Self-Monitoring Using a Digital Versus Paper DBT Diary Card Format: Predicting Fidelity of Completion, Self-Reported Mental Health Symptoms, and Social Acceptability

Morgan Anderson

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James J. Mazza, Chair

Katie Davis

David Knight

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Abstract

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Morgan Anderson

Chair of the Supervisory Committee:

James J. Mazza

College of Education

Prevalence of mental health needs, particularly those related to anxiety, depression, and emotion regulation, are on the rise in higher education institutions (Auerbach et al., 2016; Blanco et al., 2008). Research has shown college and university student help-seeking behavior varies by identity and many students are often reluctant to seek support (Oswalt et al., 2020; Rickwood et al., 2007), and yet, there are increasing rates of students seeking counseling supports on college and university campuses (Abrams, 2020; Prince, 2015; Son et al., 2020; Xiao et al., 2017). To support students' mental health needs, creative, preventive mental health care is needed in higher education institutions. The present study is situated within the context of a preventive mental health care intervention for undergraduate students in the form of an optional, universally offered course. The course draws on principles of Dialectical Behavioral Therapy, Acceptance-

Commitment Therapy, and Positive Psychology. In order to track intervention efficacy and support generalization and rehearsal of learned skills, students are tasked with using a self-monitoring tool called a diary card. Behavior change literature suggests that self-monitoring is a key factor in goal attainment and can even promote better intervention outcomes (Harkin et al., 2016; Kruglanski et al., 2002). Effective self-monitoring is that which is completed with fidelity, meaning high accuracy and consistency, both of which stand to be improved by technology. Digital formats of self-monitoring are increasingly popular because of their implications for self-monitoring fidelity and social acceptability (Aguilera, 2015; Avina, 2008; Cristol, 2018; Bedesem, 2012; Borntrager & Lyon, 2015; Dennison et al., 2013; Marzano et al., 2015; Melbye et al., 2020; Murnane et al., 2016; Sin et al., 2020; Ysseldyke et al., 2006). However, there remains a lack of robust evidence to support the use of digital self-monitoring tools in mental health interventions.

This study adds to existing literature by using quantitative and qualitative methods to further explore the efficacy and social acceptability of a digital diary card used within a preventive mental health course at the university level. Students enrolled in the course were randomly assigned either to the Business as Usual (BAU) paper diary card or the digitally formatted diary card. Multiple regression analysis showed the digital diary card format uniquely predicted lower completion fidelity and social acceptability. Qualitative interviews further revealed students had difficulty with using and submitting the digital diary card, but even in spite of these challenges, would prefer a digital diary card in the future, emphasizing the importance of ease of use and submission in future designs. This paper concludes with recommendations for the design and implementation of a digital self-monitoring tool and directions for future research.

Keywords: Digital mental health, self-monitoring, undergraduate, mHealth design.

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Chapter One: Introduction and Overview

Prevalence and Prevention of Mental Health Needs in Higher Education

Prevalence rates of mental health disorders like depression and anxiety are on the rise in higher education students, as are rates of students seeking support through formal counseling services (Auerbach et al., 2016; Blanco et al., 2008; Kitzrow, 2003; Oswalt et al., 2020; Xiao et al., 2017). However, counseling centers report their staffing rates are not increasing at a pace to keep up (Abrams, 2020; Kitzrow, 2003). Even with more students seeking counseling services, there are still many students who are reluctant to seek out formal services, including students who hold historically minoritized racial, ethnic, gender, or sexual orientation identities (Bryant et al., 2022; Eisenberg et al., 2009; Rickwood et al., 2007; Wong et al., 2014). So not only are there more students that are seeking supports, there are potentially even more that need support. Higher institutions have been getting creative in developing preventive mental health supports accessible to all students to address both the increasing numbers of students seeking support as well as to target those who are not (Auerbach et al., 2016; Blanco et al., 2008; Conley et al., 2013, 2015; Prince, 2015).

The University of Washington's Wellness and Resilience for College and Beyond class is an example of a creative solution—a preventive mental health care intervention that aims to support students throughout their academic careers and beyond by providing therapeutic skills in a general population format (Mazza & Lally, 2022). The class content draws on principles from Dialectical Behavioral Therapy (DBT; Linehan, 1993, 2014, 2018), Positive Psychology (Seligman, 2002), and Acceptance-Commitment Therapy (ACT; Hayes et al., 2009). To support students beyond simple skill acquisition, students engage in the practice of the skills through in-class rehearsal with coaching from instructors and are tasked with self-monitoring their skill use

for homework using a diary card (Linehan, 1993, 2014, 2018; Linehan & Wilks, 2015; Mazza et al., 2016).

Self-Monitoring and Mental Health Intervention

Self-monitoring is a proven tool for supporting and enacting mental health intervention (Avina, 2008; Cohen et al., 2013; Korotitsch & Nelson-Gray, 1999; Nelson & Hayes, 1981). The practice of self-monitoring involves observing and recording one's own behavior as a way of tracking progress toward a goal (Avina, 2008; Korotitsch & Nelson-Gray, 1999; Nelson & Hayes, 1981). This practice has been demonstrated to be effective in achieving a goal, changing behavior, and even improving intervention outcomes (Bakker & Rickard, 2018; Harkin et al., 2016; Korotitsch & Nelson-Gray, 1999). Effective self-monitoring is characterized by high fidelity, namely accurate and consistent self-monitoring (Avina, 2008; Harkin et al., 2016; Kanfer, 1970; Korotitsch & Nelson-Gray, 1999; Nelson & Hayes, 1981). This means that an individual needs to record their behavior as soon as possible after it is performed (Korotitsch & Nelson-Gray, 1999) and do so as routinely as possible (Harmon et al., 1980).

Potential for Digital Formats to Improve Self-Monitoring

What is less known is how the efficacy of mental health-related self-monitoring translates to the digital world (Karasouli & Adams, 2014; Marzano et al., 2015; McGee et al., 2021; Melbye et al., 2020; Sin et al. 2020; Wang et al., 2018). Increasingly, researchers and practitioners are using digital formats of self-monitoring tools to support and enact mental health-related behavior change (Marzano et al., 2015; Melbye et al., 2020). Because accuracy and consistency are key components to high fidelity, effective self-monitoring, the use of a digital format, where individuals can even more quickly and routinely record their behavior on web-connected and mobile devices, hold great promise (Aguilera, 2015; Marzano et al., 2015;

Murnane et al., 2016). Furthermore, digital formats have the added benefits of accessibility, data visualization, cost efficiency, and social acceptability (Avina, 2008; Cristol, 2018; Bedesem, 2012; Borntrager & Lyon, 2015; Dennison et al., 2013; Marzano et al., 2015; Melbye et al., 2020; Murnane et al., 2016; Sin et al., 2020; Ysseldyke et al., 2006). More research is needed to explore the extent to which digital formats of self-monitoring are socially acceptable and effective methods for supporting and enacting mental health behavior change.

Present Study and Intended Contributions to the Field

Because there is a lack of research to support the use of digital formats of self-monitoring in mental health intervention, yet the enormous potential to enhance these interventions, this study contributes to existing literature that aims to understand the utility of digital forms of self-monitoring among university students. In particular, there are few studies that use a digital diary card format and none, to the extent that this researcher uncovered, that focus on the efficacy of a digital diary card as a key component within intervention structure. This study contributes to what is known about the unique effect that diary card format has on fidelity of completion, self-reported symptoms related to anxiety, depression, emotion regulation, and social acceptability. Ultimately, this study may be used to inform decision-making about the implementation and design of effective and socially acceptable forms of self-monitoring with higher education students as part of preventive mental health care intervention.

Chapter Two: Literature Review

This literature review will first examine the mental health needs in higher education settings. Next, it will discuss self-monitoring, what makes it effective, and to what extent digital forms of self-monitoring have potential to improve this efficacy. Finally, this chapter will end by illuminating current gaps in the field and how this study assists in addressing these gaps. The present study adds to the existing evidence base on the efficacy and social acceptability of a digital DBT diary card as a form of self-monitoring within the context of a tier one, preventive mental health intervention in a university setting.

Mental Health Needs in Higher Education

The prevalence of mental health-related symptoms and needs in college-age populations has and continues to be cause for concern (Auerbach et al., 2016; Blanco et al., 2008). A 2016 analysis of data collected from the World Health Organization's Mental Health Survey across 21 countries showed that one-fifth of college students had DSM-IV diagnosed disorders, 83% of which were present prior to college enrollment (Auerbach et al., 2016). This same study also showed that disorders present before college enrollment were associated with higher rates of attrition and could be a factor in college dropout rates. College students early in their academic careers—namely freshmen—represent an especially vulnerable group (Pritchard et al., 2007). In college freshmen, fewer coping skills, low self-esteem, and increased levels of perfectionism have been shown to predict worse physical and mental health over time (Pritchard et al., 2007). Because of the prevalence of mental health disorders impacting college-age students and the relationship between mental wellness and academic success, universities are tasked with providing mental health services in order to holistically support their students (Eisenberg et al., 2009).

On the Rise

Prevalence of mental health disorders has always been high, but more concerning, is that rates of mental health disorders are only increasing (American Psychological Association, 2013; Son et al., 2020). A 2019 survey via the Association for University and College Counseling Center Directors indicated that 90% of surveyed college counseling directors report the number of students with serious psychological concerns is growing (Abrams, 2020). That is, the rate of students seeking counseling services is increasing, as is the severity and complexity of their needs (Prince, 2015). Counseling can have positive impacts on personal wellbeing, academic success, and retention rates, and, as such, there are an increasing number of college students seeking on-campus counseling services (Abrams, 2020; Kitzrow, 2003; Oswalt et al., 2020; Xiao et al., 2017). Unfortunately, what is not growing at an equivalent rate is college and university counseling centers' capacity to meet the needs of students', even with recent increases in staffing, hiring rates are outpaced by the growing demand (Abrams, 2020; Kitzrow, 2003). In the wake of COVID-19 lockdowns, universities in the United States have seen an additional rise in the number of students in need of mental health supports (Son et al., 2020). Now more than ever, it is imperative that higher education institutions support students' mental health and wellness by rallying around creative efforts, bolstering preventive services, and supporting students as early in their academic careers as possible.

Reluctance to Seek Services

Though the number of college students seeking counseling services is generally on the rise, it is also important to note this has not always been the case and help-seeking behavior varies across student characteristics (Oswalt et al., 2020). According to a 2007 study conducted by Rickwood et al., many college students have historically been reluctant to seek services. The

researchers found young men, and young men from historically minoritized racial and ethnic identities, in particular, are often the most reluctant to seek help. In 2014, Wong et al. found similar results when comparing help-seeking behavior between Asian American and White American students across 70 colleges and universities, where Asian American students were less likely to seek professional support for suicidal ideation than White American college students. Bryant et al. (2022), found factors such as sense of belonging, race or ethnicity, sexual orientation and gender identity, and living situation (i.e. whether or not a student commutes or lives on campus) can play a role in higher education students' readiness or reluctance to seek formal mental health supports. Young people who are experiencing suicidal ideation and depressive symptoms are among the mostly unlikely to seek help, as are those who hold negative attitudes toward help-seeking or who believe that they should be able to manage their mental health symptoms on their own (Rickwood et al., 2007). Personally held stigma regarding mental health has been found to be negatively correlated with help-seeking behavior (Eisenberg et al., 2009). Conversely, those who are knowledgeable of mental health treatment and have established trusting relationships with mental health providers are more likely to seek help (Rickwood et al., 2007).

Common Concerns

Among the top mental health concerns reported by counseling center directors are anxiety and depression (Kitzrow, 2003; Xiao et al., 2017). Emotion regulation, while not a defined mental health disorder, is also an important mental health consideration because challenges with emotion regulation often underpin social-emotional functioning, including the ability to regulate difficult emotions like heightened anxiety and depression (Gross, 1999, 2008). Suicidality, also is a crucial part of the discussion of mental health on college and university campuses (Becker et

al., 2018; Busby et al., 2021). In 2020, suicide was the third leading cause of death among 15 to 24 year-olds (Center for Disease Control and Prevention, 2020).

Mental Health Intervention in Higher Education

To combat high prevalence of mental health needs such as anxiety, depression, emotion regulation, and suicidality, universities have and continue to expand upon the variety of interventions available to students (Auerbach et al., 2016; Blanco et al., 2008; Prince, 2015). Because of the increasing rates of students seeking counseling services and the importance of supporting students early in their academic careers, like freshmen (Pritchard et al., 2007), higher education institutions have largely begun to take a more preventive approach to mental health intervention (Auerbach et al., 2016; Blanco et al., 2008; Conley et al., 2013, 2015; Prince, 2015). Preventive services stand to benefit the high rates of students seeking counseling services, as well as students who may be more reluctant to seek direct services (Rickwood et al., 2007). In addition to routine counseling and therapeutic services, many universities have become creative with service delivery and provide alternative interventions like support groups, drop-in counseling hours, and positive messaging campaigns (Kitzrow, 2003; Prince, 2015).

Preventive Mental Health Intervention in Higher Education

Universally delivered preventive interventions vary quite a bit across campuses and an increasing body of research aims at understanding the types of preventive programming that are most effective on college campuses (Conley et al., 2013, 2015; Prince, 2015). Across meta-analyses of preventive programming, one commonality in effective programing that has been found is the use of interventions that employ behavioral, including Cognitive Behavioral, and mindfulness-based practices (Conley et al., 2013; Regehr et al., 2013). It makes sense that mindfulness and behavioral practices are highly effective with college-age students because there

is a high prevalence of mental health concerns related to anxiety and depression, both of which are commonly treated with mindfulness and behavioral interventions in clinical settings (Brewin, 1996; Hofmann et al., 2010; Hofmann & Gómez, 2017). A second effective common practice found across studies is the use of skill training, supervision, and feedback (Conley et al., 2013, 2015). Skill training and supervision serve as moderators for better program outcomes (Conley et al., 2015), thus, when coupled with psychoeducation of behavioral and mindfulness principles, skill training programs for college students have proven to be highly effective (Conley et al., 2013, 2015). Conley et al. (2013) posit that a routine course offering within higher education settings that incorporates mindfulness and behavioral practices and uses routine supervision and coaching has great potential to benefit students and offer preventive mental health care.

One STEP further: University of Washington Resilience Course

At the University of Washington, Seattle, a universally offered course has done exactly that. The course, titled, "Wellness and Resilience for College and Beyond," (heretofore referred to as the "resilience course") is a form of preventive mental health intervention and it teaches mindfulness and behavioral principles that includes skill training, rehearsal, coaching, and feedback as key components in the teaching practice (Mazza & Lally, 2022). The resilience course aims to bolster students' mental wellness and resilience through teaching coping strategies and emotion regulation skills (Mazza & Lally, 2022). Beyond its immediate goals, the long-term outcomes of the course are to reduce the rates of suicide, self-harm, and self-medicating behaviors as well as to foster a sense of belonging on campus (Mazza & Lally, 2022). The course is open to all undergraduate students and is offered three out of four quarters in an effort to provide accessible, preventive mental health intervention (Mazza & Lally, 2022).

The resilience course compliments other mental health supports on campus by providing psychoeducation on evidence-based therapeutic skills, drawing on principles of Dialectical Behavioral Therapy (DBT; Linehan, 1993, 2014, 2018), Positive Psychology (Seligman, 2002), and Acceptance-Commitment Therapy (ACT; Hayes et al., 2009). The course also largely uses the DBT Skills Training for Emotional Problem Solving for Adolescents (DBT STEPS-A, Mazza et al., 2016) curriculum which adapts skills and evidence-based practices from DBT therapy for general use with youth. Because the curriculum is intended for younger and more general populations, it is an ideal fit for preventive mental health in the higher education setting.

In order to support skill-use and monitor progress with skill uptake, the resilience course employ a DBT diary card which is essentially a paper checklist where students mark when they've used a learned skill, as well as rate the degree to which it was helpful. The diary card is a classical component of DBT therapy used as a tool for progress monitoring and informed treatment planning (Linehan, 2014; Linehan & Wilks, 2015; Mazza et al., 2016; Wilks, 2022). The use of the diary card serves to inform the teaching team of the efficacy of intervention and guide treatment decisions, as well as encourage the generalization of skill practice to real-world settings (Linehan, 2014; Linehan & Wilks, 2015; Mazza et al., 2016).

Progress Monitoring

Progress monitoring is a broad term used to describe a sect of assessment tools that drive decision-making regarding identification for and efficacy of academic, social-emotional, and behavioral interventions (McIntosh & Goodman, 2016). Progress monitoring data provides a "pulse" on the intervention—both for those engaged in it as well as those delivering it. For a person engaged in an intervention, progress monitoring data can assist with self-reflection, goal setting, and tracking growth (Harkin et al., 2016; Kruglanski et al., 2002). For those delivering

an intervention, progress monitoring data support decisions about what or what not to adjust, including dosage and frequency (Doll, 2019; McIntosh & Goodman, 2016; Merrell et al., 2012).

Types of Progress Monitoring

There are two main categories of progress monitoring tools, distinguished primarily by their utility (McIntosh & Goodman, 2016). The first category of tools is called universal screeners, which are the progress monitoring tools used *prior to* intervention to assess the need for intervention (McIntosh & Goodman, 2016). These tools are primarily administered to broad populations to identify folks in need of intervention and to what degree of intensity. The second category, generically called progress monitoring tools, encompasses the tools ongoingly used to track efficacy *during* the intervention process and make decisions about whether or not to change the intervention, change the dosage, or keep doing things the same (McIntosh & Goodman, 2016).

Norm- or Criterion-Referenced

Progress monitoring tools are also distinguished by the type of information they provide and how said information is interpreted (Deno, 1997; McIntosh & Goodman, 2016). Some progress monitoring tools yield data that compare the subject to a normative sample of same aged peers—norm-referenced tools—and others compare the subject to select expectations or criteria—criterion-referenced tools. Norm-referenced tools are those that compare scores to a sample of peers, determining whether or not a score is statistically typical or atypical, based on how peers performed or endorsed items on the same measure. Criterion-referenced tools do not involve peer comparison but rather, compare a score or performance to a designated goal or expectation. The choice between using a norm- or criterion-referenced tool often depends on the behavior, symptom, or skill of interest. When monitoring, for example, use of a new skill, a

criterion-referenced measure could be helpful for monitoring personal growth over time as evident by increased use of said skill. On the other hand, data regarding symptoms like depression and anxiety may be more meaningful when compared to peers to get a sense of what is a typical versus atypical level of symptomatology.

It is important that norm-referenced tools used to measure progress do what they are intended to do and measure what they are intended to measure (McIntosh & Goodman, 2016). First and foremost, this means having a strong evidence-base—empirical, research, cultural, or otherwise. Tools must accurately measure the construct of interest, including having strong face validity, content validity, and criterion validity (McIntosh & Goodman, 2016). Social validity, too, is one of the hallmarks of effective progress monitoring, because it's important that the people who use the tool enjoy using it (McIntosh & Goodman, 2016).

Observer- or Self-Monitored

Progress monitoring data can be completed by outside observers like clinicians, teachers, or caregivers or by an individual themselves (McIntosh & Goodman, 2016). Observational progress monitoring data are often used in school settings by teachers and caregivers to support with monitoring wanted behaviors or academic progress (McIntosh & Goodman, 2016). Data collected by observers tend to be useful for monitoring progress toward behavioral goals, as a person's behavior can be outwardly observed by another (McIntosh & Goodman, 2016). Self-report, or self-monitoring, is the act of observing one's own target behavior and recording it in some way, for example on a checklist or record sheet, to independently track progress toward a goal (Avina, 2008; Korotitsch & Nelson-Gray, 1999; Nelson & Hayes, 1981). Self-monitoring tools tend to be most effective for measuring internal experiences and symptoms like depression and anxiety (Dart et al., 2019; Korotitsch et al., 1999). However, self-monitoring is not limited to

any one cluster of symptoms or behaviors and can be used to support a person's awareness of their progress toward any type of academic, emotional, or behavioral goal (McIntosh & Goodman, 2016).

Self-Monitoring

Self-monitoring tools are unique from other forms of progress monitoring because, in addition to assessing the efficacy of an intervention, self-monitoring tools can be an intervention in and of themselves (Bakker & Rickard, 2018; Harmon et al., 1980; Korotitsch & Nelson-Gray, 1999). Behavior change literature suggests that self-monitoring progress toward a goal is a crucial factor in its attainment (Harkin et al., 2016; Kruglanski et al., 2002). In a large-scale meta-analysis of over 300 studies on health-related self-monitoring, Harkin et al. (2016) found that behavior change through self-monitoring mediated how effective an intervention was in producing its wanted outcomes, suggesting that self-monitoring can play a role in the efficacy of an intervention as well as its ability to produce desired outcomes.

Mental Health Self-Monitoring

Because of its potency, self-monitoring has become a commonly used mechanism for supporting behavior change within mental health interventions (Avina, 2008; Cohen et al., 2013; Korotitsch & Nelson-Gray, 1999; Nelson & Hayes, 1981). In particular, numerous studies have demonstrated the empirical value of self-monitoring within interventions for depression and anxiety (Bakker & Rickard, 2018; Cohen et al. 2013; Harmon et al., 1980). In DBT, for example, self-monitoring takes the form of a diary card where clients track their daily use of learned skills to support behavior change (Avina, 2008; Korotitsch & Nelson-Gray, 1999; Linehan, 2014). The diary card is used to monitor the practice and generalization of skill use in a naturalistic setting, as well as support a person's evaluation of how effective a skill was in that moment. The diary

card also functions as a tool for communication with a person's mental health provider, as they are traditionally reviewed in-session to guide treatment planning decisions (Linehan, 1993, 2014, 2018; Linehan & Wilks, 2015; Wilks, 2022). The DBT diary card has been proven effective in clinical settings in supporting the reduction of symptoms related to suicidality and disordered eating (Klein et al., 2013; Probst et al., 2018)

Self-monitoring is a natural fit with mental health interventions because it supports the generalization of skills in the naturalistic setting and places value on situational context (Bucci et al., 2019; Kanfer, 1970). Self-monitoring improves self-awareness (Cohen et al., 2013), assisting a person's ability to better understand the situations where certain symptoms occur or where the use of a therapeutic skill is most effective. In the same way that a therapist would cue a client to use a learned skill, the client works to identify opportunities to use a skill and self-cues, effectively acting as their own therapist (Hayes & Nelson, 1983). As such, self-monitoring has the potential to build a client's autonomy in the therapeutic process, allowing them to take charge of their own behavior change (Cohen et al., 2013). Further, the information that is gathered through the process of self-monitoring can assist with the therapeutic process, because the situational specificity provides the clinician with nuanced information that can help improve their understanding of a client's strengths and needs and guide treatment decisions (Avina, 2008).

