follow-Up Assessments**

In order to contact you for the follow-up survey, please enter your email below. You will receive these emails in 3 weeks, and again in 6 weeks. You will also receive your gift cards at this email address after completing those surveys.

Email Address: \_\_\_\_\_

*---End of Baseline Survey---*