Effective Self-Monitoring

Though there is a general consensus that self-monitoring is an effective tool for behavior change (Harkin et al., 2016), there is also a consensus that there is a need for continued research on exactly what makes self-monitoring effective or less effective (Avina, 2008). Up to this point, researchers generally assert that the most effective self-monitoring tools are those used with high

fidelity, both in terms of accuracy and consistency (Avina, 2008; Harkin et al., 2016; Kanfer, 1970; Korotitsch & Nelson-Gray, 1999; Nelson & Hayes, 1981).

Accuracy. One of the most important components of effective self-monitoring is the accuracy of recording (Nelson & Hayes, 1981). Therefore, researchers have worked hard to identify the mechanisms that make for the most accurate self-monitoring (Korotitsch & Nelson-Gray, 1999). Among other variables, Korotitsch and Nelson-Gray (1999) identified that the immediacy of recording and compliance of use are two crucial components of accurate self-monitoring.

Immediacy. Optimal accuracy of self-monitoring data occurs when the behavior is recorded as soon as is feasible after it is performed (Korotitsch & Nelson-Gray, 1999). Immediacy of monitoring is crucial because retroactive monitoring based on memory has been deemed less reliable due to the challenge of recall accuracy (Avina, 2008). Thus, a tool that can be used immediately after a behavior is performed is ideal (Korotitsch & Nelson-Gray, 1999).

Compliance. Unsurprisingly, compliance also improves the accuracy of self-monitoring (Korotitsch & Nelson-Gray, 1999). That is, a tool needs to actually be used in order for it to be effective. Researchers have found that prompting increases the likelihood of self-monitoring, as it aids a person with remembering to do it (Harkin et al., 2016; Liberman & Dar, 2009).

Consistency. Consistent self-monitoring also has been proven an important component of effective self-monitoring (Harmon et al., 1980). Consistent self-monitoring is that which is frequent, and frequent self-monitoring increases when a tool is easy to use (Korotitsch & Nelson-Gray, 1999; Nelson & Hayes, 1981).

Frequency. Self-monitoring tools are most effective when they are used often (Harkin et al., 2016). In addition to the link between efficacy of an intervention and self-monitoring, Harkin

et al. (2016) found that more frequent progress monitoring leads to greater likelihood of goal attainment. That is, the more often a person uses a self-monitoring tool, the more likely they are to modify their behavior to meet their goal.

Ease of Use. The nature of the self-monitoring device also matters (Korotitsch & Nelson-Gray, 1999; Nelson & Hayes, 1981). Devices that are less obtrusive to use in-the-moment to record symptoms and behaviors are more likely to be used (Korotitsch & Nelson-Gray, 1999). Meaning, tools that are easy to use and mark in-the-moment are more likely to be used frequently and regularly. When a tool is easy to take out and put away, the behavior or symptom can be recorded immediately (Nelson & Hayes, 1981).

Limitations of Paper Self-Monitoring

Since accuracy and consistency are both crucial to the efficacy and fidelity of self-monitoring, it makes sense that the format of the recording device matters because it can either facilitate or stymie the fluidity of completion (Korotitsch & Nelson-Gray, 1999; Nelson & Hayes, 1981). Traditionally, paper checklists and charts have been used to enact self-monitoring (Korotitsch & Nelson-Gray, 1999; Stone, 2002, 2003). However, Stone et al. (2002, 2003), found that the accuracy of reported compliance with paper self-monitoring is highly questionable. In an experimental study with 80 adults who experience chronic pain, the research team tested out the accuracy of compliance with a paper versus digital symptom self-monitoring tool. In order to record the actual versus self-reported use of the paper self-monitoring tool, the researchers attached a discreet light sensor to the binder that housed the paper self-monitoring tool so that each time the binder was opened to record, light was sensed and the time was recorded. The number of times the binder was opened was then compared with the number of times a person reported self-monitoring using the paper tool. This was compared to the

timestamps used to record the completion of the digital self-monitoring tool. Stone et al. (2003) found that people who used the paper self-monitoring tool reported 90% compliance with recording, however their *actual* compliance, according to light sensor data, was only 11%, indicating a large discrepancy in self-reported versus actual recording. In comparison, the people who completed the electronic self-monitoring tool did so at a compliance rate of 94%. These results suggest that the self-reported accuracy of paper self-monitoring might not be as trustworthy and that electronic self-monitoring, among other things, may be a more reliable tool for high fidelity completion.

Digital Self-Monitoring

In today's digital world, electronic self-monitoring tools are increasingly appealing, and many have begun to shift toward using them in place of paper formats (Bucci et al., 2019; Wang et al., 2018). Digital self-monitoring tools gained traction in the medical field where they have been successfully used to monitor health-related behaviors, like smoking cessation, and dietary management (Free et al., 2009; Lieffers & Hanning, 2012; Sama et al., 2014; Swendeman et al., 2015). In the mental health field, too, many have begun to use digital formats of self-monitoring to support with tracking symptoms, behaviors, and skill use (Bucci et al., 2019; Marzano et al., 2015; Melbye et al., 2020). While there is great potential and expansion regarding the use of digital formats of self-monitoring in mental health, there is also still much to be learned regarding the efficacy of digital formats (Bucci et al., 2019; Karasouli & Adams, 2014; Marzano et al., 2015; McGee et al., 2021; Melbye et al., 2020; Sin et al. 2020; Wang et al., 2018; Wilks, 2022). There are both benefits and drawbacks to using digital tools to support progress monitoring systems that warrant further research and exploration.

Benefits of Digital Self-Monitoring

While there is a need for further research on the efficacy of digital self-monitoring tools in the context of mental health, there is an undeniable wealth of potential benefits of using digitally formatted self-monitoring tools (Bucci et al., 2019; Wang et al., 2018). Digital formats hold the potential to improve the fidelity of self-monitoring tool completion—accuracy and consistency—as well as the additional benefits of accessibility, visibility of data, cost efficiency, and social acceptability.

Benefits to Fidelity. As was discussed previously, the efficacy of self-monitoring pivots on fidelity, and high fidelity progress monitoring is that which is completed with accuracy and consistency (Avina, 2008; Harkin et al., 2016; Kanfer, 1970; Korotitsch & Nelson-Gray, 1999; Nelson & Hayes, 1981). Digital formats of progress monitoring tools pose the potential to improve fidelity through more accurate and consistent recording (Aguilera, 2015; Marzano et al., 2015; McGee et al., 2021; Murnane et al., 2016; Wang et al., 2018).

Accuracy. According to Nelson and Hayes (1981), accuracy is one of the most important components of effective self-monitoring. Accuracy of recording depends largely on the immediacy of use (Korotitsch & Nelson-Gray, 1999) and compliance (Harkin et al., 2016), both of which stand to improve when a tool can be used more easily in-the-moment (Marzano et al., 2015). A digital tool, especially one available on a mobile device, can be quickly used immediately after a skill is used or behavior is performed, as is ideal in terms of immediacy of recording and prevention of recall bias (Korotitsch & Nelson-Gray, 1999; Marzano et al., 2015). Further, compliance with recording also stands to be improved with the use of digital devices, because compliance improves with prompting and reminders (Harkin et al., 2016). Mobile and

web devices have notification capacities that make them a natural fit with routine prompting and reminders which could easily be incorporated into the design of digital self-monitoring tools.

Consistency. Consistency of self-monitoring is also important to efficacy (Harmon et al., 1980), and how frequently and easily a device can be used underpin the likelihood of consistent use (Korotitsch & Nelson-Gray, 1999; Nelson & Hayes, 1981). As Korotitsch and Nelson-Gray (1999) point out, the nature of the recording device matters. The less obtrusive the device, the more likely that it will be used frequently and consistently. Self-monitoring using a mobile or web-based device makes the process of recording discreet and easy to do in-the-moment, because devices like phones tend to sit just within arm's reach (Aguilera, 2015; Marzano et al., 2015). Mobile and web devices are also minimal in terms of the effort they require and are easy and fluid to use, a desired feature of many users as well as an important component of consistent use (Murnane et al., 2016; Nelson & Hayes, 1981).

Additional Benefits. Beyond their potential to be more reliable in terms of fidelity, digital self-monitoring tools have the added benefits of accessibility, visibility of data, cost efficiency, and social acceptability (Avina, 2008; Bedesem, 2012; Borntrager & Lyon, 2015; Cristol, 2018; Dennison et al., 2013; Luxton et al., 2011; Marzano et al., 2015; Melbye et al., 2020; Murnane et al., 2016; Price et al., 2014; Sin et al., 2020). These additional benefits make digital formats of self-monitoring an attractive alternative to traditionally used formats of self-monitoring using pencil and paper.

Accessibility. Digital tools and platforms certainly have their accessibility limitations, but tools like computers, phones, and tablets also have built-in accessibility features that make paper tools less attractive (Henry et al., 2014; Kane et al., 2009). The vast majority of self-monitoring tools rely on reading and writing for completion. For students with vision impairments, for

example, digital devices have integrated e-reading and text to speech capabilities that improve access to text-based self-monitoring tools (Kane et al., 2009).

In addition to specific accessibility features, digital self-monitoring tools increase access in a more general sense, specifically access to care (Luxton et al., 2011; Marzano et al., 2015; Rodriguez-Villa, 2020). Web-connected mobile devices are increasingly common, including in countries with high rates of poverty, and digital self-monitoring interventions are plausibly accessible to anyone with a phone connected to the internet (Berrouiguet et al., 2016; Rodriguez-Villa, 2020). In particular, digital self-monitoring improves care for hard-to-reach populations (McGee et al., 2021; Wang et al., 2018). People who live in rural communities or who do not live within close proximity to a wide range of mental health care options now have access to essentially limitless options through their phones and web-connected devices (Benavides-Vaello et al., 2013; Wendel et al., 2011).

***Visibility of Data*.** Digital self-monitoring tools often yield visible, graphical data that can improve the user's experience, provide motivation, and assist with coordination of care. In a discussion of the principles of effective progress monitoring, Borntrager and Lyon (2015) posit that feedback should be provided to the individual routinely and in a digestible format, like a visual or a graph. The visual data produced by digital self-monitoring tools are an additional way for individuals to communicate with their mental health clinician and coordinate more effective care (Marzano et al., 2015). Additionally, individuals who observe a record of their self-monitored responses perform said response more frequently than those who do not (Avina, 2008). Therefore, the visual data produced by digital self-monitoring tools serve as a form of feedback that could potentially improve the efficacy of the self-monitoring process. Finally, in

some instances, visibility of self-monitoring data may be something that clients want and enjoy having access to (Cristol, 2018).

Cost Efficiency. Digital self-monitoring tools also may be more cost effective than their paper counter parts (Avina, 2008; Bucci et al., 2019; Marzano et al., 2015; Sin et al., 2020). Digital tools could be used to eliminate costs of paper as well as the cost to the clinician(s) scoring and tracking data (Avina, 2008). Further, analyzing the data through technological means can be used to inform decisions about whether or not the intervention is functioning as intended and, therefore, whether or not it is cost-effective (Avina, 2008). However, it is also of note that the cost-efficiency of scaling up would need to be considered for the large-scale use of digital self-monitoring tools (Sin et al., 2020).

Social Acceptability. Finally, there is also something to be said for user preference. Digital tools often have higher social acceptability than paper tools, meaning users may simply like them better (Bedesem, 2012; Dennison et al., 2013; Melbye et al., 2020; Murnane et al., 2016), which would likely translate to more use and/or adherence to using such tools.

Drawbacks of Digital Self-Monitoring

There are, of course, drawbacks to the use of digital forms of self-monitoring for mental health intervention (Aguilera, 2015). The drawbacks of using technology for progress monitoring converge around issues of accessibility and responsibility (Aguilera, 2015; Dennison et al., 2013; Marzano et al., 2015; Murnane et al., 2016; Price et al., 2014).

Accessibility. Accessibility could be, conversely, compromised by the use of a digital self-monitoring system. Unsurprisingly, there is a huge gap in accessibility to technological self-monitoring tools because digital devices are expensive (Aguilera, 2015; Bucci et al., 2019; Marzano et al., 2015). The digital divide is a term used to describe the gap in accessibility to

technology, like computers and internet, based on privileges and socioeconomic status (Cullen, 2001; Selwyn & Facer, 2007). Access to technology varies widely depending on geographic locale and socio-economic status. Thus, the use of digital methods of self-monitoring may be more reflective of privilege and access rather than a desire to make the switch.

Responsibility. Legal and ethical responsibility is also a major concern with regard to digital self-monitoring. Of the utmost importance is responsibility to data security practices (Aguilera, 2015; Bucci et al., 2019; Dennison et al., 2013; Luxton et al., 2011; Marzano et al., 2015; Price et al., 2014). The use of digital tools creates new challenges in terms of keeping data confidential and securely stored across platforms and devices (Luxton et al., 2011; Price et al., 2014). Added data security measures can be a hidden cost of using a digital system for collecting and storing self-monitoring data online. Depending on the platform, there may be an added risk of data being used for commercial or marketing purposes (Marzano et al., 2015). Individuals and mental health practitioners need to carefully review the policies of a platform or agency before using it to understand any risks regarding how their information is used. To date, there is little regulation and quality control regarding applications and websites used for self-monitoring of mental health symptoms and behaviors, so use of technology comes with added risks (Luxton et al., 2011; Marzano et al., 2015).

Applications of Digital Self-Monitoring

In spite of drawbacks, digitally formatted self-monitoring tools have high social acceptability (Aguilera, 2015; Dennison et al., 2013) as well as the potential to increase the fidelity of completion and therefore, the efficacy of intervention in improving desired outcomes (Avina, 2008; Harkin et al., 2016; Kanfer, 1970; Korotitsch & Nelson-Gray, 1999; Nelson & Hayes, 1981). Mental health practitioners and researchers have begun the work of understanding

the social acceptability and efficacy of the use of digital self-monitoring tools and have seen some promising results (Aguilera, 2015; Bakker & Rickard, 2018; Dennison et al., 2013; Harrison et al., 2011; Marzano et al., 2015; Melbye et al., 2020; Summers et al., 2021). In particular, digital applications of the DBT diary card have recently been explored with mixed results (Laursen et al., 2021; O'Grady et al., 2020; Wilks et al., 2021), as have applications with populations like students in higher education (Gatto et al., 2020; Grant et al., 2020; Kajitani et al., 2020), who are much in need of accessible mental health supports.

Mental Health

In a quasi-experimental pre-post intervention study of the efficacy of a 12-week mobile intervention that included brief psychoeducation and self-monitoring of symptoms including anxiety, stress, and depression, Summers et al. (2021) found that adult participants reported statistically significant improvements in perceived stress, depression, and anxiety after using the application. Similarly, in a pre-post-intervention comparison study to assess the efficacy of a mobile mood self-monitoring tool in reducing symptoms of anxiety and depression in 234 adults, Bakker and Rickard (2018) found reductions in anxious and depressive symptoms. Similarly, Harrison et al. (2011) found a reduction in symptoms of stress, anxiety, and depression in 44 adults after they were given a self-monitoring app that included prompting and brief CBT skills modules to use over the course of a six-week period. These results indicate that mobile mental health self-monitoring interventions are a plausible means for assisting with monitoring and reduction of mental health symptoms like anxiety and depression.

Dialectical Behavioral Therapy (DBT)

Digital applications of mental health self-monitoring tools like the DBT diary card, thus, hold great promise (Wilks et al., 2021). Many clinicians and clients have already moved to tech-

based versions of communicating and sharing the DBT diary card, for example via emails, mobile applications, and shared folders (Wilks, 2022). However, studies specific to the use of a digital DBT diary card are few, and those that exist have yielded mixed results in terms of the completion fidelity, efficacy, and social acceptability of a digital format (Laursen et al., 2021; O'Grady et al., 2020; Wilks, 2022). More work is needed to further explore the conditions, including when and for whom, that make digital applications of the DBT diary card more or less effective and socially acceptable (Wilks, 2022).

Though there is an increasing body of literature on the use of digitally formatted DBT-based interventions including mobile applications to supplement or substitute skills training, there are few studies specific to the DBT diary card (Wilks, 2022; Wilks et al., 2021). This dearth of literature could, in part, be due to the scarcity of digital diary card options. Wilks et al. (2021) conducted a systematic review of the content quality and usability of existing DBT-based mobile applications. The team found that, of the 21 mobile applications retained in the study, five included a DBT diary card component, and of those five, only two were customizable. Simply put, there aren't many digital DBT diary card options to choose from, and far fewer that can be adjusted based on the need of the user population.

The few studies that have been conducted on the use of a digital DBT diary card have yielded mixed results regarding completion fidelity, efficacy, and social acceptability (Laursen et al., 2021; O'Grady et al., 2020). In a randomized control trial, Laursen et al. (2021) assigned 78 patients with diagnosed Borderline Personality Disorder served in a psychiatric outpatient facility in Denmark either to a mobile app or paper format of the DBT diary card in order to evaluate the economic benefits and drawbacks to the use of the digital diary card. Acceptability among users of the mobile app version of the diary card was reportedly high, and mobile diary

card users logged more skills per week compared to paper diary card users, indicating higher fidelity of completion with the use of the digital format. The therapists and researchers postulate that the mobile app was also a time saver for users, as they averaged one minute per diary card entry. However, the digital diary card was more expensive, and, perhaps most importantly, the team found a significant improvement in the self-reported quality of life, as well as a significant reduction in symptoms of depression and suicidality in the group assigned to the *paper* format of the diary card. Laursen et al. concluded that there are both pros and cons to the use of a digital format of the diary card and more research is warranted to better understand the utility of a digital format of the diary card. They also noted that there was no visualization component to the mobile app they used, so patients could not see and monitor their own progress.

O'Grady et al. (2020) used a digital format of the DBT diary card outside of the clinical setting in a secondary school with students. The researchers partnered with mental health clinicians to inform the design of a mobile app to support with safety planning and management of suicidal ideation that included a DBT diary card component to support the generalization of DBT skills across the school and home settings. The app was deployed in a secondary school with 18 children ages 14 to 16. The research team hypothesized that using a digital format of the diary card would reduce the likelihood of human error in recording, as well as assist with real-time data collection, improving the accuracy and "completeness" of data, however, no outcome data was collected to support or disprove this claim. The primary outcomes of the study were related to social acceptability, where youth participants indicated a high level of acceptability, noting that they did, however, have concerns regarding the security of their data.

Higher Education

Digital self-monitoring of mental health symptoms and behaviors has great potential for use in higher education settings, specifically because college-age youth are more connected than generations ever before (Grant et al., 2020; Kajitani et al., 2020). Digital formats of self-monitoring have been tested for social acceptability with college-age populations (Dennison et al., 2013). In the United Kingdom, Denniston et al. (2013) conducted a focus group study with 19 university students and staff who used a mental health-related behavior change application that included self-monitoring capabilities. The researchers found, amidst challenges, there were high rates of self-reported benefits to using the digital tool, including that it was pleasant to use.

Beyond studies of social acceptability, some have also begun to look at efficacy of digital forms of self-monitoring with college-age populations. In a non-randomized controlled trial, Kajitani et al. (2020) developed and tested the efficacy of a mobile self-monitoring application for behaviors such as eating, exercise, and sleep, as well as for mood-related depressive symptoms with university students in Japan. Results showed a significant difference between app and non-app users' pre-and post- scores on the General Health Questionnaire in favor of app users, indicating that the self-monitoring tool they developed poses the potential for assisting with depression symptom management. Survey data also revealed that students were primarily "satisfied" with the design of the tool. In an experimental study, Gatto et al., (2020) conducted multiple studies with hundreds of college-age students comparing weekly and bi-weekly digital self-monitoring with paper self-monitoring control groups to determine whether or not format impacted reduction in levels of anxiety. The researchers found that weekly self-monitoring using the digital format significantly reduced anxiety and stress compared to the paper format control

group, indicating that digital formats of self-monitoring tools hold potential for supporting the reduction of anxiety symptoms in college-age populations.

Gaps in the Field

There is a surprisingly small evidence-base to support the efficacy of digital formats of self-monitoring tools for mental health (Karasouli & Adams, 2014; McGee et al., 2021; Pagoto & Bennett, 2013; Sin et al. 2020; Wang et al., 2018) and, in particular, the DBT diary card (Wilks, 2022; Wilks et al., 2021). Fewer still, are the number of studies that focus solely on digital, mental health-related self-monitoring as a form of intervention and the mechanisms that underpin its efficacy or lack thereof (Marzano et al., 2015; Melbye et al., 2020). More research is needed to understand the extent to which digital self-monitoring tools like the DBT diary card retain their efficacy when translated to a digital format, as well as the extent to which they may even enhance the fidelity of self-monitoring tools and therefore their efficacy. Additionally, more research is needed to understand the conditions in which digital self-monitoring is effective and/or ineffective, as well as when and for whom.

Among the efficacy studies that have been done, few focus on non-clinical, general populations, and fewer focus on college-age students (Gatto et al., 2020; Kajitani et al., 2020). With the overwhelming prevalence of mental health concerns among college-age students in the general population (Auerbach et al., 2016; Blanco et al., 2008), there is a need for more research on tools, like digital self-monitoring, that have the potential to increase access to preventive mental health care.

Additional research also could be done to complement what is known about the social acceptability of digitally formatted self-monitoring tools with college-age populations. Qualitative work like that of Denniston et al. (2013) could be expanded to additional qualitative

studies with U.S. populations, as well as with quantitative work that compares digital and non-digital formats of self-monitoring.

In particular, more research is needed to understand the efficacy and social acceptability of a digital format of the DBT diary card (Wilks, 2022; Wilks et al., 2021). DBT-based programming, like the DBT STEPS-A (Mazza et al., 2016) curriculum for schools, uses a traditional DBT diary card as a progress monitoring tool to collect daily and weekly data on how often students are using the skills that they've learned. As the popularity of digital tools continues to grow, the DBT diary card is a natural place to turn for an opportunity for a digital "facelift" because its paper format is a well-researched form of self-monitoring that easily translates to a digital format. The DBT diary card employed in the University of Washington wellness and resilience course, for example, could easily be shifted to a digital format that college students can access through their phones, computers, tablets, and other web-connected devices. To the best of this author's knowledge, the work of Laursen et al. (2021) is the only study, to date, that focuses solely on the format of the DBT diary card as a predictor of efficacy in reducing mental health related symptoms. More work could be done to further understand the extent to which diary card format predicts variations in mental health outcomes in non-clinical, general populations.

Present Study

The present study employs the use of a digital format of the DBT diary card, building on previous work, to further investigate the efficacy and social acceptability of a digital format of the DBT diary card in the context of a tier one mental health intervention with a universal college-age population. The theory of change that underlies the research questions that follow is that the format of the diary card impacts fidelity of completion (accuracy and consistency)

which, in turn, impacts the efficacy of the tool in supporting behavior change and, therefore, the reduction of mental health symptoms (see Appendix 1 for a visual depiction of the theory of change). As such, the following research questions guide this study:

Research Question 1 (Q1)

To what extent does diary card format uniquely predict variation in students' fidelity of diary card completion as measured by weekly grading checks?

It was hypothesized that the digital format of the diary card would be more readily used in the moment due to ease of access to devices such as mobile phones (Marzano et al., 2015). In a study comparing the efficacy of a digital versus paper DBT diary card with a clinical population, Laursen et al. (2021) found participants assigned to the digital diary card logged more skills per week, indicating more frequent use with a digitally formatted DBT diary card. Given what behavior change literature suggests regarding high fidelity self-monitoring, namely that it is more accurate and consistent when recordings are frequent (Harkin et al., 2016), it was hypothesized that the increased frequency of use would lead to greater fidelity of diary card completion.

Research Question 2 (Q2)

To what extent does diary card format uniquely predict students' self-reported symptoms of anxiety as measured by post-intervention survey score?

Building on research question one, because it was hypothesized that the digital format of the DBT diary card would see a higher rate of fidelity, it was also hypothesized the digital diary card would uniquely predict a greater reduction in symptoms related to anxiety. The act of self-monitoring has been proven an effective tool for reduction of mental health symptoms related to anxiety and depression (Cohen et al. 2013; Harmon et al., 1980). Because it was hypothesized

the digital diary card would be easier to use (Korotitsch & Nelson-Gray, 1999; Marzano et al., 2015), the theory of change that underpins this study suggests greater fidelity of use would lead to greater efficacy in behavior change (Harkin et al., 2016), yielding a greater reduction in symptoms.

Research Question 3 (Q3)

To what extent does diary card format uniquely predict students' self-reported symptoms of depression as measured by post-intervention survey score?

Similarly to research question two, it was hypothesized that the digital format of the DBT diary card would see a higher rate of fidelity and, in effect, greater efficacy than the paper format of the diary card in reducing symptoms related to depression. Findings regarding the efficacy of digital self-monitoring tools in reducing depression symptoms is conflicting. In their randomized study comparing DBT diary card formats in a psychiatric outpatient facility, Laursen et al. (2021) found significant differences in depression symptom reduction in favor of the *paper* diary card. However, in a 2018 quasi-experimental study, Bakker and Rickard found a significant reduction in symptoms of anxiety and depression in a digital self-monitoring tool. Although Laursen et al. (2021) found positive impacts on symptomatology in favor of the paper diary card format, it stands to reason that a digital format may be easier to use, thus, used with a higher rate of fidelity which would, in turn, lead to greater symptom reduction (Bucci et al., 2019; Harkin et al., 2016). Furthermore, Laursen et al.'s (2021) was conducted with a clinical population whereas Bakker and Rickard's (2018) study was conducted with a non-clinical population which more closely mirrors the population of the present study. Thus, in the present study, it was hypothesized that the digital format would see a greater reduction in depression symptoms in the digital format of the diary card due to hypothesized increased fidelity of use.

Research Question 4 (Q4)

To what extent does diary card format uniquely predict students' self-reported symptoms of emotion regulation as measured by post-intervention survey score?

Echoing the hypotheses in research questions two and three, it was hypothesized that the digital format of the DBT diary card would be completed with greater fidelity, leading to greater efficacy than the paper format of the diary card in reducing self-perceived difficulties with emotion regulation. Clinical DBT heavily emphasizes skills intended to support emotion dysregulation as a core component in the treatment of Borderline Personality Disorder (Linehan, 1993, 2014, 2018). While there is limited evidence specific to the efficacy of DBT in reducing emotion dysregulation with general populations (Harvey et al., 2019), it stands to reason that more frequent practice of the emotion regulation skills listed on the diary card would produce greater reduction in self-reported difficulties with emotion regulation. Thus, because it was hypothesized the digital diary card would predict higher fidelity of completion (Harkin et al., 2016), it was hypothesized the digital diary card would also predict greater reduction in emotion regulation symptoms as compared to the Business as Usual (BAU) paper diary card.

Research Question 5 (Q5)

To what extent does diary card format uniquely predict level of satisfaction with said format as measured by post-intervention acceptability survey score?

It was hypothesized that the digital format of the diary card would be more socially acceptable than the BAU, paper format. Previous research has demonstrated digital formats of self-monitoring tools have high social acceptability, and it was predicted these results would be consistent within the present study (Bedesem, 2012; Dennison et al., 2013; Melbye et al., 2020; Murnane et al., 2016).

Research Question 6 (Q6)

What are students' perceptions of the digital and Business As Usual (BAU), paper diary card formats, how do these perceptions factor into their overall experience of the course, and how might this vary by person?

Given prior research on the acceptability of digital self-monitoring tools (Bedesem, 2012; Dennison et al., 2013; Melbye et al., 2020; Murnane et al., 2016), it was hypothesized that students would report a high level of satisfaction with the digital format of the diary card. Because self-monitoring is an important component of behavior change within the overall resilience course intervention, it was also hypothesized that during qualitative interview, students assigned to the digital format of the diary card would report feelings of personal growth in relation to the skills taught in the course.

Chapter Three: Methodology

This study is part of a larger, single institution project that delivers and assesses the efficacy of a tier one mental health-focused intervention to support undergraduate students' wellness and resilience skills for college and beyond; referred to here as the "resilience course." The resilience course is a tier one mental health intervention being taught at the higher education level that involves the delivery of mental wellness and resilience skills, coupled with in-class skill rehearsal, weekly goal-setting, self-reflection, and progress monitoring.

Study Context

This study takes place within the context of a university course offered at a large, public institution in an urban area of the Pacific Northwest region of the United States. The course is five credits and is offered as an option to all undergraduate students at the institution. A detailed course description can be found in Appendix 2.

The course meets twice weekly—once for a lecture (170 minutes) and once for a quiz section (50 minutes), where skills taught in lecture are practiced in a smaller setting with real-time coaching and feedback. During the academic quarter in which this study was conducted, the lecture portion of the class was offered in either an in-person or online format to improve accessibility in the wake of the COVID-19 pandemic. Students self-selected which lecture format they preferred at the time of enrollment. The online lecture group, which met on Wednesdays, was divided into three quiz sections. The in-person lecture group, which met on Thursdays, was divided into seven quiz sections. Altogether there were ten quiz sections, all of which met in-person on Fridays.

The course is not required, though it partially satisfies one of the general education requirements of all undergraduate students who attend the university, a potentially motivating

factor for students to enroll beyond general interest in the resilience course description. The course is also provided in partnership with a first-year clustering program on campus that utilizes a cohort model to promote friendships and foster sense of belonging. There are an allotted number of spots in the course held for first-year undergraduate students who are a part of this first-year clustering program to enroll. This, in part, contributes to the high volume of first-year students who typically enroll in the course. The course content appeals to first-year students, as the skills taught are intended to support wellness and resilience through and beyond college.

Sample

The participants in this study are the students who self-selected to enroll in the resilience course during the Fall quarter of 2022 who were age 18 and above at the start of the study and volunteered and gave consent to participate ($N = 181$; $n = 88$ treatment and $n = 93$ control). Only students with complete data across both the pre- and post-intervention surveys are included in the sample population. In addition, students who were absent for more than three class meetings, either lecture or quiz section, were excluded from the sample. Attendance data were tracked via the resilience course's instructional team and used to indicate the sample population before data analysis was completed. A total of 371 students were enrolled in the course at the end of the quarter and 190 students were removed from the study because they did not meet inclusion criteria. A description of students enrolled versus students retained as part of the present study is provided in Appendix 3.

Demographic information used within this study's quantitative modeling (race or ethnicity, gender identity, and academic year) are highlighted. The count of self-reported race or ethnicity was: 110 Asian or Southeast Asian, 43 White or Caucasian, 20 who reported more than one race or ethnicity, four Hispanic, Latino/a, or Spanish Origin, two Black or African

American, one Middle Eastern or North African, and one unspecified race or ethnicity. 113 members of the sample indicated they identify as female, 63 identify as male, and 5 identify as nonbinary. Students also reported their academic year: 82 students were in their first year, 53 students were in their second year, 21 students were in their third year, 12 students were in their fourth year, eight identified as transfer students, four chose not to disclose, and one student was in their fifth year. Demographic characteristics of the sample population including academic year, race or ethnicity, and gender identity are provided in Appendix 4.

Measures

A DBT-based diary card is used as part of the intervention (the resilience course). The BAU format of the diary card is traditional pen and paper. The ten quiz sections of the resilience class were randomly assigned to one of the two diary card formats, digital and BAU, in order to understand how format predicts fidelity, post-intervention symptomatology, and social acceptability. A select subset of participants were interviewed to further understand students' perceptions of the two diary card formats. As such, there are four major outcomes in this study: fidelity of diary card completion, students' self-reported symptoms of anxiety, depression, and emotion regulation post-intervention, self-reported social acceptability, and students' qualitative perceptions of diary card format. The respective instruments employed in this study include: BAU and digital formats of the diary card, diary card fidelity data, pre- and post-intervention anxiety, depression, and emotion regulation survey data, social acceptability post-intervention survey data, and qualitative interview data.

Diary Cards

Diary cards are a standard tool in the progress monitoring of DBT skill use in traditional DBT-based interventions (Linehan, 1993, 2014, 2018). The diary card has been adapted for use

within the resilience course and its completion is assigned as a weekly homework task for students enrolled in the course. In this study, a digital, web- and app-based format of the diary card was used in addition to the BAU, paper format that is typically used in the resilience course.

Paper Diary Card. The paper diary card used in the resilience course is typically provided as an electronic PDF that students download, print, and complete on paper (Appendix 5). In some instances, students use PDF software to highlight or circle responses digitally to complete their diary card. Although PDF completion of the diary card employs digital software, for the purpose of this study, this form of completion was considered a part of the BAU category because the format is still delivered via the paper-based format of the diary card, as opposed to an intentionally digital, web- or app-based format.

Digital Diary Card. For the digital format of the diary card, this study employs a modified version of the diary card available through PsychSurveys (PsychSurveys LLC, n.d.). The PsychSurveys platform has been used in various studies across a range of populations and applications with success and ease (Augustin, 2010; Franco-Zamudio, 2009; McMurtry, 2013; Swinson, 2013). Psych Surveys LLC's website describes the service as:

> "PsychSurveys simplifies the process of psychometric assessment; an essential element of evidence based treatment. Mental health professionals in private or group practices can use PsychSurveys to administer customizable diary cards/tracking sheets as well as valid and reliable mental health surveys to their patients to measure distress levels and track patient progress over time. PsychSurveys was developed in partnership with psychologists who are intensively trained in cognitive and dialectical behavior therapies. It improves client care by allowing you to objectively measure your clients' symptoms and use the results to highlight progress or identify areas needing further intervention." (PsychSurveys, n.d.)

PsychSurveys (n.d.) has already done the work of adapting the DBT diary card into a digital format with clickable checkboxes, text entry spaces, graphic visualizations, and a calendar overview in place of paper and pencil.

The rationale for using the digital diary card available on PsychSurveys as opposed to other digital diary cards was threefold: PsychSurveys is a HIPAA-compliant platform, can be accessed via web browser or mobile device, and allows for customization. First, because the responsible handling of confidential data is an important consideration when using digital self-monitoring tools (Aguilera, 2015; Dennison et al., 2013; Luxton et al., 2011; Marzano et al., 2015; Price et al., 2014), using a HIPAA-compliant platform like PsychSurveys was a key component of the decision process when searching for a platform to house the digital diary cards. Second, PsychSurveys can be accessed via their website, as well as via a mobile application available for download on both Apple and Android devices via the Apple Store and Google Play, respectively. The mobile application option was another deciding factor in this study, because the hypothesis that a digital platform could potentially improve fidelity of completion pivots on the notion that the diary card is easily accessible for in-the-moment use (Korotitsch & Nelson-Gray, 1999; Marzano et al., 2015). Additionally, the PsychSurveys mobile application includes notifications that can be toggled on or off by users to aid them in remembering to log their skill use each day, and prompting is yet another factor that could potentially aid in accuracy and consistency of completion (Harkin et al., 2016). Third and finally, the PsychSurveys diary card is one of few that allows for customization (Wilks et al., 2021). Because the digital diary card needed to be comparable to the control, BAU format of the diary card, customization was necessary. The PsychSurveys diary card was modified to mirror the BAU, paper format of the diary card used in the resilience class, including the descriptions of skills and the letter-based rating system that students use to indicate how effective a skill was for them on a given day. A drawback of the use of the customized version of the PsychSurveys diary card was that it rendered the graphing feature unusable, and according to behavior change literature, viewing

one's progress through data visualization has the potential to enhance the self-monitoring process (Avina, 2008). However, though not graphical in nature, the PsychSurveys platform includes a calendar overview where students assigned to the digital diary card could view the days for which they completed their diary card, a potentially motivating feature. An example PsychSurveys diary card is pictured in Appendix 6.

Diary Card Fidelity Data

The theory of change that drives this study begins with effective self-monitoring which is maximized through high fidelity completion (Avina, 2008; Harkin et al., 2016; Kanfer, 1970; Korotitsch & Nelson-Gray, 1999; Nelson & Hayes, 1981). In the present study, fidelity of diary card completion was tracked using weekly diary card submission data. Students enrolled in the resilience course are required to submit their completed diary cards weekly as an accountability measure to encourage independent practice of skills. Existing literature has demonstrated the value of using at-home practice, homework, and self-monitoring data as a measure of fidelity (Walton et al., 2017). Instructional staff use these data to monitor students' independent DBT skill use and the degree to which students are finding the skills helpful. This study used this existing practice as a means for collecting fidelity data and tracking compliance with diary card completion. Completion data were collected as a numerical value of total weeks where students enrolled in the course submitted a diary card as part of their weekly assignments, given eight total opportunities.

Pre- And Post-Intervention Survey

Survey data were collected both pre- and post-intervention as part of the larger project that this study is situated within. Students completed the surveys online, during class time. The pre- and post-intervention survey included a number of empirically validated measures including

the Student Life Satisfaction Scale, Positive and Negative Affect Schedule, Brief Symptom Inventory-18, Revised Life Problems Inventory, Psychological Capital Scale-12, Stress Mindset Measure, Psychological Sense of School Membership, Acculturative Stress Scale for International Students, and Adverse Childhood Experiences screener. The survey also included multiple questions regarding demographic characteristics, including academic year, race, gender identity, age, living situation, education funding source, native language, and residential status (Appendix 7). The measures included in the overall survey were selected based on their content validity, the degree to which they accurately reflect the constructs the intend to assess.

For the purpose of this study, demographic items related to race or ethnicity, gender identity, and academic year were used in data analysis as covariates. These variables were selected because they represent broad demographic characteristics that are typically used as control variables in quantitative studies (Creswell, 2009). Other demographic constructs were excluded from data analysis either because they do not relate to the present research questions or posed the potential to obscure any significant results, as they would constitute non-independent residuals. For example, academic year is not independent from age, because younger students tend to be earlier in their academic careers, increasing over time. Academic funding source, a construct related to socioeconomic status, is not independent from race or ethnicity due to the financial disenfranchisement of racially and ethnically marginalized populations that is deeply engrained in the history and systems of the United States (Barnard & Turner, 2011; Ladson-Billings, 2006; VanEenwyk, 2010).

From the larger survey, validated measures were selected for use within this study based on alignment with variables of interest: anxiety, depression, emotion regulation, and social acceptability. Anxiety and depression symptoms were measured using the Anxiety and

Depression subscales from the Brief Symptom Inventory-18 (BSI-18; Derogatis, 2001). Emotion regulation was measured using the Emotion Dysregulation subscale from the Revised Life Problems Inventory (R-LPI; Rathus et al., 2018). Social acceptability was measured using a total score on the Acceptability of Intervention Measure (AIM; Weiner et al. 2017). Appendix 8 includes item descriptions, as well as sample items, from the BSI-18, R-LPI, and AIM scales used within this study.

Brief Symptom Inventory-18. The BSI-18 is a screening tool used to measure levels of psychological distress in adults ages eighteen and up (Derogatis, 2001). The BSI-18 is comprised of eighteen five-point Likert-scale items for which respondents are asked to mark the degree to which the stated problem has bothered them during the last seven days. The Anxiety and Depression subscales are each comprised of six items that yield total scores, where higher scores indicate higher levels of anxiety and depression symptomatology. The BSI-18 Somatization subscale was not used in the present study because the construct does not align with the stated research questions. The BSI-18 (Derogatis, 2001) has been validated through extensive research and has strong content validity. Cronbach's alpha, a measure of internal consistency, is 0.79 for the Anxiety subscale and 0.84 for the Depression subscale (Derogatis, 2001; Kaufman et al., 2016). Internal reliabilities between 0.70 to 0.95 are considered acceptable (Tavakol & Dennick, 2011).

Revised Life Problems Inventory. The Life Problems Inventory measures the core areas of difficulty with regard to emotional functioning observed in adults with Borderline Personality Disorder (BPD) as conceptualized within Linehan's (1993) DBT treatment (Linehan, 1993; Linehan, 2018; Wagner et al., 2015). The Revised Life Problems Inventory (R-LPI; Rathus et al., 2018) was developed to extend the utility of the earlier iteration as applications of DBT have

grown to meet the needs of younger, non-clinical populations, such as adolescents and young adults in colleges and universities, who also benefit from DBT-based supports for symptoms related to depression, suicidal ideation, and emotional dysregulation (Mazza et al., 2016; Rathus & Miller, 2015; Rathus et al., 2015; Wagner et al., 2015). The R-LPI is comprised of 60 five-point Likert scale items where respondents are asked to indicate the degree to which a statement describes their experience over the last 30 days (Rathus et al., 2018). The individual items load onto seven subscales: Emotion Dysregulation, Confusion About Self, Teen Family Conflict, Interpersonal Chaos, Aggression, High Risk Behavior, and Acting Without Thinking (Rathus et al., 2018). Each subscale yields a total subscale score which can be combined to yield an overall total score where higher scores indicate greater difficulty in the corresponding area of functioning (Rathus et al., 2018; Wagner et al., 2015). Of the R-LPI subscales, only the Emotion Dysregulation subscale was used in the present study because the construct aligns with the stated research questions. Cronbach's alpha is 0.90 for the Emotion Dysregulation subscale (Wagner et al., 2015), demonstrating excellent internal consistency (Tavakol & Dennick, 2011).

Acceptability of Intervention Measure. The AIM measures the acceptability of an implemented intervention among stakeholders (Weiner et al. 2017) and was used in the present study as a measure of social acceptability. Weiner et al. (2017) define acceptability as "the perception among implementation stakeholders that a given treatment, service, practice, or innovation is agreeable, palatable, or satisfactory" (p. 2). The AIM is composed of four five-point Likert scale items that yield an average score where higher scores indicate a higher level of intervention acceptability (Weiner et al. 2017). Respondents are asked to indicate how strongly they agree with statements regarding the extent to which the intervention is appealing and

agreeable to them (Weiner et al. 2017). Cronbach's alpha is 0.85 for the AIM (Weiner et al. 2017) which indicates adequate internal consistency (Tavakol & Dennick, 2011).

Interview Protocol

Individual semi-structured interviews were conducted using open-ended questions that explored students' general experiences in the resilience course, as well as questions that targeted their experiences and preferences regarding their assigned diary card format. The interview protocol was drafted prior to study deployment and additional edits were informed by quantitative results in alignment with an explanatory sequential mixed methods approach (Creswell, 2009). The individual interview protocol is provided in Appendix 9.

Procedures

This study employed explanatory sequential mixed methods to investigate the research questions (Creswell, 2009). First, quantitative methods were used to randomly assign quiz sections to either the digital or BAU version of the diary card and, post-intervention, explore the relationships between variables of interest. Second, qualitative methods were used to further explore and make sense of quantitative results through the interview of select participants. In sum, the procedures used to conduct this study include recruitment of participants, pre- and post-intervention surveying of participants, deployment of the digital and paper diary cards, random assignment of approximately half the participants, and qualitative interview of select participants.

Recruitment

Internal Review Board (IRB) approval was obtained to recruit and survey undergraduate students for the larger research study (STUDY00007274), and an IRB amendment specific to the present study was approved prior to the start of the Fall 2022 quarter. Students were informed

that their participation is voluntary and their survey and interview responses remain confidential. Prior to random assignment, students were provided with an opportunity to opt-out of the study by choosing to use the BAU, paper version of the progress monitoring tool typically used in the course. These students' pre- and post-intervention surveys were retained as part of the larger study, but were not used in data analysis for this study.

As part of the larger resilience course study, students are incentivized with a nominal amount of extra credit for completing the pre- and post-intervention surveys, as well as with the premise that they will see the results of the study once completed. In addition, as part of the present study, all students were incentivized with an option to be entered into a raffle to win one of two $50 Amazon gift cards—one gift card for each of the treatment groups. Students who were assigned the digital format of the diary card received the added incentives of optionally using the PsychSurveys mobile application to more conveniently complete their diary card, optionally turning on notifications to remind them to complete their diary card homework, and visualizing their skill use through the PsychSurveys calendar overview. After quantitative analysis, students were invited to volunteer to interview and further incentivized with a $20 Amazon gift card upon completion of the interview, which took approximately 30 minutes.

Random Assignment

Random assignment was used to assign approximately half of students to the BAU, paper format of the diary card and approximately half to the digital format of the diary card. Because students are clustered within quiz sections which are further nested within the two lecture formats (in-person or online), block random assignment using stratified random sampling was employed to balance sample sizes and control for the influence of covariates (Kim & Shin, 2014; Suresh, 2011). First, quiz sections were separated into two groups based on lecture format—

seven in-person and three online. Second, quiz sections within each format were randomly assigned to either the BAU or digital diary card condition. Because there are an odd number of quiz sections within each lecture format, both formats contain one more quiz section assigned to either the BAU or digital format, meaning each contains a larger portion of one treatment condition than the other. Randomization was conducted using random integer generation in Excel, a trusted mechanism for assigning conditions in quantitative studies (Kim & Shin, 2014). Randomization took place prior to the start of the course, after enrollment had been confirmed. Students were notified of the condition they were assigned to via the course website in the form of instructions for their weekly diary card assignment. Appendix 3 includes a table illustrating the stratified block random assignment of quiz sections within lecture formats.

Diary Card Deployment

The DBT diary card was deployed in partnership with the resilience course instructional team with initial and ongoing support from the researcher. The digital format of the diary card was delivered using the HIPAA-compliant platform, PsychSurveys, which can be accessed via web or mobile device and costs five dollars per month to use as a provider or researcher with no additional cost to respective users. In order to mitigate potential risk to confidentiality of information, the researcher was solely responsible for maintenance of the PsychSurveys account used to deploy the digital format of the DBT diary card.

Prior to the start of the quarter, the researcher met with the course's two instructors to review the study's procedures, demonstrate the use of the digital format of the diary card, and elicit feedback on the proposed deployment process. The course's four Teaching Assistants (TAs) were trained on the use and grading of the digital diary card via a pre-recorded demonstration video and an in-person presentation and with step-by-step visual, verbal, and

written instructions. The researcher also provided instructional staff with her contact information, inviting them to reach out for ongoing case-by-case support over the course of the academic quarter.

Once enrollment for the course was confirmed and random assignment was conducted, the researcher was added to the course instructional website in order to retrieve the emails of students who consented to participate in the study and were assigned to the digital format, loading the emails of these individuals on to the researcher's PsychSurveys managerial account. Upon student account creation, an individualized email was automatically sent to each student with their login ID and a unique password so that they could log in to their free PsychSurveys account.

In order to support students with initial and ongoing use of the diary card, the researcher provided parallel instructional support on the use and submission of both diary card formats through a video, a written document, and an example diary card. Each of the instructional materials (video, instruction document, and example) were linked in every assignment submission page for each of the respective formats. The pre-recorded videos included a step-by-step demonstration on how to use each diary card format, as well as how and where to submit it. The digital diary card instructions included how to access PsychSurveys via web and mobile application, how to log in to PsychSurveys for the first time, how to access and use the digital diary card, how to view the calendar with overall diary card completion data, and how to view and download the diary card PDF for assignment submission. The paper diary card instructions included how to find the paper diary card on the course website, how to download and print it, and how to submit the diary card on the course website. To limit risk of contamination, students were only be able to view the instructions for the diary card format to which they were assigned

based on their quiz section. Appendix 10 and 11 include the written instructions for both the paper and digital diary card formats.

Because completion of the DBT diary card is a required course assignment, ease of assignment submission for the digital format was comparable to that of the BAU diary card. The BAU diary card is typically submitted online as a PDF or jpeg photograph of the paper diary card. Students assigned to the digital format were instructed to download a PDF of their weekly diary card and upload the file to the same web platform used for BAU assignment submission. Prior to the start of the course, the researcher supported the instructional team in modifying the diary card assignment submission instructions to include the upload of the digital diary card PDF, linking in the written instructions, a step-by-step instruction video, and a sample diary card.

New skills are added to the resilience course diary card each week as new skills are learned in the course lecture. For the paper, BAU format of the diary card, this happens by way of students downloading a new diary card document each week from the course website. In order to mirror this process in the digital diary card, the researcher partnered with one of the founders and developers of PsychSurveys, Jesse Bertier, to develop a system for automatically assigning new skills to students each week so that they appeared at the exact time that the new paper diary card was made available to students.

Throughout the academic quarter, various deployment and implementation challenges arose, and the researcher partnered with the instructional team to provide ongoing technical support. After account activation emails were generated, there were approximately seven students who were unable to locate their login information. In response, the instructional team developed a standardized email response with tips for how students could locate their account activation email (i.e. checking their spam folder, ensuring they were using their university email,

etc.). These instructions were also added to the assignment description on the course website for students assigned to the digital diary card to proactively assist them in finding their login information. When trouble persisted, TAs emailed the researcher to request individual students' login information, which the researcher had access to as the PsychSurveys account manager. Approximately five students also experienced challenges with downloading the digital diary card PDF, either because they were using a tablet or because they were selecting a PDF with incorrect diary card dates. In order to support students with downloading the correct PDF, two actions were taken. First, students who were using tablets were instructed to use their tablet's browser (as opposed to the PsychSurveys mobile application) in order to download the PDF. Second, students who had trouble with locating the PDF with the correct dates were provided with a one-minute video clip demonstrating which button to click and which not to click. Additionally, the researcher worked with Bertier at PsychSurveys to toggle the settings on student accounts, simplifying the user interface and mechanism for downloading the correct PDF.

Surveying

Students' symptoms related to anxiety, depression, and emotion regulation were individually assessed using the pre- and post-intervention survey. Participants were surveyed at the beginning and end of the Fall quarter of 2022 which spanned a total of 11 weeks. Prior to distribution, it was stated both verbally and in writing that survey completion is optional and has no impact on course grades. Students who opted-in completed the survey outside of lecture and quiz sections. A total of 371 students completed both the pre- and post-intervention surveys, of which 181 were retained in this study. The number of respondents retained in the present study are reported by quiz section and lecture format in Appendix 3.

Interview

To support the interpretation of quantitative results, student interviews were conducted after data analysis was completed. Quantitative results were used to inform both the selection of participants for interview, as well as the interview protocol used to explore students' experiences, as is recommended within an explanatory sequential mixed methods design (Creswell, 2009). The rationale for conducting student interviews was to compliment quantitative results with an opportunity for select students to tell the story of their experience with the resilience course, overall, and their assigned diary card format (Brenner, 2006; Seldman, 2006).

Interview Timing and Format. Semi-structured, half-hour individual interviews were conducted after the resilience course ended and data analysis was completed. Participants met with the researcher on Zoom, where the interview was confidentially recorded and digitally transcribed using Zoom's built-in transcription software (Lobe et al., 2020). Zoom and other web-based video conferencing services have become popular and reliable tools for qualitative interviewing (Archibald, 2019; Gray et al., 2020; Lobe et al., 2020), thus, Zoom was deemed appropriate for use within this study.

Interview Participant Selection. Interview participants were purposefully selected based on quantitative results, as is the recommended method within an explanatory sequential mixed methods design (Creswell, 2009). The email inviting students to interview was sent to all 181 participants retained in this study, and from those who responded, select students were interviewed based on quantitative results. Quantitative results will be discussed in further detail in chapter four; however, for the sake of describing interview participant selection, it is notable that the digital diary card format was found to be uniquely predictive of lower fidelity and lower

social acceptability. Thus, participants with a range of fidelity levels and scores on the social acceptability measure were selected to interview. Furthermore, interviewees were selected with the aim of including a diverse sample based on demographic characteristics, prioritizing the inclusion of populations who hold historically marginalized identities. Because interview participants were a sample of convenience, there are limitations to the sample. For example, only one interviewee had less than perfect diary card fidelity, and all but one interviewee identified as female. A more detailed description of interview participants' demographic characteristics, lecture format, diary card format, number of diary cards complete, and social acceptability score is located in Appendix 12.

Data Analysis

This study employs an explanatory sequential mixed methods design. Quantitative research methods are used to explore Q1, Q2, Q3, Q4, and Q5, and qualitative research methods are used to explore Q6. Quantitative analysis was conducted first and used to further inform qualitative analysis.

Quantitative Analysis

Quantitative methods were used to analyze Q1, Q2, Q3, Q4, and Q5, including a priori analysis of variables, specification check, transformation of variables, visual inspection of assumptions, and a series of multiple linear regression models to determine unique effects of predictors on the variables of interest (diary card fidelity, post-intervention self-reported symptoms of anxiety, depression, and emotion regulation, and social acceptability).

A Priori Analysis. Prior to analysis, data were prepared by removing missing data, adding in the measure of diary card fidelity, and calculating necessary composite scores. Students with missing data, those under the age of 18, those who did not consent, and those who

did not meet the absence threshold of three or fewer classes missed were removed from the data set. Pre- and post-intervention surveys were paired to ensure complete data for each participant retained in the study (N=181). In order to obtain the measure of fidelity of diary card completion, student homework grades were gathered from the course website. Students' unique IDs were matched to the number of diary cards they completed as an integer with a maximum of eight. Pre- and post-intervention composite scores were calculated for the BSI-18 Anxiety, BSI-18 Depression, and R-LPI Emotion Dysregulation subscales by summing the items that load onto each of the respective composites. An average score for the AIM was calculated by summing all items and dividing by the number of items.

Descriptive statistics for all variables were carefully reviewed to determine whether or not demographic categories needed to be collapsed. All three demographic variables used within this study's quantitative modeling (race or ethnicity, gender identity, and academic year) were collapsed in some way due to small, unrepresentative sample sizes within categories. The rationale behind the collapsing of each variable is described in further detail here.

Students self-reported their academic year as either First Year, Second Year, Third Year, Fourth Year, Fifth Year, Transfer Student, or Other. Due to small sample sizes, the Fifth Year, Transfer Student, and Other categories were collapsed into a single variable (Other Year). It is notable that the Other Year category likely contains variation across individual students' experiences related to their academic year.

Race or ethnicity was initially coded using the categories listed on the pre- and post-intervention survey measures in order to honor students' self-identified race or ethnicity. Because students had the option of selecting more than one racial or ethnic identifier, a new category for race or ethnicity was created and coded as Multiracial, which included students who

selected more than one race or ethnicity (VanEenwyk, 2010). Due to small sample sizes, the race or ethnicity variable was further collapsed into Historically Marginalized Race or Ethnicity (HMRE) and Non-Historically Marginalized Race or Ethnicity. Race or ethnicity was intentionally collapsed into categories based on historically marginalized identity in alignment with QuantCrit literature (Clauss-Ehlers et al., 2019; Else-Quest & Hyde, 2016; Kahn, 2006). It is crucial to note that the aggregation of the multiracial category, as well as the collapsing of race or ethnicity may harmfully mask intersectionality, as these categories are likely more heterogeneous than homogenous. Thus, the HMRE variable was used in analysis with particular attention and caution (Barnard & Turner, 2011; Else-Quest & Hyde, 2016). The HMRE category consists of the following original categories listed on the pre- and post-intervention survey: Asian or Southeast Asian, Black or African American, Hispanic, Latino/a, or Spanish Origin, and Middle Eastern or North African. The non-HMRE category consists of students who self-identified as White or Caucasian.

Gender identity, too, was initially coded using students' self-reported gender identity selection. Also due to small sample sizes, the gender identity variable had to be collapsed into a dichotomous variable: Historically Marginalized Gender Identity (HMGI) and Non-Historically marginalized Gender Identity. Again, QuantCrit literature was used to inform the collapsing of gender identity into a variable that centered historically marginalized status, even though the HMGI variable likely masks differences in lived experiences (Clauss-Ehlers et al., 2019; Else-Quest & Hyde, 2016; Kahn, 2006). The HMGI category consists of the following original categories listed on the pre- and post-intervention survey: Female and Nonbinary. The non-HMGI category consists of students who self-identified as Male.

Specification Check. In order to ensure that the collapsing and coding of variables did not change or obscure results, a specification check of coefficients was conducted (Hausman, 1978). The primary goal for the specification check was to compare the use of the following categories: disaggregated race or ethnicity vs. the collapsed, HMRE status variable, disaggregated gender identity vs. the collapsed, HMGI status variable, and age vs. the Academic Year variable. A secondary goal for the specification check was to assess the handling of pre- and post-intervention scores using one of three mechanisms: using change scores without controlling for baseline, using change scores and controlling for baseline, or using post-intervention scores and controlling for baseline. A table detailing the results of the specification check is included in Appendix 13.

Results from the specification check indicated that the collapsing of race or ethnicity and gender identity into the HMRE and HMGI variables, as well as the use of Academic Year status instead of age, did not meaningfully impact the significance of outcomes. Students' self-identified racial or ethnic category and gender identity would have been used, but were unable due to the sample sizes in some of the categories was too small to be representative of that category, so HMRE and HMGI were used in the final models. Academic Year was chosen for use in the final model over age because, given the context of this study is specific to higher education institutions and was developed with the intention of supporting first year and early-career college students, academic year is more meaningful for comparison and interpretation.

The specification check also revealed that, whether using change scores or post-intervention scores, controlling for baseline ensures a more precise measurement (Cronbach & Furby, 1970). Post-intervention scores were chosen for use in the final model because existing

literature posits that post-intervention scores, as opposed to change scores, yield more accurate estimations (Cronbach & Furby, 1970).

Coding and Transformation of Variables. Metrical and categorical variables were transformed to aid in ease of results interpretation. Pre-intervention continuous variables (BSI-18 and R-LPI pre-intervention total scores) were standardized into *z*-scores with a mean of zero and a standard deviation of one. Categorical variables were either effect coded or dummy coded in order to compare each to a meaningful average (Cohen et al., 2014); this process is described in further detail below.

Demographic characteristics related to race or ethnicity, gender identity, and academic year were effect coded in order to compare each respective group to the unweighted mean across groups as opposed to comparing each group to the mean of the reference group (Cohen et al., 2014). As such, effect coding is more aligned with a QuantCrit approach to variable coding, which de-emphasizes group-to-group comparisons (Cohen et al., 2014; Johfre & Freese, 2021). Effect coding was further deemed appropriate, as each of the dichotomous demographic variable pairings were approximately equal in size, making the unweighted average across groups a reasonable point of comparison (Cohen et al., 2014). Race or ethnicity was effect coded where HMRE status was coded as 1 and non-HMRE status was coded as -1. Similarly, gender identity was effect coded where HMGI status was coded as 1 and non-HMGI status was coded as -1. HMRE and HMGI status were intentionally coded as 1 in order to prioritize non-dominant, historically marginalized identities in alignment with a QuantCrit approach to variable coding and interpretation (Johfre & Freese, 2021). Academic Year was effect coded where first year students served as the reference group (coded as -1) and second, third, fourth, and other year students were respectively coded as 1. First year students were chosen as the reference group

because they are a clearly defined category and represent the "target" group for the resilience class intervention (Cohen et al., 2014).

Lecture format and diary card format were dummy coded in order to compare groups to one another more easily and meaningfully, as dummy coding can aid in comparing treatment groups to one another (Cohen et al., 2014). Online lecture format was coded as 1 and in-person lecture format was coded as 0. The digital diary card format was coded as 1 and the paper, BAU format was coded as 0. The online and digital formats of the lecture and diary card were chosen as 1 because tech-based variables are of interest in this study.

While initially metrical, fidelity of diary card completion was recoded as a dichotomous variable due to violation of the assumption of normality. The histogram for the numerically coded version of diary card fidelity revealed that diary card completion fidelity was not evenly distributed and was skewed (-0.76) in favor of perfect completion, meaning eight out of eight total diary cards. As such, diary card fidelity was dummy coded where 1 = imperfect fidelity and 0 = perfect fidelity in order to compare fidelity of completion more meaningfully. The interaction between diary card fidelity and format was calculated by multiplying the dummy coded versions of each variable.

Assumptions. Prior to analysis, scatterplots and histograms for each predictor were visually examined to assess for normality, linearity, and homoscedasticity and ensure that linear regression model assumptions were tenable (Osborne & Waters, 2002). Because students were nested within ten quiz sections which were further nested within the two lecture formats (online and in-person), nonindependence could not be assumed. The most elegant way to handle lecture format and quiz section membership would be to use multilevel modeling, which would account for between-group and within-group variance, as well as yield maximum power for analysis;

however, the current model also suffices (Bell & Jones, 2015; Lee & Pustejovsky, 2021). To address lecture format, the dummy coded lecture format variable was added to each model and treated as a fixed effect in order to explicitly control for and avoid non-independence of residuals (Gormley & Matsa, 2014). To address quiz section membership, cluster-robust standard errors were used to minimize the risk of Type I error (Hayes & Cai, 2007). The use or absence of cluster-robust standard errors was also included in the specification check previously described, and use of cluster-robust standard errors was determined to be the most appropriate way to handle the data due to its nested structure (Appendix 3).

Multiple Linear Regression Modeling. Q1, Q2, Q3, Q4, and Q5 were analyzed using five multiple linear regression models with sequential predictor entry to understand the unique effect the predictors have on diary card completion fidelity, post-intervention self-reported symptoms of anxiety, depression, and emotion regulation, and social acceptability. Sequential predictor entry allowed for testing incremental variance accounted for as predictors are added to the model, combatting confounding or spurious relationships (Cohen et al., 2014). Data were analyzed using SPSS (28.0), R (4.0.3), and R studio (version 1.3.1093).

Research Question One. The first linear regression model was used to explore Q1—the unique effect of diary card format on fidelity of diary card completion when all other variables are held constant. In model one, block one included lecture format and demographic predictors (race or ethnicity, gender identity, and academic year). Block two of model one included diary card format. The final model was:

$$Y_{hat}\ (\text{Diary Card Fidelity}) = b_0 + b_1 * \text{Lecture Format} + b_2 * \text{HMRE Status} + b_3 * \text{HMGI Status}$$

$+ b_4$* Second Year + b_5* Third Year

$+ b_6$* Fourth Year + b_7* Other Year

$+ b_8$* Diary Card Format

In model one, diary card fidelity was equal to the conditional mean (b_0), plus the unique effects of lecture format (b_1), race or ethnicity (b_2), gender identity (b_3), and academic year ($b_4 – b_7$), as well as the unique effect of diary card format (b_8).

Research Question Two. A second model was used to explore Q2—the unique effect of diary card format on post-intervention self-reported symptoms of anxiety when all other variables are held constant. In model two, block one included lecture format, demographic predictors (race or ethnicity, gender identity, and academic year), and the baseline, pre-intervention survey score for anxiety. Block two of model two included diary card fidelity. Block three of model two included the diary card format. Block four included the interaction between diary card fidelity and diary card format. The final model was:

Y_{hat} (Post-Survey Anxiety) = $b_0 + b_1$* Lecture Format

$+ b_2$* HMRE Status

$+ b_3$* HMGI Status

$+ b_4$* Second Year + b_5* Third Year

$+ b_6$* Fourth Year + b_7* Other Year

$+ b_8$* Pre-Survey Anxiety

$+ b_9$* Diary Card Fidelity

$+ b_{10}$* Diary Card Format

$+ b_{11}$* Fidelity x Format

In model two, post-intervention self-reported anxiety was equal to the conditional mean (b_0), plus the unique effects of lecture format (b_1), race or ethnicity (b_2), gender identity (b_3), academic year ($b_4 – b_7$), and pre-intervention self-reported anxiety (b_8), as well as the unique effects of diary card fidelity (b_9), diary card format (b_{10}), and the interaction between diary card fidelity and format (b_{11}).

Research Question Three. A third model was used to explore Q3—the unique effect of diary card format on post-intervention self-reported symptoms of depression when all other variables are held constant. In model three, block one included lecture format, demographic predictors (race or ethnicity, gender identity, and academic year), and the baseline, pre-intervention survey score for depression. Block two of model three included diary card fidelity. Block three of model three included the diary card format. Block four included the interaction between diary card fidelity and diary card format. The final model was:

Y_{hat} (Post-Survey Depression) = b_0 + b_1* Lecture Format
+ b_2* HMRE Status
+ b_3* HMGI Status
+ b_4* Second Year + b_5* Third Year
+ b_6* Fourth Year + b_7* Other Year
+ b_8* Pre-Survey Depression
+ b_9* Diary Card Fidelity
+ b_{10}* Diary Card Format
+ b_{11}* Fidelity x Format

In model three, post-intervention self-reported depression was equal to the conditional mean (b_0), plus the unique effects of lecture format (b_1), race or ethnicity (b_2), gender identity (b_3),

academic year ($b_4 – b_7$), and pre-intervention self-reported depression (b_8), as well as the unique effects of diary card fidelity (b_9), diary card format (b_{10}), and the interaction between diary card fidelity and format (b_{11}).

Research Question Four. A fourth model was used to explore Q4—the unique effect of diary card format on post-intervention self-reported symptoms of emotion regulation when all other variables are held constant. In model four, block one included lecture format, demographic predictors (race or ethnicity, gender identity, and academic year), and the baseline, pre-intervention survey score for emotion regulation. Block two of model four included diary card fidelity. Block three of model four included the diary card format. Block four included the interaction between diary card fidelity and diary card format. The final model was:

$$\begin{aligned} Y_{hat}\ (\text{Post-Survey Emotion Reg}) = {} & b_0 + b_1 * \text{ Lecture Format} \\ & + b_2 * \text{ HMRE Status} \\ & + b_3 * \text{ HMGI Status} \\ & + b_4 * \text{ Second Year} + b_5 * \text{ Third Year} \\ & + b_6 * \text{ Fourth Year} + b_7 * \text{ Other Year} \\ & + b_8 * \text{ Pre-Survey Emotion Reg} \\ & + b_9 * \text{ Diary Card Fidelity} \\ & + b_{10} * \text{ Diary Card Format} \\ & + b_{11} * \text{ Fidelity x Format} \end{aligned}$$

In model four, post-intervention self-reported emotion regulation was equal to the conditional mean (b_0), plus the unique effects of lecture format (b_1), race or ethnicity (b_2), gender identity (b_3), academic year ($b_4 – b_7$), and pre-intervention self-reported emotion regulation (b_8), as well

as the unique effects of diary card fidelity (b_9), diary card format (b_{10}), and the interaction between diary card fidelity and format (b_{11}).

Research Question Five. A fifth model was used to explore Q5—the unique effect of diary card format on level of social acceptability when all other variables are held constant. In model five, block one included lecture format and demographic predictors (race or ethnicity, gender identity, and academic year). Block two of model five included diary card fidelity. Block three of model five included the diary card format. Block four included the interaction between diary card fidelity and diary card format. The final model was:

$$Y_{hat}\ (\text{Social Acceptability}) = b_0 + b_1 * \text{Lecture Format} + b_2 * \text{HMRE Status} + b_3 * \text{HMGI Status} + b_4 * \text{Second Year} + b_5 * \text{Third Year} + b_6 * \text{Fourth Year} + b_7 * \text{Other Year} + b_8 * \text{Diary Card Fidelity} + b_9 * \text{Diary Card Format} + b_{10} * \text{Fidelity x Format}$$

In model five, social acceptability was equal to the conditional mean (b_0), plus the unique effects of lecture format (b_1), race or ethnicity (b_2), gender identity (b_3), and academic year ($b_4 – b_7$), as well as the unique effects of diary card fidelity (b_8), diary card format (b_9), and the interaction between diary card fidelity and format (b_{10}).

Qualitative Analysis

Research question six (Q6) was explored through thematic analysis of semi-structured interview responses. Thematic analysis involves the repeated review of data to unveil emerging

patterns and themes (Braun & Clarke, 2006). Interview responses were coded by a single researcher using a school-based mental health perspective. The researcher first gained familiarity with the data, thoroughly reviewing the overall data set prior to analyzing individual responses. Next, the researcher deductively coded the responses, creating primary codes. After initial coding, secondary codes within each primary category were identified and responses were inductively coded to reflect these multiple categories. Both primary and secondary codes were reviewed during multiple passes to ensure they accurately reflected the data, then they were named and defined in the codebook. All coding was member checked by another expert in the field of education research in order to minimize single coder bias (Birt et al., 2016; Carlson, 2010).

Chapter Four: Results

This chapter presents the quantitative and qualitative results of the study, by research question. First, quantitative results for Q1, Q2, Q3, Q4, and Q5 are reported to examine the unique effects of diary card format on diary card fidelity, post-intervention self-reported symptoms of anxiety, depression, and emotion regulation, and social acceptability, respectively. Second, qualitative results for Q6 are reported to explore seven students' individual experiences with their assigned diary card format and the course overall.

Quantitative Results

In this section, all quantitative results from the five multiple linear regression models are presented. First, tests of assumptions are reviewed to examine the appropriateness of the use of multiple regression. Second, zero-order correlations across variables are provided. Third, the results from each of the linear regression models are presented for research question.

Tests of Assumptions

In order to ensure that multiple regression is appropriate, assumptions must be tested (Friesen, 2022; Osborne & Waters, 2002; Tabachnick & Fidell, 2013). The assumptions of normality, linearity, homoscedasticity, independence of residuals, and multicollinearity were examined prior to multiple regression analysis.

Normality. The assumption of normality was tested for each of the continuous variables as well as all residuals used within modeling. Skewness and kurtosis of continuous variables, provided in Appendix 14, are within the range of a normal distribution as defined by George and Mallery (2010). To assess normality or residuals, the P-P plots shown in Appendix 15 were reviewed and also determined to be normally distributed (Friesen, 2022; Osborne & Waters, 2002).

Linearity and Homoscedasticity. Linearity and homoscedasticity were visually examined using scatter plots of residuals against predicted values for each of the dependent variables (Friesen, 2022). The rectangular shape and even scatter of plotted points suggest linearity and homoscedasticity can be assumed (Tabachnick & Fidell, 2013).

Independence of Residuals. Independence of residuals was inspected using the Durbin-Watson test (Durbin & Watson, 1951). Durbin-Watson values were within the acceptable range of 1.50 to 2.50, so independence of residuals can be assumed (Durbin & Watson, 1951; Friesen, 2022; Tabachnick & Fidell, 2013).

Multicollinearity. Multicollinearity was evaluated in two ways. First, the zero-order correlation matrices provided in Appendix 16 were reviewed. For most values, correlation between predictors was less than 0.70, which is the recommended acceptable threshold (Tabachnick & Fidell, 2013). However, there were two instances where correlations were greater than 0.70. In both instances, the high correlations between predictors were concluded not to be risks to the validity of the regression models that follow, however, it is also recognized that the models are imperfect. First, the correlation between pairings of the Second Year, Third Year, Fourth Year, and Other Year variables were at or above 0.70 due to small sample sizes. One possible solution for the high correlations that was considered was collapsing these academic years into a single variable. However, although these variables were highly correlated with one another, they were kept separate in the preferred and final model because collapsing them yielded similar results but a poorly defined variable for representation of academic year.

Second, the diary card format and the diary card format by diary card fidelity interaction term were highly correlated with each other ($r = 0.88$). Although correlated, the format variable and fidelity by format interaction terms do not pose a major concern because the interaction term

variable works in unison with the format variable, producing an understandable correlation. There was deemed to be enough variation across groups to be able to move forward with inclusion of the interaction term in the modeling.

A secondary assessment of multicollinearity was conducted to ensure the assumption was met by reviewing variance inflation factor (VIF) values (Friesen, 2022). All VIF values were less than 5.0, a standard limit in statistical analyses (James et al., 2013), indicating the absence of multicollinearity can be assumed.

Zero-Order Correlations

Means, standard deviations, and zero-order correlations among all variables are presented in Appendix 16. Pre-survey measures of anxiety, depression, and emotion regulation were each positively correlated with their respective post-intervention measures (pre- and post-intervention anxiety $r = 0.55$, $p < 0.01$; pre- and post-intervention depression $r = 0.58$, $p < 0.01$; and pre- and post-intervention emotion regulation $r = 0.67$, $p < 0.01$), meaning higher levels of symptomatology at baseline were associated with higher levels at post-intervention and vice versa. Pre-survey anxiety was also positively correlated with HMGI status ($r = 0.19$, $p < 0.01$), and it was negatively correlated with being in the second academic year ($r = -0.16$, $p < 0.05$) and the other academic year categories ($r = -0.19$, $p < 0.01$). There was a direct relationship between second year students and third year ($r = 0.70$, $p < 0.01$), fourth year ($r = 0.75$, $p < 0.01$), and other academic year students ($r = 0.78$, $p < 0.01$). There was also a direct relationship between third year and fourth year students ($r = 0.78$, $p < 0.01$), third year and other year students ($r = 0.80$, $p < 0.01$), and fourth year and other year students ($r = 0.83$, $p < 0.01$). Lecture format was positively correlated with HMRE status ($r = 0.25$, $p < 0.01$), as well as with being in the second year ($r = 0.18$, $p < 0.05$), third year ($r = 0.16$, $p < 0.05$), fourth year ($r = 0.15$, $p < 0.05$), or other

year categories ($r = 0.20$, $p < 0.01$). Diary card format and lecture format were positively correlated, $r = 0.23$, $p < 0.01$, as there were more online lecture format quiz sections assigned to the digital diary card due to an uneven split between lecture formats. The interaction term between diary card fidelity and format was positively correlated with diary card fidelity ($r = 0.88$, $p < 0.01$) and diary card format ($r = 0.26$, $p < 0.01$), respectively. It is notable that social acceptability was not directly correlated with any other variables. Finally, and importantly, diary card format and diary card fidelity were positively correlated, $r = 0.17$, $p < 0.05$. In other words, assignment to the digital diary card condition (coded as 1) was weakly, yet significantly, associated with imperfect fidelity (coded as 1).

Regression Models

Five multiple linear regression models with sequential predictor entry were used to explore Q1, Q2, Q3, Q4 and Q5. Results from all five models are presented here, in order of research question.

Research Question One. Results from the model used to explore Q1 are shown in Appendix 17, Table 18. Block 1 of Model 1, which included lecture format and demographic predictors (HMRE status, HMGI status, and academic year), did not account for significant variation in diary card fidelity, $R^2 = 0.02$, $p > 0.05$. Block 2 of Model 1, which included diary card format, accounted for significant variation in diary card fidelity, $R^2_{change} = 0.04$, $p < 0.05$, suggesting diary card format explained 4% of variation in diary card fidelity. Results from the final model with all predictors included indicated diary card fidelity across racial or ethnic identities, gender identities, and academic years, and for people in the in-person lecture format and assigned to the paper, BAU diary card format was estimated to be $b = 0.06$, which was significantly different from zero ($p < 0.05$). Of interest to the present study, diary card format

was uniquely predictive of diary card fidelity. Students assigned to the digital diary card format were predicted to average 0.11 standard deviations closer to imperfect fidelity than students assigned to the paper, BAU format of the diary card, holding all else constant.

Research Question Two. Results from the model used to explore Q2 are shown in Appendix 17, Table 19. Block 1 of Model 2, which included lecture format, demographic predictors (HMRE status, HMGI status, and academic year), and the baseline measure of anxiety, accounted for significant variation in post-survey anxiety, $R^2 = 0.34$, $p < 0.001$, meaning the predictors explained 34% of students' post-survey anxiety score. Block 2 of this model, which included diary card fidelity, was not significant ($R^2_{change} < 0.01$, $p > 0.05$). Block 3 which included diary card format, was not significant ($R^2_{change} = 0.01$, $p > 0.05$). Block 4, which included the effect of the interaction between diary card fidelity and format was not significant ($R^2_{change} = 0.01$, $p > 0.05$) either. Results from the final model with all predictors included indicated that the mean post-survey anxiety score across racial or ethnic identities, gender identities, and academic years, and for people who reported average levels of pre-survey anxiety, had perfect completion fidelity, were enrolled in the in-person lecture, and were assigned to the paper diary card format was estimated at 6.40 points, which was significantly different from zero ($p < 0.001$). For every one standard deviation increase in pre-survey anxiety, there was a predicted 2.93 point increase in post-survey anxiety, holding all else constant. Compared to students in other academic years, fourth year students averaged 2.45 points higher on the post-survey anxiety measure, holding all else constant. Students with imperfect diary card completion fidelity averaged 4.42 points lower on the post-survey anxiety measure than those with perfect fidelity, holding all else constant. Students assigned to the digital diary card averaged 1.45 points

lower on the post-survey anxiety measure than those assigned to the paper, BAU diary card, holding all else constant.

The interaction between diary card fidelity and format, whereby the two variables were multiplied, significantly and uniquely predicted post-survey anxiety ($b = 5.45$, $p < 0.05$). To better understand this interaction, the graph in Appendix 18 was created, where predicted values for post-survey anxiety are shown for each combination of the predictors, diary card fidelity and diary card format. For students with perfect fidelity assigned to the digital diary card, post-survey anxiety was predicted to be 4.95 points, and for those with perfect fidelity assigned to the paper diary card, post-survey anxiety was predicted to be 6.40 points. For students with imperfect fidelity assigned to the digital diary card, post-survey anxiety was predicted to be 0.53 points, and for those with imperfect fidelity assigned to the paper diary card, post-survey anxiety was predicted to be 1.98 points.

Research Question Three. Results from the model used to explore Q3 are shown in Appendix 17, Table 20. Block 1 of Model 3, which included lecture format, demographic predictors (HMRE status, HMGI status, and academic year), and the baseline measure of depression, accounted for significant variation in post-survey depression, $R^2 = 0.38$, $p < 0.001$, indicating the predictors explained 38% of students' post-survey depression score. Block 2 of this model, which included diary card fidelity, was not significant ($R^2_{change} < 0.01$, $p > 0.05$). Block 3, which included diary card format, was not significant ($R^2_{change} < 0.01$, $p > 0.05$). Block 4, which included the effect of the interaction between diary card fidelity and format, was not significant ($R^2_{change} < 0.01$, $p > 0.05$). Results from the final model with all predictors included indicated that the mean post-survey depression score across racial or ethnic identities, gender identities, and academic years, and for people who reported average levels of pre-survey

depression, had perfect completion fidelity, were enrolled in the in-person lecture, and were assigned to the paper diary card format was estimated at 6.27 points, which was significantly different from zero ($p < 0.001$). For every one standard deviation increase in pre-survey depression, there was a predicted 3.27 point increase in post-survey depression, holding all else constant.

Research Question Four. Results from the model used to explore Q4 are shown in Appendix 17, Table 21. Block 1 of Model 4, which included lecture format, demographic predictors (HMRE status, HMGI status, and academic year), and the baseline measure of emotion regulation, accounted for significant variation in post-survey emotion regulation, $R^2 = 0.49$, $p < 0.001$, meaning the predictors explained 49% of students' post-survey emotion regulation score. Block 2 of this model, which included diary card fidelity, was not significant ($R^2_{change} < 0.01$, $p > 0.05$). Block 3, which included diary card format, was not significant ($R^2_{change} < 0.01$, $p > 0.05$). Block 4, which included the effect of the interaction between diary card fidelity and format, was not significant ($R^2_{change} < 0.01$, $p > 0.05$). Results from the final model with all predictors included indicated that the mean post-survey emotion regulation score across racial or ethnic identities, gender identities, and academic years, and for people who reported average levels of pre-survey emotion regulation, had perfect completion fidelity, were enrolled in the in-person lecture, and were assigned to the paper diary card format was estimated at 30.46 points, which was significantly different from zero ($p < 0.001$). For every one standard deviation increase in pre-survey emotion dysregulation, there was a predicted 8.51 point increase in post-survey emotion dysregulation, holding all else constant. Compared to students in other academic years, students in their second year averaged 3.56 points lower on the post-survey emotion regulation measure, holding all else constant.

Research Question Five. Results from the model used to explore Q5 are shown in Appendix 17, Table 22. Block 1 of Model 5, which included lecture format and demographic predictors (HMRE status, HMGI status, and academic year), did not account for significant variation in social acceptability, $R^2 = 0.02$, $p > 0.05$. Block 2 of this model, which included diary card fidelity, was not significant ($R^2_{change} < 0.01$, $p > 0.05$). Block 3, which included diary card format, accounted for significant variation in social acceptability, $R^2_{change} = 0.03$, $p < 0.05$, meaning diary card format explained 3% of the variation in students' social acceptability ratings. Block 4, which included the effect of the interaction between diary card fidelity and format, was not significant ($R^2_{change} < 0.01$, $p > 0.05$). Results from the final model with all predictors included indicated that the mean social acceptability score across racial or ethnic identities, gender identities, and academic years, and for people who had perfect completion fidelity, were enrolled in the in-person lecture, and were assigned to the paper diary card format was estimated at 3.85 points, which was significantly different from zero ($p < 0.001$). Notably, students assigned to the digital diary card format were predicted to, on average, endorse ratings 0.37 points lower on the social acceptability measure compared to students assigned to the paper diary card, holding all else constant.

Qualitative Results

Thematic analysis of semi-structured individual interviews was used to explore Q6. Primary and secondary themes that emerged across the seven interviews are described here. De-identified direct quotations from interviews are integrated into the discussion to provide rich insights into students' experiences with the class and, in particular, their assigned diary card format, as is best practice in qualitative research methods (Braun & Clarke, 2006; Brenner, 2006; Holliday, 2007; Seldman, 2006).

Skills from the Resilience Course

All seven interview participants described having an overall positive experience with the course content. Even participants who noted negative experiences with certain elements of the course (i.e. course logistics, communication with the grading team, etc.), indicated that their experience with the content taught in the course was positive and meaningful. When asked to describe their experience in the resilience course, interviewees tended to describe the skills they learned in the class, and the lasting impact that learning the skills has had on their mental wellness. Therefore, the first theme across interviews was the centrality of skills practice as part of interviewed students' positive experiences in the resilience course. One participant, for example, remarked:

> "…[When we learn about the] more scientific or like biological, anatomy [content], that's when I'm gonna start losing interest. But then, getting introduced to certain tips, or like certain ways to navigate, you know, stress, those helped me a lot, and I enjoyed those more." (Student 4, paper diary card)

Some of the skills students spoke about during interviews included mindfulness, REFRESHERs, TIPP, and the daily gratitude practice. For example, Student 4 described engaging in a gratitude practice every day since taking the resilience course. Other participants, too, commented on using the skills beyond the course, including during final exams:

> "I think I gained skills on how I could better myself, like I used a lot of those skills during finals week to make sure that I wasn't forgetting about myself as I was studying for my final and taking it, like I used the REFRESHER taking a break." (Student 2, digital diary card)

Overall, learning and practicing skills was reported as an integral component of interviewed students' positive experience with the resilience course.

Utility of the Diary Card

When asked to describe their experience with the diary card, interviewees described appreciating it for its function, even though it may not have been used to full fidelity in practice. An overarching theme was the diary card serves as a useful reminder to engage in skills practice and helps students remember and reflect on the skills they've learned. Student 1 described the diary card as a tool for "accountability" and multiple students used the word "reflection" when describing the utility of the diary card. Another student described how logging skills in the diary card at night can be helpful in priming skill use for the following day:

> "I think it was helpful just to keep me thinking about the skills constantly like in the back of my mind, because I would log it at night. And then the next day I would wake up kind of still thinking about it." (Student 3, paper diary card)

Overall, interview participants across conditions tended to describe the diary card as a helpful reminder to practice the skills they'd learned, increasing their attention to and awareness of their emotions and behaviors even when they weren't explicitly logging their skill use.

Consistency and Accuracy

However, though most interviewees described an appreciation for and understanding of the utility of the diary card, immediate and accurate use of the diary card was relatively inconsistent for those who interviewed. Some interviewees described using their diary card every day or every other day, while others tended to log their skills at the end of the week. Furthermore, there was a trend across interviews where students described how the regularity of their skill use shifted over the academic quarter. Some described logging their skills more consistently early-on and less consistently as the quarter got busier, while others described struggling to remember to log their skills early on and then catching a rhythm as time went on. Student 1, for example, described noticing a difficulty with remembering to log skill use early on

and, a few weeks into the quarter, deciding to set an alarm as a reminder to complete the diary card each night. Interestingly, Student 1 was assigned the digital diary card and reported using the mobile application, which has notification capabilities; however, Student 1 did not report using the notifications within the PsychSurveys app.

Multiple students across conditions described a tendency to complete their diary cards retroactively, at the end of the week. Students named their inconsistency or latency in diary card completion likely had a negative impact on the accuracy of their reporting:

> "I know that a lot of people forget about [the diary card] and like, just work on it during like the last day before we turn it in as well." (Student 5, paper diary card)

> "The first, like one to four weeks where it was kind of chill, I had time, so I would be able to pull [the diary card] out like every one or two days, and check in the boxes. But then, when I got to like midterms and finals, that's when I started only doing it Fridays, when it was due, and just like trying to remember what I used throughout the week, and just marking down some stuff I assumed I used, but most of it was quite inaccurate, because it's hard for me to remember every single skill I used." (Student 4, paper diary card)

Student 4, who was assigned the paper, BAU format of the diary card, went on describe a preference for using a mobile app-based version of the diary card with built-in notifications to aid in remembering to log skill use.

Digital Either Way

Regardless of assigned format, interviewees reported completing their diary card using a digital device and, further, expressed interest in a digital, mobile-app based version of the diary card. Every interviewee assigned the paper diary card completed it digitally, as a PDF document on their computer, as opposed to printing and carrying the diary card with them. Interestingly, two of the three interviewees who were assigned to the paper, BAU condition explicitly stated they would have preferred a digital, mobile app-based version of the diary card due to the potential ease of use in-the-moment:

> "I have school, work, and everything. I'm running around and sometimes I can't just be like oh, I used this [skill], I should pull out my laptop and put it in. You know, it's just kind of tedious, so I wish it was just easily accessed on my phone." (Student 4, paper diary card)

> "Maybe if I could do it on my phone somehow, or if it's like, simulated more of like an app style, you know… because I think just the kind of Google sheet-like excel file looking format of it seems a little overwhelming when you constantly look at it like that." (Student 3, paper diary card)

Even interviewees assigned the digital version of the diary card noted they would still want to use a digital version of the diary card, but would want a more user-friendly interface. Student 2, for example, stated, "It was the app's problem, not the course's problem or the diary card's… maybe [use] a different structure or a different app." Thus, regardless of assigned format, students used digital means to complete their diary card and indicated they would prefer a more user-friendly app-based version of the diary card moving forward.

Importance of a User-Friendly Interface

As interview participants discussed their desire for a mobile app-based version of the diary card, emphasis was placed on the importance of a user-friendly interface. For those assigned the digital diary card, there was a theme of making the interface easier to navigate, as they tended to describe having difficulty with logging their skills and submitting their PsychSurveys diary cards. Those assigned the paper format described similar features, like checkboxes, that would make the diary card easy to use and submit to the grading team.

Ease of Viewing. The layout and view of both the paper and digital diary cards emerged as a theme across interviews. Student 5, who was assigned the paper, BAU diary card, mentioned the skills were listed too close together, making it difficult to track which row corresponded with which skill, and recommended the skills be more spaced out or set apart using a color-coding system. Multiple interview participants who were assigned the digital format commented on the

length of the diary card and the difficulty they had with scrolling through the skills as the weeks went on and the number of skills increased:

> "I think it could be helpful if there was, instead of having it in a list, if you could answer each question and move on to the next one, like maybe have a next button and be like, okay, here's the next [skill]." (Student 7, digital diary card)

In fact, two interviewees independently mentioned they would recommend creating a mobile app where the user views one skill on their screen at a time, then cycles through the skills by selecting a "next" button.

Ease of Rating. Ease of rating was also a central theme within the umbrella of a user-friendly interface. Interview participants described multiple features they would like to see in future iterations of a diary card mobile app, including checkboxes, a sliding scale, notifications, and gamification:

> "Instead of having the text box response, maybe it could have like a bubble, multiple choice thing." (Student 2, digital diary card)

> "Something that is easy and convenient to do like something that could be on your phone, or maybe, I guess I'm envisioning in my head maybe it's a scale, and you just press the ones that you did that day or something, and it goes to the next skill." (Student 3, paper diary card)

Two interviewees, one who was assigned the paper diary card and one who was assigned the digital diary card, commented on a desire for notifications that would remind them to complete their diary card, particularly when they had not logged any skills for a given day. This would serve both to remind them to log any skills they had already used, as well as remind them to engage in skill use had they not yet practiced a skill that day. Student 2 also noted a desire for more detailed descriptions underneath each skill that would help students remember how to use skills in-the-moment.

Ease of rating was notably tied to motivation to engage in the rating process. Many interviewees described lacking the desire to rate their skills or putting off rating because it was cumbersome. Student 6 suggested future designs of the diary card include some form of gamification in order to engage students in the rating process and increase the likelihood they rate their skill use each day.

> "Having some sort of a gamification, maybe even like an answering streak, or a daily task type of thing, instead of just a questionnaire every day might be a bit more motivating for students to use." (Student 6, digital diary card)

Student 6 also recommended including a graph that tracks users' progress, another feature that could improve motivation to practice and rate skills.

Ease of Submission. Also within the larger theme of a user-friendly interface was the theme of making submission of the diary card fluid and integrated into the digital platform. Most of the interviewees who were assigned the digital diary card described difficulty with downloading a PDF that accurately reflected the dates for which they wanted to submit their diary card:

> "Overall it was pretty decent, except at the end, like at the end of every week, when we had to generate the PDF… it would never work the first time. So I think that was just something annoying more than anything else, because I'm just taking up unnecessary time. It doesn't need to take so long." (Student 1, digital diary card)

> "I ran into a problem during, I think, starting the fifth week where, when I tried to get the PDF version, it wouldn't give me the PDF of the days that I selected… And so that was really confusing. But I did manage to get it eventually." (Student 2, digital diary card)

For those assigned the digital diary card, downloading the PDF from PsychSurveys required for submission of their diary card assignment on the course website was notably difficult. One of the interviewees who completed the paper diary card, Student 4, recommended creating a "submit"

button for an app-based version of the diary card so that it can instantly be sent to the grading team for review.

Chapter Five: Discussion

In this final chapter, results are summarized and synthesized, leading to implications and recommendations for the design and implementation of a digital self-monitoring tool, such as the DBT diary card, as part of a preventative school-based mental health intervention. The chapter closes with a discussion of study limitations and concluding remarks.

Summary of Findings

The present study set out to explore the fidelity, efficacy, and social acceptability of a digital DBT diary card. Quantitative methods were used to examine the extent to which diary card format (either digital or paper/BAU) uniquely predicted fidelity of diary card completion, post-intervention self-reported symptoms of anxiety, depression, and emotion regulation, and level of social acceptability. Qualitative interviews were used to further explore and explain quantitative results and shed light on individual experiences of students enrolled in the class both in general and with the diary card, specifically.

Summary of Quantitative Results

Quantitative analysis was used to explore the first five research questions regarding the digital diary card format's unique effect on completion fidelity, self-reported post-survey symptoms of anxiety, depression, and emotion regulation, and social acceptability. It was hypothesized the digital diary card format would predict greater completion fidelity and, therefore, lower levels of symptomatology, as behavior change literature asserts that the more consistently and accurately a self-monitoring tool is used, the more effective it is (Avina, 2008; Harkin et al., 2016; Kanfer, 1970; Korotitsch & Nelson-Gray, 1999; Nelson & Hayes, 1981). It was also hypothesized the digital diary card would uniquely predict higher levels of satisfaction with the diary card, because digital self-monitoring tools have been shown to be associated with

high levels of social acceptability in previous studies (Bedesem, 2012; Dennison et al., 2013; Melbye et al., 2020; Murnane et al., 2016). Each of these hypotheses is unsupported by the results of this study, explained in further detail below.

Research Question 1: Completion Fidelity. The first hypothesis, that the digital DBT diary card would uniquely predict greater levels of completion fidelity, is not supported by this study. In fact, the digital diary card was both correlated with imperfect fidelity and uniquely predicted imperfect fidelity. This finding implies the digital diary card was used with less fidelity than its paper counterpart. Literature on self-monitoring tools suggests devices that are easy to use are more likely to be used with fidelity (Avina, 2008; Korotitsch & Nelson-Gray, 1999; Nelson & Hayes, 1981). Because qualitative interviews pointed to significant barriers to use, it is likely that difficulty with using and submitting the digital diary card stymied completion fidelity for those assigned to the digital diary card format. The paper diary card, in contrast, was reportedly easy for students to use and submit. It is plausible that differences in user-friendliness reported across diary card formats contributed to the observed differences in completion fidelity.

Research Questions 2 to 4: Anxiety, Depression, and Emotion Regulation. The second through fourth hypotheses, which stated the digital diary card format would uniquely predict lower levels of symptomatology on the post-intervention survey, was also not supported by the results of this study. Across measures of anxiety, depression, and emotion regulation, diary card format did not uniquely predict higher nor lower levels of symptomatology. Diary card completion fidelity was controlled for in the model in order to rule out the possibility that level of completion fidelity influenced self-monitoring efficacy; however, completion fidelity did not significantly predict post-intervention survey outcomes. This suggests diary card format, regardless of fidelity level, did not play a role in altering the efficacy of the self-monitoring tool

in supporting behavior change practices. The absence of significant findings in this area is good news for practitioners and users of self-monitoring tools, because the results of this study indicate diary card format does not alter the efficacy of the self-monitoring process within the context of a tier one preventive mental health intervention with higher education students.

Each of the regression models used to explore the factors that uniquely predicated post-survey levels of symptomatology, as well as zero-order correlations, suggest pre-intervention levels of symptomatology are a significant predictor of post-intervention levels of symptomatology, meaning severity of symptoms prior to intervention is one of the most important indicators of post-intervention symptom severity. This is not surprising, as past symptomatology and behavior is a known predictor of future symptomatology and behavior according to developmental cascade theory (Masten & Cicchetti, 2010). This does not, however indicate the intervention (the resilience course) has not accomplished its goal. Previous studies of the resilience course have found the intervention had positive implications for subjective wellbeing, as well as reduction of anxiety and depression symptoms (Friesen, 2022; Liao, 2022). In the context of data-based decision making, the observation that pre-intervention symptom levels are predictive of post-intervention symptom levels suggests the careful review of pre-intervention scores is a crucial component of making intervention and treatment decisions, including what the resilience course triage team might need to support student wellbeing over the course of the academic quarter or which students could benefit from targeted coaching and skill rehearsal.

Additionally, in the models used to explore anxiety and emotion regulation, academic year uniquely predicted post-survey levels of symptomatology. In the model used to explore emotion regulation, Second Year membership was associated with slightly lower post-

intervention levels of emotion dysregulation. It is plausible that factors such as adjustment to college (Baker et al., 1985; Baker & Siryk, 1984; Lee et al., 2018) contributed to the lower levels of emotion dysregulation reported by second year students. Meaning, students in their second year may have developed greater feelings of self-efficacy in relation to their ability to cope with the stressors of college life, which acted as a protective factor with regard to mental health symptoms (Lee et al., 2018). Students in their fourth year reported slightly higher levels of post-survey anxiety as compared to students in other academic years. Because this study was conducted at a four-year institution, it is likely that students in their fourth year were thinking through post-graduation plans, including entering the workforce or applying to graduate-level training programs, which tends to contribute to feelings of stress and anxiety (Beiter et al., 2015). However, it is also notable that the Fourth Year group was comprised of only 13 students, and the observations within the present study may not generalize to broader populations of fourth year students. In all, the variations in symptomatology across academic years suggests where a student is at in their academic career may be a factor to consider in understanding and addressing current levels of symptomatology.

The diary card fidelity and format interaction effect observed in the model used to explore post-survey anxiety revealed students' level of completion fidelity, interacted with their assigned diary card format, uniquely predicted their self-reported level of anxiety post-intervention. Existing literature suggests there is a relationship between anxiety levels and perfectionism (Burgess & DiBartolo, 2016; Flett et al., 1994; Zhou et al., 2013), and it is plausible that perfectionistic tendencies associated with higher levels of anxiety impacted students' level of completion fidelity, that is, students experiencing higher levels of anxiety were more likely to complete their diary card to full fidelity. Additionally, the first model shows the

digital diary card uniquely predicated lower rates of fidelity, so rather than diary card format uniquely predicting level of anxiety, the significant finding related to diary card format in model two is likely a byproduct of the interaction effect and the lower rates of completion fidelity observed in the digital diary card treatment group.

Research Question 5: Social Acceptability. The fifth hypothesis, that the digitally formatted DBT diary card would be associated with higher levels of social acceptability was also not supported by the quantitative findings of this study. The digital diary card, in fact, uniquely predicted lower ratings on the social acceptability measure, meaning students assigned to the digital diary card format liked it less than those assigned to the paper diary card. Completion fidelity was intentionally controlled for in the modeling, and the interaction between fidelity and format was included in order to rule out the possibility that level of completion fidelity influenced students' attitudes toward their assigned diary card format. The absence of significant findings related to completion fidelity in the regression model used to explore social acceptability suggests level of completion fidelity did not moderate social acceptability. Therefore, regardless of completion fidelity and other extraneous variables, students assigned the digital diary card simply liked it less than those assigned the paper, BAU diary card. Qualitative interviews further illuminated students' dissatisfaction with the digital diary card's design features (discussed in more detail in the summary of qualitative results section), and it is likely that the design feature difficulties noted in qualitative interviews contributed to the lower ratings of the digital diary card on the social acceptability measure. Interestingly, in spite of the digital diary card's lower social acceptability rating, all but one student interviewed expressed a desire for a digital diary card in the future, including both those assigned to the paper and digital diary card groups.

In all, quantitative results demonstrated the digital diary card was used with less fidelity, did not have a significant impact on symptomatology, and was less socially acceptable than the paper, BAU version of the diary card. To better understand the factors that may have contributed to the lower rates of completion fidelity and social acceptability observed in the digital diary card group, qualitative interviews were conducted.

Summary of Qualitative Results

Qualitative interviews were conducted to further explore and explain quantitative findings and address research question six. It was hypothesized, compared to students assigned to the paper diary card, students assigned to the digital diary card would express higher levels of satisfaction with their diary card format and higher levels of personal growth in relation to the skills taught in the course. Qualitative results did not support this hypothesis.

Perceptions of the Course. Across all interviews, students reported positive attitudes toward the course and, in particular, the skills taught in the course. Skills practice was reportedly central to students' experience in the course and multiple interviewees described skills they have continued to integrate into their daily lives since taking the resilience course. Students' overwhelmingly positive perceptions of the course and its content indicated satisfaction with and appreciation for the resilience course's larger intention of supporting student wellbeing through and beyond college.

Perceptions of the Diary Card. Students understood the function of the diary card as a tool for supporting skills practice and appreciated it for its function, and regardless of assigned diary card format, students' consistency and accuracy of diary card use tended to fluctuate over the quarter. Some students reported using the diary card more consistently at the beginning of the quarter and less at the end, while other students reported struggling to use the diary card in the

beginning of the quarter and using it more consistently toward the end. Students from both the digital and paper diary card treatment groups stated their skill reporting was likely more inaccurate when the diary card was completed retroactively, at the end of the week. Behavior change literature emphasizes the importance of immediacy in recording as a mechanism for accurate and effective self-monitoring (Avina, 2008; Korotitsch & Nelson-Gray, 1999). Students' reported latency and subsequent inaccuracy in their recording, emphasizes the need for continued development of technologies and tools that can reduce barriers to immediate recording and improve accuracy and fidelity of self-monitoring.

Recommendations for Future Designs. Interestingly, all but one interview participant, across both the digital and paper groups, reported a desire for a digital diary card in the future, particularly one that is accessible via a mobile application. While students assigned to the digital diary card expressed frustration with some of their diary card's features, they maintained they would still want a digital diary card in the future, with the caveat that it needs to be designed to be more user-friendly. User-friendliness features included making the diary card easier to view, making the skills easier to rate, and making the diary card easier to submit. Students also recommended adding in features such as graphing or gamification to enhance the user's experience and improve motivation to engage in the self-monitoring process. Submission, in particular, was described across multiple interviews as a feature of the digital diary card that was difficult to use, indicating barriers to submission may have been linked to the lower rates of completion fidelity for the digital diary card.

Overall, qualitative results demonstrated students had positive experiences with the course and the skills they learned have, for many, generalized to their daily lives. Students understand the utility of the diary card, but would like a diary card that is easy to use to improve

their consistency and accuracy of reporting. Even though the design of the digital diary card was reportedly cumbersome for those assigned to it, students across conditions expressed a desire for a mobile app-based version of the diary card, emphasizing the design features must be easy to use and submission of the diary card should be simplified.

Synthesis of Results

Taken together, quantitative and qualitative results demonstrate the digital diary card was difficult to use, less likely to be completed with fidelity, and less socially acceptable than the paper diary card. Neither the digital nor the paper format of the diary card uniquely predicted mental health symptom outcomes. Despite challenges with using the digital diary card, students would prefer a digital diary card in the future, emphasizing the importance of a user-friendly design, including the reduction of barriers to submission.

Format Did Not Impact Intervention Efficacy. The results of this study show format, whether paper or digital, did not uniquely predict or impact the efficacy of the intervention in reducing mental health symptoms related to anxiety, depression, and emotion regulation. This is good news, because it indicates there is no benefit to using one format over the other in terms of reducing symptoms, and personal preference can, instead, be a deciding factor in format choice. The self-monitoring tool that supplements the resilience course intervention, the diary card, can take either a digital or paper form without compromising the efficacy of the intervention.

Format Impacted Ease and Frequency of Use. While format did not impact intervention efficacy, it *did* impact the usability of the diary card, which likely contributed to the lower completion fidelity and lower social acceptability observed in the digital diary card group. During interviews, students reported difficulty with viewing, rating, and submitting their digital diary cards using the PsychSurveys platform. These barriers led to frustration with the digital

diary card format and, ultimately, lower rates of submission of the digital diary card as compared to the paper, BAU diary card. But in spite of challenges with using and submitting the digital diary card, all but one of the students interviewed expressed a desire for a digital diary card in the future, particularly one they could use and submit from their phones. Students emphasized the importance of a digital diary card that is easy to view, use, and submit to the grading team, thus, the key takeaway from this study is that tool selection and design are critical to the success of a digital DBT diary card within the context of a preventative mental health intervention with higher education students.

Tool Selection, Design, and Implementation Matter. Tool selection and design are critical to enhancing the usability of a digital DBT diary card. The PsychSurveys platform was chosen primarily because it is customizable and secure, both of which were necessary design features for use within the context of the resilience course. The digital diary card needed to be modified to mirror the paper diary card, and the PsychSurveys diary card was customized to use the same letter-based rating system used on the paper version. Unfortunately, this meant the digital diary card's checkbox and graphing features were rendered unusable, because the platform is designed to use a numerical rating system. Further, the PsychSurveys diary card had to be downloaded as a PDF in order to be submitted to the course website to the grading team. This was a reported barrier for students assigned to the digital diary card, because there was difficulty with downloading a diary card with the correct dates on it for grading. In this way, PsychSurveys may not have been the perfect fit for use within the context of the resilience course, because the diary card used in the course is constrained by the needs of the course and the grading team. The paper diary card, on the other hand, was easy to navigate and submit because it has been built into the systems and routines of the resilience course over time. The

challenge, moving forward, is how best to adapt the paper diary card to a digital format, considering students who were interviewed requested an easy-to-use digital diary card in the future.

Recommendations

This section provides recommendations for the selection, design, and implementation of a digital DBT diary card or self-monitoring tool, leveraging principles from the Human Computer Interaction (HCI) and implementation science fields. HCI literature has demonstrated a tool's social acceptability is tied to its effectiveness (Koelle et al., 2020; Perski & Short, 2021), meaning designs that work well tend to be more pleasing to their user population. In this way, design features can simultaneously improve efficacy and social acceptability. Design and implementation go hand-in-hand, and the efficacy and social acceptability of even the most well-designed tools and interventions can often depend on implementation factors such as stakeholder support and deployment processes (Bauer et al., 2015; Damschroder et al., 2009; Forman et al., 2013; Kelly & Perkins, 2012; Moir, 2018; Nilsen & Bernhardsson, 2019; Owens et al., 2014). In order to produce a digital DBT diary card or self-monitoring tool that is highly effective and socially acceptable, it is suggested that stakeholders are included in design, selection, and implementation processes, feedback loops are built in to deployment. Additionally user-friendliness should be prioritized, tools should be integrated into existing systems, future customization needs should be recognized, and security of users and information should be carefully considered.

Include Stakeholders in the Process

Including students and other stakeholders in the selection, design, and implementation of a digital DBT diary card could mitigate the barriers to usability reported during interviews and

observed in the social acceptability and completion fidelity outcomes for the digital diary card group. The digital diary card used within this study was chosen by the researcher after a review of available digital DBT diary cards. In retrospect, this approach to selection and implementation was flawed, because the challenges students faced related to usability could have potentially been avoided had input from the course instructors and students been gathered proactively as opposed to retroactively. The diary card format was not observed to predict changes in symptom outcomes, so empowering students and instructors to choose tools that best fit their preferences and needs could greatly improve acceptability. Implementation science literature suggests buy-in from stakeholders is a key mechanism for supporting change within groups or organizations (Damschroder et al., 2009; Nilsen & Bernhardsson, 2019), and future tool selection and implementation could greatly benefit from proactively partnering with students and the course instructional team.

Alternatively, it may be advantageous to design a digital DBT diary card tailored to the needs of the resilience course, because students emphasized the importance of making the tool easy to use and submit to the grading team. A concept bred from participatory design, co-design is a popular term in the field of HCI used to describe the collaborative process where users are valued members of the design team from start to finish (Thabrew et al., 2018). Because of the immense benefits of co-design, both in terms of outcomes for the quality and social acceptability of the product, as well as for the co-design population of interest (Bucci et al., 2019; Cheng et al., 2021; Thabrew et al., 2018), it is recommended that future iterations of digital self-monitoring tools like the DBT diary card are co-designed alongside their intended user population.

It is important to note the "stakeholders" in the implementation and co-design processes might look different depending on setting. In the present study, stakeholders included both students who were engaged in the self-monitoring process (front-end users), as well as the instructional team who viewed and monitored diary cards (back-end users); however, stakeholders would likely vary based on setting. In a clinical setting, this would mean the clinicians who use progress monitoring tools like the DBT diary card to communicate with clients and collaboratively make treatment decisions (Meier, 2014; Linehan & Wilks, 2015; Wilks, 2022). In the K-12 school setting, this would mean stakeholders like school psychologists, teachers, and other Multitiered Systems of Support (MTSS; McIntosh & Goodman, 2016) team members who regularly use data to make MTSS decisions (Borntrager & Lyon, 2015).

Build in Feedback Loops

Feedback from students was collected retroactively in the present study, and the insights gathered via interviews are invaluable to future decision making. It is encouraged that future iterations of the digital DBT diary card use stakeholder feedback loops to assess usability and inform design and implementation choices. With regard to implementation, it is recommended that steering committees or focus groups are created to provide insights into tool selection and deployment in the resilience course. From a design standpoint, iterative and pilot testing is highly recommended in future developments of digital self-monitoring tools like a DBT diary card.

A key construct in implementation science research is the evaluation of the implementation process to inform improvements and future deployment decisions (Damschroder et al., 2009). Implementation scientists recommend forming an implementation steering group or committee to monitor and evaluate the process of implementation and collaboratively make

decisions to address any barriers (Forman et al., 2013; Kelly & Perkins, 2012; Moir, 2018). Within the context of the resilience course, it may be helpful to form a committee or focus group to inform and assess the implementation processes, like submission and grading of the diary card, to address challenges as they arise. As previously stated, it is important that any groups formed reflect the perspectives of all relevant stakeholders, including students and members of the grading team.

Iterative testing, like pilot testing, is an integral component of the co-design process and can reveal bugs or challenges along the way, ultimately saving valuable time and resources in the larger roll-out of co-designed technologies (Thabrew et al., 2018). In the present study, the digitally formatted diary card was not pilot tested on a smaller scale, and doing so could have eliminated barriers to completion including the difficulty students experienced with the downloading and submission of their PDFs. Future designs of self-monitoring tools made accessible across devices and operating systems should be tested across devices and systems. Wilks et al. (2021) have also noted, in the case of the DBT diary card, DBT mobile applications should be reviewed by users with lived experience, as the population that the DBT diary card is traditionally used with hold specific knowledge regarding the barriers to use an implementation. In the context of the resilience course, this could mean utilizing the perspectives of previously enrolled students through interviews similar to those conducted in the present study to provide insights into the user-friendliness of the design, as well as holding pilot testing sessions with the grading team to better understand their needs related to the collection and review of the digital diary card.

Prioritize User-Friendliness

Perhaps the most valuable outcome of student interviews was the breadth of suggestions made regarding improvements to the user-friendliness of the digital DBT diary card. Students reported challenges with using the diary card rating system and recommended additional features like prompting and motivational tactics to improve their engagement in the self-rating process. According to behavior change and HCI literature, technologies that are unobtrusive and easy-to-use are more likely to be used with fidelity and are more socially acceptable (Koelle et al., 2020; Murnane et al., 2016; Nelson & Hayes, 1981), so prioritizing features recommended in student interviews related to usability could potentially shift the observed deficits in social acceptability and completion fidelity that were observed in the present study.

Rating. Interviewees repeatedly made suggestions to improve the ease of using the digital DBT diary card, including checkboxes, sliding scales, a skill-by-skill view, and skill descriptions. Across interviews, students reported a desire for a mobile app-based version of the digital diary card, and many of the recommendations related to ease of skill rating were specific to what the digital DBT diary card could look like if it were primarily created for use on a phone. Checkboxes and sliding scales were recommended in place of the letter-based rating systems that students used in the context of this study. Digital diary cards and self-monitoring tools that utilize a checkbox or sliding-scale rating system should be selected or designed for use in the resilience course in order to minimize the time and energy needed for students to quickly identify how effective a skill or behavior was in the moment. Students also recommended simplifying the way skills are viewed, for example, by displaying skills one-by-one and including a “next” button to minimize the need for scrolling. One student noted difficulty with remembering how to

use the skills and recommended that each skill include a shot description underneath or an option to click on the skill to see an example of how it might be used in the real world setting.

Prompting. Notifications are also an important recommendation for future designs of a digital self-monitoring tools that was noted during interviews. Behavior change literature backs the assertion that notifications and prompting are a powerful attribute of effective self-monitoring tools, because they remind the user to engage in skill use as well as assist in keeping skills more present in the user's mind (Harkin et al., 2016). Finally, it was suggested that future iterations of the DBT diary card, specifically, include snapshots of how to use a skill by including a short description of each skill underneath it. This feature could be added in a variety of formats, including having the description underneath the skill or by allowing users to click on the skill to read a description or see an example of how it can be used in a scenario-like format. Future developments of digital self-monitoring tools should prioritize minimal effort on the part of the user to improve social acceptability and completion fidelity.

Motivation. Improving motivation in the self-rating process could increase frequency of use and completion fidelity and, in turn, efficacy of a tool in promoting behavior change (Harkin et al., 2016). Gamification and data visualization were both referenced in qualitative interviews as potentially motivating design features to be included in future developments of digital self-monitoring tools like the DBT diary card.

Streamline and Integrate

During qualitative interviews, multiple students recommended a future digital DBT diary card design that uses a "submit" button to send the diary card directly to the grading team, eliminating the tedious task of downloading and submitting a PDF, a process that was reportedly difficult for students due to trouble with the digital DBT diary card user-interface. Integrating the

completion of the digital diary card into the resilience course's grading system could have reduced barriers to submission and perhaps even improved fidelity of completion and social acceptability.

For the grading team, too, the seamless integration of the diary card into the grading system could save valuable time and resources, potentially removing the task of grading diary cards for completion from their weekly job responsibilities. This time could, instead, be allocated to reviewing diary card data from a mental health provider lens, leading to a stronger understanding of students' needs and experiences with their skill use that could be leveraged in treatment planning (Meier, 2014; Linehan & Wilks, 2015; Wilks, 2022). Thus, the intentional integration of systems in the design of a digital self-monitoring tool holds much more than the potential to improve the user-experience, it can also improve the tool's capacity to drive communication with clinicians and make collaborative treatment decisions (Marzano et al., 2015; Meier, 2014; Linehan & Wilks, 2015; Wilks, 2022). The original intention of the DBT diary card is to both support clients with behavior change through the act of self-monitoring, as well as support with communication between clients and clinicians in coordinating and enhancing care (Linehan, 1993, 2014, 2018; Linehan & Wilks, 2015; Wilks, 2022). For example, a completed diary card that is brought to session can serve as a launching point for deep conversation about how a person is progressing through their treatment. The integration of a digital DBT diary card into existing systems holds the potential to improve the ease and quality of communication between clients and clinicians and, ultimately, improve care (Meier, 2014; Wilks, 2022).

Plan for Future Customization

Of course, no single format or design of a digital self-monitoring tool will meet the needs of every user or institution, so future selection and design of digital mental health self-monitoring tools like the DBT diary card could greatly benefit from planning ahead for customization needs (Barstow & Arango, 1991; Wilks et al., 2021). In addition to allowing for customization of features from the beginning, planning ahead for customization means selecting or designing tools with the anticipation that elements will need to be customized based on contextual factors that may not be able to be determined at the outset of the design process (Barstow & Arango, 1991). According to Wilks et al. (2021), the PsychSurveys digital DBT diary card was, at the time, one of only two DBT-based mobile applications that allowed for customization, indicating a large gap in existing options. In the present study, PsychSurveys was used in large part due to its customization features. The DBT diary card used in the resilience course is a modified form of the original DBT diary card used in clinical applications (Mazza et al., 2016), and, as such, customization of the digital diary card was imperative. Conversely, too many customization options can be overwhelming to users, as Schwartz (2004) classically describes in "The Tyranny of Choice." It is important that future selection and design of self-monitoring tools like the DBT diary card allow for customization and design with the flexibility of unanticipated future customization needs, while also striking a balance between too much choice and too little.

Be Sure it's Secure

Because mental health-related information is sensitive, data security is a primary goal when selecting or creating a digital self-monitoring tools like the DBT diary card (Aguilera, 2015; Bucci et al., 2019; Dennison et al., 2013; Luxton et al., 2011; Marzano et al., 2015; Price

et al., 2014). In the present study, the PsychSurveys platform was chosen due to its HIPAA compliance. Data security is complex, and as technology continues to evolve with advancements in machine learning and artificial intelligence, network security needs will continue to evolve in turn (Chin, 1999; Scott-Hayward, 2021). Future developments of the digital DBT diary card and mental health self-monitoring tools should continue to be carefully planned around data sensitivity and data security and experts should be included on the design or selection team as needed (Chin, 1999; Scott-Hayward, 2021).

Implications

While specific to the use of a digital diary card in a higher education application of a DBT-based preventive mental health intervention, the results of this study have broader implications for the use of a digital DBT diary card or self-monitoring tool in the clinical and K-12 school settings. Because the findings of this study suggest lower social acceptability and fidelity when a digital tool is not user-friendly, it is crucial that tools be selected, designed, and implemented with great care and attention to their context and intended user population.

Clinical Settings

In clinical settings, many have already begun to employ digital means of completing and sharing the DBT diary card (Wilks, 2022). While the DBT diary card used in the resilience course is a modified form of the DBT diary card used in clinical settings (Linehan, 1993, 2014, 2018; Linehan & Wilks, 2015), the information from this study could be used as a possible reference point for clinicians interested in switching to a digital DBT diary card, including how to go about choosing a diary card design that meets the needs of their population or how to make the switch more seamless for patients or clients.

K-12 School Settings

In K-12 schools, the implications of this study are even more broad, as self-monitoring tools are largely used within the context of Multitiered Systems of Support (MTSS; McIntosh & Goodman, 2016). The "multiple tiers" of MTSS are a reference to three, increasing levels of academic, social-emotional, and behavioral supports for students in schools (Kilgus et al., 2015; McIntosh & Goodman, 2016; Sugai, & Horner, 2009).

A digital mental health self-monitoring tool would most readily be used within MTSS as the progress monitoring component of a social-emotional intervention (Kilgus et al., 2015; McIntosh & Goodman, 2016). In fact, the use of the DBT diary card within the resilience course stems from a DBT-based tier one, social-emotional intervention for middle and high school students, DBT Skills Training for Emotional Problem Solving for Adolescents (DBT STEPS-A, Mazza et al., 2016). Because the DBT diary card is classically used as a tool for communication between clients and clinicians (Linehan, 1993, 2014, 2018; Linehan & Wilks, 2015; Wilks, 2022), it is a natural fit within the tier one social-emotional assessment component of MTSS, as the data-based decision making process is an indirect form of communication between students and MTSS stakeholders like school psychologists.

The use of a digital self-monitoring tool such as the DBT-based diary card employed in this study, has the potential to improve the ease and efficacy of communication and data-based decision making within MTSS, because data can be collected, gathered, scored, analyzed, and disseminated more efficiently and effectively (Aguilera, 2015; Dennison et al., 2013; Ysseldyke et al., 2006). But because of the scale and complexity of school systems, decisions about the design and implementation of a digital self-monitoring tool require great attention and care. The recommendations from this study can be used by MTSS teams and school-based stakeholders,

like school psychologists, to help them design, select, pilot, and implement a digitally formatted self-monitoring tool within MTSS.

There is still much to learn about the efficacy and social acceptability of digital self-monitoring tools (Karasouli & Adams, 2014; McGee et al., 2021; Pagoto & Bennett, 2013; Sin et al. 2020; Wang et al., 2018) and, in particular, the DBT diary card (Wilks, 2022; Wilks et al., 2021). This study contributes to the literature by deepening our understanding of the factors that stymie and strengthen a digital self-monitoring tool's completion fidelity and social acceptability. Across settings, those seeking to employ a digitally formatted self-monitoring tool could benefit from careful consideration of the design and implementation factors that could improve both social acceptability and completion fidelity of a digital self-monitoring tool like the DBT diary card.

Limitations

This study offers a unique contribution to literature on the design and implementation of digital self-monitoring tools as part of preventive, tier one mental health interventions by focusing on completion fidelity, impact on self-reported internalizing symptoms, and social acceptability. However, there are limitations to generalizability and validity of findings.

Validity Limitations

There are multiple potential threats to validity to address within this study. First, threats to validity based on the sample are addressed, and second, threats to validity related to methods are discussed, along with threats to validity related to the diary card treatment.

Sample-Related. Because the resilience course is optional for all students, there is a self-selection bias for those who enrolled in the course, and it is plausible that the mental health-related nature of the course appeals to the students who choose to enroll in the course. There is a

potential contamination effect that could not be controlled for, because students may be in relation with one another due to factors outside of the course and due to the fact that students from different quiz sections met during the same lecture section and could have been exposed to the other diary card treatment format. Furthermore, the sample retained in this study represented approximately 49 percent (181 out of 371) of all students enrolled in the resilience course in Fall of 2022. Many students were removed from the sample due to the absence threshold, and the removal of these students could have potentially shifted study outcomes. Qualitative interviews were conducted using a self-selected convenience sample, and it is plausible students who chose to participate were motivated to interview in order to communicate either extreme positive or extreme negative perceptions. Additionally, due to convenience sample, only one interviewee had less than perfect diary card fidelity, and all but one interviewee identified as female.

Method-Related. The research methods employed in this study introduce multiple limitations. First, the model is founded on the notion that block random assignment provided sufficient randomization across individuals to control for extraneous variables. However, the clustered nature of the data within lecture formats and quiz sections remains a potentially confounding factor in spite of efforts to control for this using cluster-robust standard errors (Hayes & Cai, 2007).

Second, the variable coding and categorization employed within this study was limited due to small sample sizes. Race or ethnicity and gender identity had to be collapsed into heterogeneous categories that may have obscured variation across populations or, worse, harmfully assumed similarities across populations who hold historically marginalized identities. Future studies could improve the methods and modeling used within this study by employing individual random assignment and increasing the sample size.

Third, it is important to note that this study was essentially an intervention *within* an intervention. That is, the treatment condition was assigned to students who were already receiving the intervention that is the resilience course content, therefore, the study is absent of a true control group. Future research could include a control group that is absent of intervention in order to better understand and compare traditional and digital means of mental health intervention and progress monitoring. Finally, because qualitative coding of short answer items was completed by one researcher, there is a possibility of single coder bias.

Treatment-Related. First, the format and features of the digital diary card were limited based on the constraints of this study, and these features, like graphing and checkboxes, could have potentially improved the user experience. The format of the paper, BAU diary card was predetermined by the researcher and, because the randomized nature of this study necessitated that the digital diary card mirrored the BAU version, checkboxes and the graphing data visualization feature were rendered unusable. During qualitative interviews, students from both the paper and digital treatment conditions reported a desire for checkboxes and one interviewee noted a desire for graphical data visualization because it would potentially be motivating.

Second, this study is limited by the lack of understanding of the extent to which students may or may not have used the PsychSurveys mobile application and its notification feature. The hypotheses of this study, in large part, relied on the notion that students assigned the digital diary card would use it on their phones and, therefore, more readily in-the-moment, which would potentially improve accuracy and consistency of reporting. Outside of qualitative interviews, data on the use of the mobile application was not collected, and future research could focus more specifically on the use of a mobile app-based version of a digital self-monitoring tool. Relatedly, there was also no information collected on the extent to which students used the notification

capabilities within the PsychSurveys mobile application. Because notifications and prompting are known factors to improve compliance with self-monitoring (Harkin et al., 2016), it is possible that the use of notifications could have improved students' completion fidelity.

Finally, and perhaps the most notable threat to validity related to the diary card treatment condition, is the measure of fidelity completion. Students assigned to both the paper and the digital diary cards alluded to inaccuracy in their diary cards due to latency in their recording. Immediacy of recording is a known condition of accurate reporting, and retroactive self-monitoring has been proven less reliable due to the challenge of recall accuracy (Avina, 2008). Additionally, Stone et al. (2002, 2003) determined that self-reported accuracy of paper self-monitoring tends to be untrustworthy, as people tend to report compliance with skill use that does not align with their real time frequency of use. This is further complicated by the fact that diary card completion is tied to a grade within the context of this study, because the resilience class in a graded university course. That is, rather than lose points on their diary card for not completing it, students reported that they simply filled in "guesses" at when they may have used skills on their diary card. These students would still have received full points on their diary card because there is no way to determine the accuracy of reporting. That means, even diary cards that weren't completed accurately would still have counted toward the total number of completed diary cards, so it is feasible that students who completed all eight diary cards may not have completed them to full fidelity as defined by both consistency and accuracy (Avina, 2008; Harkin et al., 2016; Kanfer, 1970; Korotitsch & Nelson-Gray, 1999; Nelson & Hayes, 1981). Ultimately, the measure of diary card fidelity was flawed, and further research needs to be conducted to better understand consistency and accuracy of completion fidelity.

Generalizability Limitations

Due to contextual factors, this study is limited in its generalizability. This study was conducted in the Fall of 2022, in the wake of COVID-19. The COVID-19 pandemic had a profound impact on mental health (Son et al., 2020), and because this study is mental health-related, it is important to note that COVID-19 is a potential confounding factor that could not be controlled for and may impact generalizability across time. Since the study focused on students' experience at a single institution, within a single course that is limited to undergraduate students (primarily first year students) the generalizability to other academic settings may be limited. The DBT diary card is traditionally used in a clinical setting with those who experience symptoms at a higher level of acuity (Linehan, 1993, 2014, 2018), and it is important to name that these results do not directly generalize to clinical applications of the DBT diary card. Lastly, within the scope of this paper, differences across students' experiences based on demographics was not centered, including racial identity, gender identity, socio-economic status, disability status, country of origin, native language, etc., and future research could intentionally focus on the experiences of students who hold nondominant identities in order to design more socially just digital tools.

Conclusion

The goal of this study was to examine the fidelity completion, efficacy, and social acceptability of a digitally formatted DBT diary card used within the context of a tier one mental health intervention at the higher education level. The results of this study revealed lower rates of completion fidelity and social acceptability in the digital diary card group as compared to the paper group likely caused by reported challenges with the usability of the digital diary card. However, in spite of challenges with the digital diary card's design features, interviewed students

still reported a desire for a digital diary card in the future, so long as it is easy to view, use, and submit to the grading team. It is recommended that digital, self-monitoring tools like the DBT diary card used within this study are carefully selected, designed, and implemented in collaboration with stakeholders, with careful consideration of user-friendliness, feedback loops, integration into existing systems, customization, and security.

Digitally formatted self-monitoring tools such as the DBT diary card hold great promise, but there is still much to be done to understand the factors that contribute to or stymie the efficacy and social acceptability of their use. Digital tools should continue to be implemented with great care and consideration, and more research should be done to better understand the design and use of digital self-monitoring tools. This study demonstrates the importance of considering not only format, but also the factors and conditions that make a particular format more or less likely to be done with fidelity, effective in reducing symptoms, and socially acceptable.

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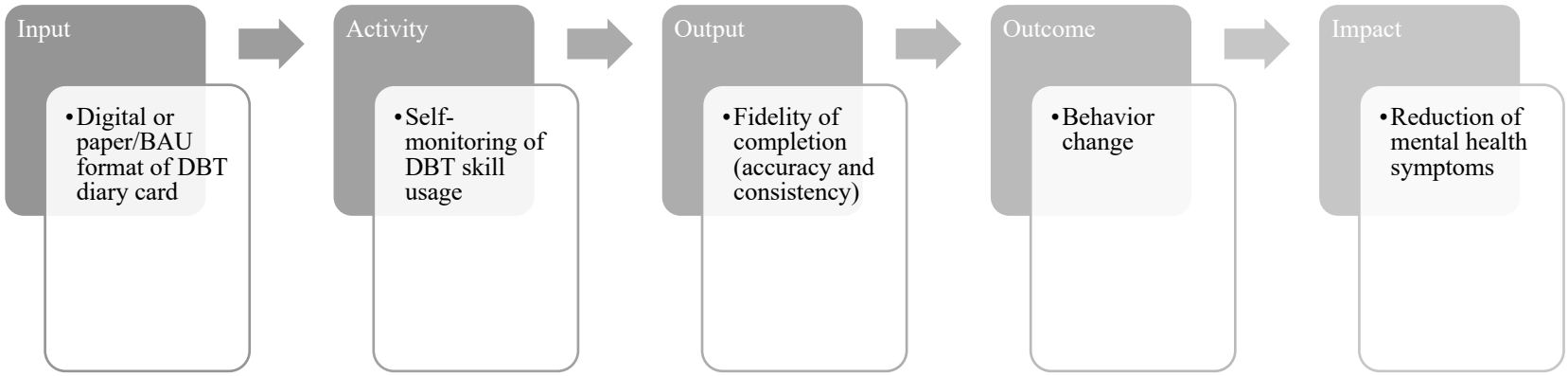
Appendix 1
Theory of Change



Note. Logic model adapted from W. K. Kellogg Foundation, 2004.

Appendix 2
Resilience Course Description

The primary objectives for the resilience course are to provide students with resilience and mental wellness skills that will benefit them through college and beyond. The skills taught in the resilience course align with principles from Dialectical Behavioral Therapy (DBT; Linehan, 2014), Acceptance-Commitment Therapy (ACT; Hayes et al., 2009), and Positive Psychology (Seligman, 2002), and largely mirror the DBT Skills Training for Emotional Problem Solving for Adolescents curriculum (DBT STEPS-A; Mazza et al., 2016). The university's course catalog description states:

> "Students will learn skills to enhance their wellbeing in college and in their life in general. Particular focus will be given to skills that help people withstand common difficulties in life. Skills will include but will not be limited to mindfulness, emotion regulation, distress tolerance, and interpersonal effectiveness skills. Students will also learn about research underlying stress, resilience, and related skill areas." (University of Washington, n.d.)

Course Content

The course consists of ten modules spread out across the ten weeks of the academic quarter. The content is organized in a sequence that builds week-by-week on previous skills taught, culminating in a review of all skills and concepts during the final class session. As is typical in clinical formats of DBT (Linehan, 2014), a weekly self-monitoring chart, called a diary card, is used to assist with practice and generalization of skills. The diary card is assigned as homework each week to assist with accountability of skills practice. An example diary card is pictured in Appendix B. As new skills are taught each week, they are added to the assigned diary card so that students can track their skill practice. The skills accumulate over the ten weeks of the course, so skills taught in earlier weeks remain on the diary card as new skills are added. The course modules and diary card skills are displayed by week in Table 1.

Table 1.
Course Modules and DBT Skills Taught by Week

Week	Module Name	Diary Card Skills[1]
1	Introduction to Class	No new skills taught
2	Mindfulness	No new skills taught
3	Values and Goals	Wise Mind, Observe, Describe, Participate, Non-judgmentally, One-mindfully, and Effectively
4	Willpower & Distress Tolerance	No new skills taught
5	Choosing Attention & Gratitude	TIPP, ACCEPTS, Pros & Cons, WOOP, and I will/want/won't power
6	Identifying Unhelpful Thoughts & Changing them to Helpful Thoughts	Self-sooth plus movement, Turning the Mind, Mindfulness of Current Thought, and Practicing Gratitude
7	Managing Negative Emotions & Cultivating Positive Emotions	Check the Facts and Opposite Action
8	Relationships & Connecting with Others in Meaningful Ways	Self-Talk and the Wave Skill
9	Therapeutic Lifestyle Changes & Sleep	DEAR MAN, GIVE, and FAST
10	Putting it all together & Review of Content	REFRESHER and sleepy hygiene

[1] New skills assigned to the diary card each week are tracked in addition to all previous week's skills.

Course Instructional Team

The teaching team for the resilience course consists of one tenured professor, one university lecturer, and four Teaching Assistants (TAs). The course meets two days per week for ten weeks, and during the eleventh week they meet only for the final exam. On the first day of the week, students meet in a large lecture hall and are provided content through didactic training led by the tenured professor and/or lecturer. On the second day of the week, students meet for a quiz section, which is an opportunity to practice the skills taught in lecture in a smaller setting with more individualized support and coaching from teaching staff. During the academic quarter in which this study was conducted, the lecture portion of the class was offered in either an in-person or online format to improve accessibility.

Students are split into quiz sections taught by the course TAs. The TAs support student with skills practice during the quiz section by circulating while they engaged in activities and role plays, providing group and individualized coaching and support. The teaching team meets weekly to discuss course logistics and content, as well as to conduct triage for students that have been identified as potentially at-risk and needing referrals for higher levels of care including on campus counseling or crisis services.

Appendix 3
Description of Quiz Sections

Table 2.
Description of Quiz Sections, Randomization, and Survey Sample Retention

Quiz Section	In-Person or Online Lecture	Digital (Treatment) or BAU (Control)	Total Students Enrolled in Section ($N = 371$)	Total Students Retained in Study ($N = 181$)
Section 1	In-Person	Digital	45	20
Section 2	In-Person	Digital	44	22
Section 3	In-Person	Digital	29	17
Section 4	In-Person	BAU	42	19
Section 5	In-Person	BAU	44	24
Section 6	In-Person	BAU	44	25
Section 7	In-Person	BAU	27	12
Section 8	Online	Digital	34	16
Section 9	Online	Digital	30	13
Section 10	Online	BAU	32	13

Appendix 4
Survey Sample Demographic Characteristics by Treatment Condition

Table 3.

Survey Sample Demographic Characteristics by Treatment Condition

Characteristic	Digital *n* = 88		Paper *n* = 93	
	N	*%*	*N*	*%*
Academic Year				
First Year	44	50%	39	41.9%
Second Year	22	25%	32	34.4%
Third Year	11	12.5%	10	10.8%
Fourth Year	8	9.1%	5	5.4%
Fifth Year	1	1.1%	0	0%
Transfer	2	2.3%	6	6.5%
Unspecified	0	0%	1	1.2%
Gender Identity				
Female	52	59.1%	61	65.6%
Male	34	38.6%	29	31.2%
Nonbinary	2	2.3%	3	3.2%
Race or Ethnicity				
Asian or Southeast Asian	55	62.5%	55	59.1%
Black or African American	2	2.3%	0	0%
Hispanic, Latinx, or Spanish Origin	2	2.3%	2	2.2%
Middle Eastern or North African	1	1.1%	0	0%
Multiracial	10	11.4%	10	10.8%
White or Caucasian	17	19.3%	26	28%
Unspecified	1	1.1%	0	0%

Note. Selections of more than one race or ethnicity were collapsed into the category, Multiracial. Due to small sample sizes, the following categories were collapsed in quantitative analyses: Fifth Year, Transfer, and Unspecified were collapsed into Other Year; Female and Nonbinary were collapsed into Historically Marginalized Gender Identity (HMGI); Asian or Southeast Asian, Black or African American, Hispanic, Latinx, or Spanish Origin, Middle Eastern or North African, Multiracial, and Unspecified were collapsed into Historically Marginalized Race or Ethnicity (HMRE).

Appendix 5
Sample Paper Diary Card

EDUC 215 Skills Daily Diary Card

Utility and frequency of skills usage: **Name:_____Morgan Anderson_____** **Date started:_9_/_25_/__22_**

E = Effective **S = So so effective**	**N = Not effective** **D = Did not use**

Skills *For each skill you must track how often you used it (write a letter for every day indicating whether or not you practiced a skill and how effective it was using one of the letters above).*	**Daily Skill Use**						
MINDFULNESS	**T**	**W**	**Th**	**F**	**Sa**	**Su**	**M**
1. Wise Mind (balance between emotion mind and reasonable mind)	D	E	S	D	E	S	E
2. Observe (just notice the experience) a component of the "What" skills	N	E	D	N	E	D	E
3. Describe (put words on the experience) a component of the "What" skills	S	S	N	S	S	N	S
4. Participate (throw yourself completely into it) a component of the "What" skills	E	D	D	E	D	D	D
5. Non-judgmentally (see but don't evaluate, just the facts) a component of the "How" skills	D	N	N	D	N	N	N
6. One-mindfully (be completely present) a component of the "How" skills	D	S	S	D	S	S	S
7. Effectively (focus on what works) a component of the "How" skills	N	E	E	N	E	E	E

Questions or Comments to share with TA/Instructor:

Appendix 6
Sample Digital Diary Card

PsychSurveys.com

Weekly Diary Card

Patient: MA 9/13/2022 to 9/19/2022

Day	Description
Tuesday	
Wednesday	
Thursday	
Friday	
Saturday	
Sunday	
Monday	

Day	Wise Mind (balance between emotion mind and reasonable mind)
Tuesday	E
Wednesday	D
Thursday	E
Friday	D
Saturday	N
Sunday	S
Monday	E

Day	Observe (just notice the experience) a component of the "What" skills
Tuesday	D
Wednesday	N
Thursday	N
Friday	S
Saturday	S
Sunday	D
Monday	E

Day	Describe (put words on the experience) a component of the "What" skills
Tuesday	S
Wednesday	D
Thursday	E
Friday	N
Saturday	N
Sunday	D
Monday	D

Day	Participate (throw yourself completely into it) a component of the "What" skills
Tuesday	N
Wednesday	E

Day	Description
Thursday	D
Friday	E
Saturday	D
Sunday	N
Monday	N

Day	Non-judgmentally (see but don't evaluate, just the facts) a component of the "How" skills
Tuesday	N
Wednesday	S
Thursday	S
Friday	E
Saturday	E
Sunday	S
Monday	S

Day	One-mindfully (be completely present) a component of the "How" skills
Tuesday	D
Wednesday	N
Thursday	N
Friday	S
Saturday	E
Sunday	E
Monday	D

Day	Effectively (focus on what works) a component of the "How" skills
Tuesday	E
Wednesday	E
Thursday	D
Friday	D
Saturday	D
Sunday	E
Monday	E

Appendix 7
Demographic Items Included in Full Survey

Table 4.
Demographic Items Included in Full Survey

Construct	Question	Response Options
Academic Year	What is your year of study at the University of Washington? (mark one)	Freshman Sophomore Junior Senior
Race or ethnicity	What racial or ethnic group(s) do you most identify with? (Select all that apply. One or more.)	American Indian or Alaskan Native Asian or Southeast Asian Black or African American Hispanic, Latino/a, or Spanish Origin Middle Eastern or North African Native Hawaiian or Other Pacific Islander White or Caucasian
Gender Identity	With which gender do you most identify? (mark one)	Male Female Nonbinary
Age	What is your age?	Typed, short-answer response.
Living Situation	Which of the following best describe your status? (mark one)	I commute from outside the Seattle city limits. I live off-campus in the city of Seattle. I live on-campus.
Education Funding Source	How are you funding your education at University of Washington? (mark all that apply)	Scholarship Government Funding Personal/Family Fund On-campus employment Student Loans
Language	Is English your native language? (mark one)	Yes No
Language	If English is not your native language, for how long have you learned English?	Typed, short-answer response.
Language	What is your TOEFL or IELTS scores? If you do not remember your exact score please provide an approximate score.	Typed, short-answer response.
Residential Status	Which of the following best describe your status? (mark one)	In-state student (WA) Out-of-state student (within the United States) International student with F-1 visa
Residential Status	If you are an international student with F-1 visa, which country are you from?	Typed, short-answer response.
Residential Status	How long have you been in the United States?	Typed, short-answer response.
Residential Status	How many quarters have you lived in a university residence at UW?	Typed, short-answer response.
U.S. College Experience	Is attending University of Washington your first United States college experience? (mark one)	Yes No

Appendix 8
Pre- and Post-Intervention Survey Measures Used in Quantitative Modeling

Table 5.
Pre- and Post-Intervention Survey Measures Used in Quantitative Modeling

Measure	Items	Sample Items
Brief Symptom Inventory-18: Depression Subscale	Six, 5-point Likert-scale ($\alpha = 0.84$)	Feeling no interest in things. Feelings of worthlessness. Feeling hopeless about the future.
Brief Symptom Inventory-18: Anxiety Subscale	Six, 5-point Likert-scale ($\alpha = 0.79$)	Nervousness or shakiness inside. Feeling so restless you couldn't sit still. Feeling fearful.
The Revised Life Problems Inventory: Emotion Dysregulation Subscale	Fifteen, 5-point Likert-scale ($\alpha = 0.90$)	I can't seem to shake off feelings of sadness. I find that my mood often changes quickly. I often feel guilty or ashamed.
Acceptability of Intervention Measure	Four, 5-point Likert-scale ($\alpha = 0.85$)	The diary card format I used meets my approval. The diary card format I used is appealing to me. I like the diary card format I used.

Appendix 9
Individual Interview Protocol

Introduction:

1. Introduce self and ask participant to do the same
2. Ask the participant to complete the interview consent form if not already obtained.
3. Describe the project:
    a. Describe the purpose of the interview: to understand students' individual and unique experiences learning and practicing skills with an emphasis on the utility and acceptability of the diary card.
    b. Review the voluntary nature of participation.
    c. Review data storage and security practices.
        i. The meeting will be recorded for the purpose of data analysis
        ii. Recorded documentation will be stored on the HIPAA compliant Zoom cloud as well as in a confidential file on Google Drive.
        iii. Audio and video recordings, as well as transcripts, will not be shared beyond the research team (which includes the interviewer and resilience class research team).
    d. Name that there are no anticipated harms of participation.
    e. Describe hoped benefits of participation: to further inform the format and delivery of the wellness and resilience class in a way that maximizes benefit to students
4. Obtain verbal consent of participant.
5. Begin recording on Zoom cloud.

Semi-Structured Interview Questions:

1. First let's talk about the class overall…
    a. Why did you enroll in the resilience class?
    b. If online: How was it being in the online version of the lecture?
    c. What do you feel you gained from the course?
    d. What do you wish you got more of? Less of?
2. Now let's talk about the diary card…
    a. Tell me about your experience with your weekly diary card.
    b. When did you typically log your skill use?
    c. If digital: Did you use the mobile app? If so, how was it for you?
    d. In what ways was the diary card helpful and/or unhelpful to your skills practice?
3. Design-related questions:
    a. What would've made the diary card format that you used more user-friendly?
    b. What would you recommend for someone designing a diary card to be used in the future?

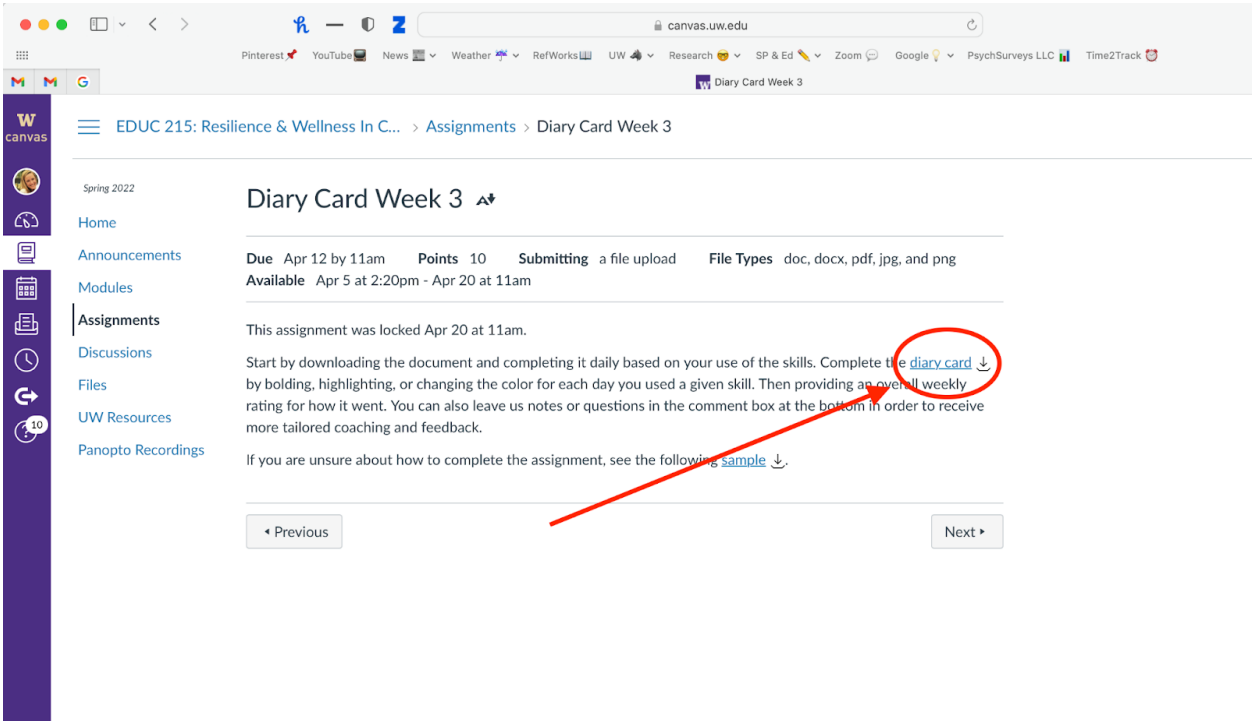
Conclusion:

1. Thank the participant for their time and insights.
2. Describe sharing of results.
3. Get email for gift card to be sent to.
4. Answer any questions.
5. Stop the recording and save to confidential location on Google Drive.

Appendix 10
Instructions for Paper Diary Card

Download the Diary Card

1. Navigate to the Canvas website and log in.
2. Choose the diary card assignment for the appropriate week.
3. Download the diary card linked in the Canvas assignment:



Complete the Diary Card

1. Open the diary card document you have downloaded.
2. Type in your name and the starting diary card date at the top.
3. Complete ratings for each day by typing in the letter that corresponds with how effective the skill was or "D" if you did not use the skill (E = Effective; S = So so effective; N = Not effective; D = Did not use).
4. Double check that you have a rating in every box (every day, every skill) and SAVE the document:

EDUC 215 Skills Daily Diary Card

Utility and frequency of skills usage: **Name: Morgan Anderson** **Date started: 9/25/22**

E = Effective	**N = Not effective**
S = So so effective	**D = Did not use**

Skills *For each skill you must track how often you used it (write a letter for every day indicating whether or not you practiced a skill and how effective it was using one of the letters above).*	**Daily Skill Use**						
MINDFULNESS	**T**	**W**	**Th**	**F**	**Sa**	**Su**	**M**
1. Wise Mind (balance between emotion mind and reasonable mind)	D	E	S	D	E	S	E
2. Observe (just notice the experience) a component of the "What" skills	N	E	D	N	E	D	E
3. Describe (put words on the experience) a component of the "What" skills	S	S	N	S	S	N	S
4. Participate (throw yourself completely into it) a component of the "What" skills	E	D	D	E	D	D	D
5. Non-judgmentally (see but don't evaluate, just the facts) a component of the "How" skills	D	N	N	D	N	N	N
6. One-mindfully (be completely present) a component of the "How" skills	D	S	S	D	S	S	S
7. Effectively (focus on what works) a component of the "How" skills	N	E	E	N	E	E	E

Questions or Comments to share with TA/Instructor:

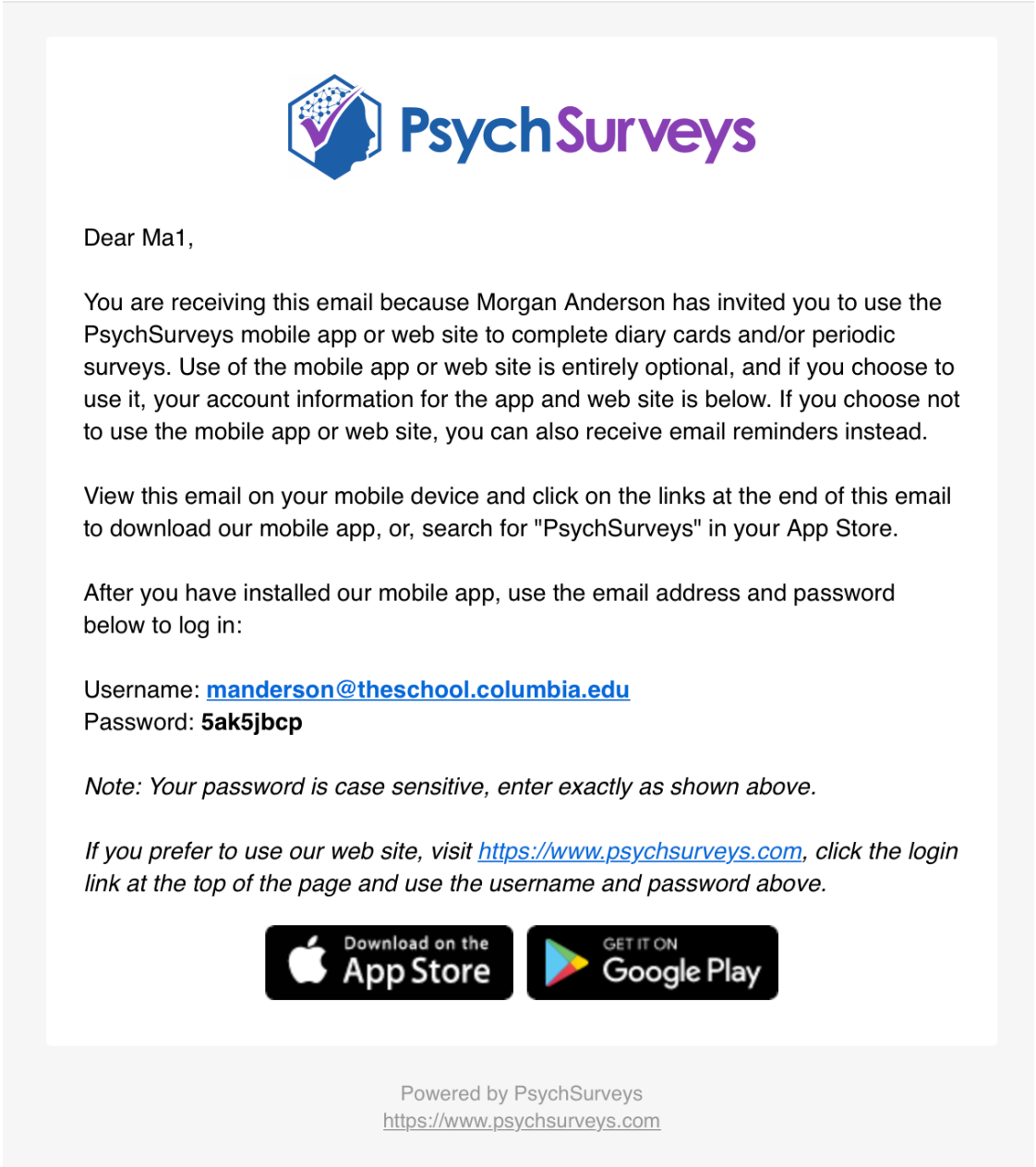
Submit the Diary Card on Canvas

1. Navigate to the Canvas website and log in.
2. Choose the diary card assignment for the appropriate week.
3. Upload the file to the assignment and click "Submit."

Appendix 11
Instructions for Digital Card

Setting Up Your Account

1. You will receive an email from PsychSurveys inviting you to create an account using your UW email address. The email will contain your username (your UW email) and a password you will use to set-up your account. Here is an example of what it will look like:



PsychSurveys

Dear Ma1,

You are receiving this email because Morgan Anderson has invited you to use the PsychSurveys mobile app or web site to complete diary cards and/or periodic surveys. Use of the mobile app or web site is entirely optional, and if you choose to use it, your account information for the app and web site is below. If you choose not to use the mobile app or web site, you can also receive email reminders instead.

View this email on your mobile device and click on the links at the end of this email to download our mobile app, or, search for "PsychSurveys" in your App Store.

After you have installed our mobile app, use the email address and password below to log in:

Username: manderson@theschool.columbia.edu
Password: **5ak5jbcp**

Note: Your password is case sensitive, enter exactly as shown above.

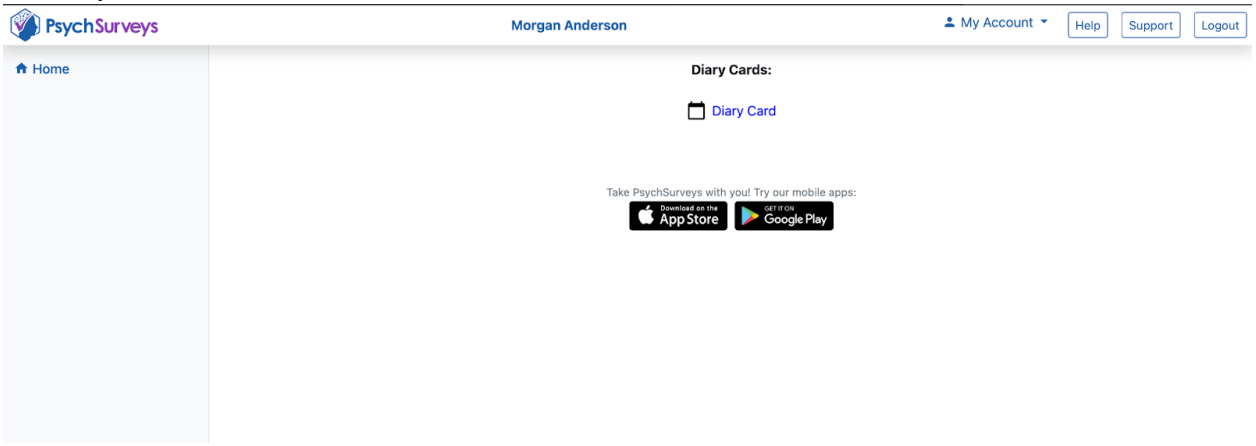
If you prefer to use our web site, visit https://www.psychsurveys.com, click the login link at the top of the page and use the username and password above.

Download on the App Store | GET IT ON Google Play

Powered by PsychSurveys
https://www.psychsurveys.com

2. Download the PsychSurveys mobile app on the Apple App Store or Google Play store and/or go to https://www.psychsurveys.com/Login.aspx to log in.
3. When you open the application or navigate to the website, you'll be prompted to enter your username (UW email) and the password that was sent to you via email.

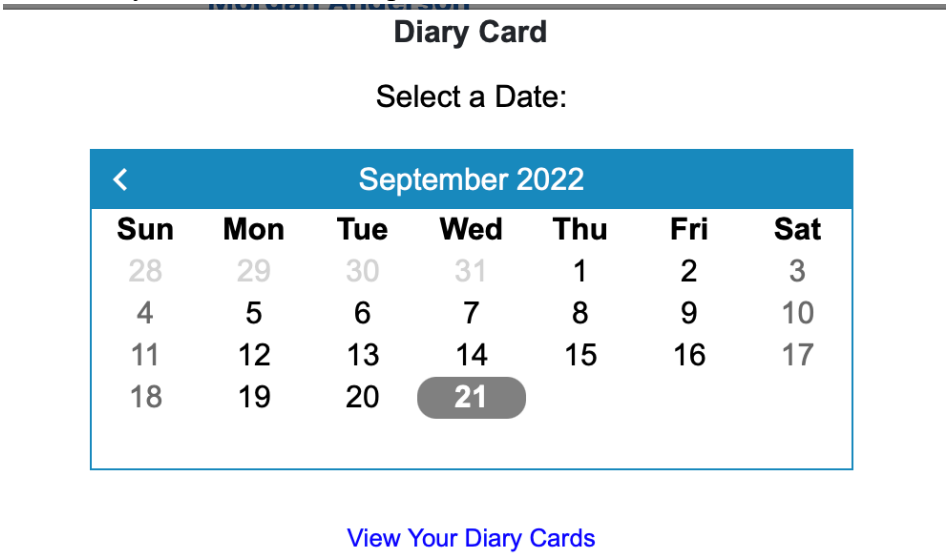
4. You will be prompted to accept the PsychSurveys Terms and Conditions. Click "I agree."
5. You will see the "Diary Card" button on your screen once you are logged in. Here is what your screen will look like:



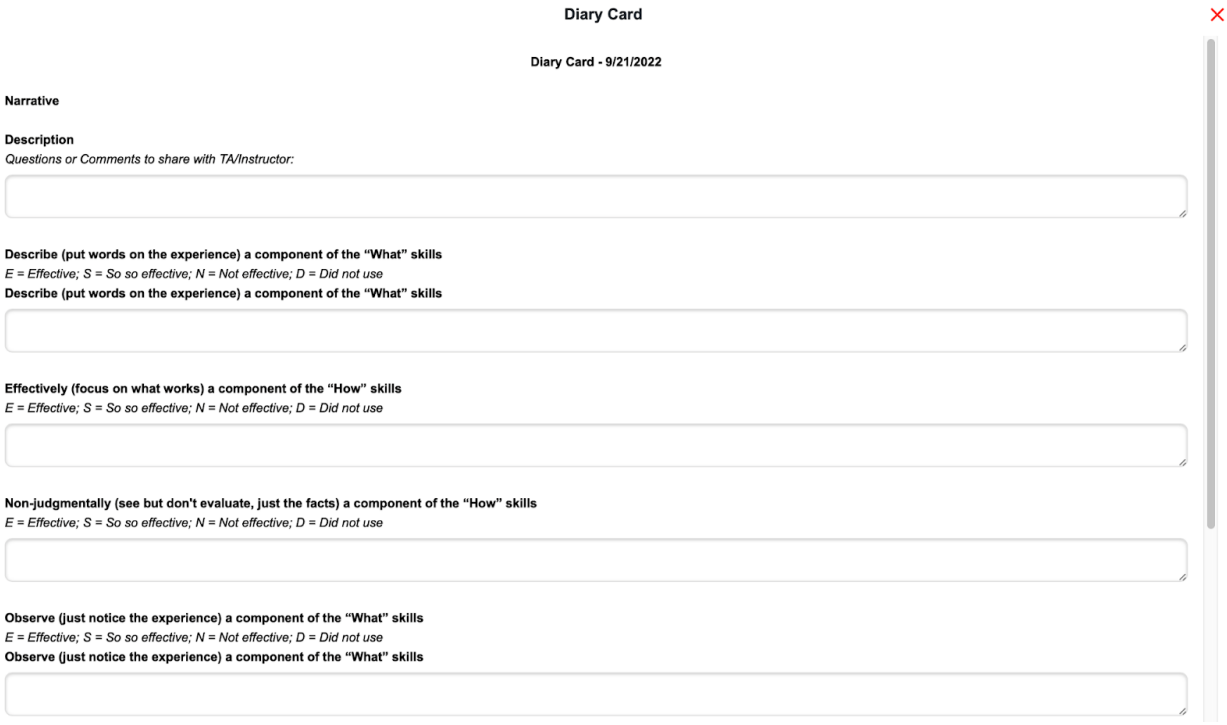
6. You are all set! If you would like, you can change your password by clicking "My Account" and then "Change Password."

Using the Diary Card

1. Your weekly diary card can be accessed and completed either on the PsychSurveys website or via the app on your phone. Open the PsychSurveys mobile app or navigate to https://www.psychsurveys.com/Login.aspx
2. Click on "Diary Card." This will open to a screen that looks like this:



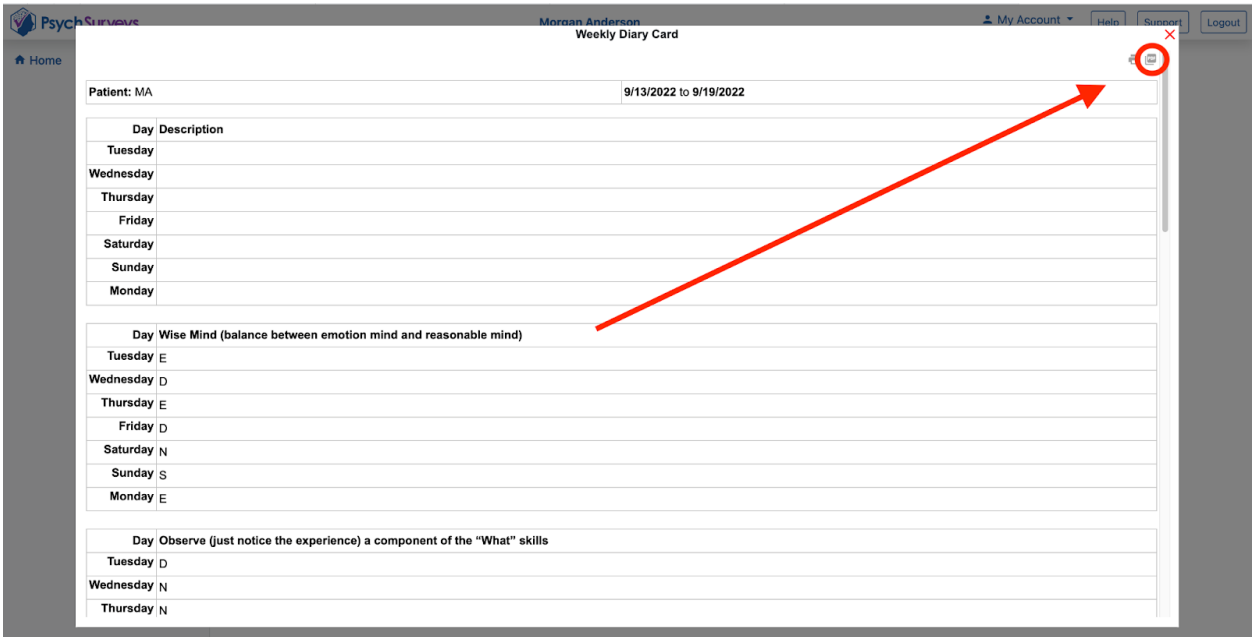
3. Select the date of the diary card you'd like to complete. Please note that it is ideal to complete your diary card daily, however, the PsychSurveys platform also allows the user to go back and retroactively complete diary cards in case you miss a day.
4. Your diary card will open and it will look something like this (keep in mind that new skills will be added as you learn new skills each week):



5. For each skill, type a letter using the rating scale.
6. When you are done with all ratings, scroll to the bottom and click Finish → .

Submitting the Diary Card on Canvas

1. Navigate to the PsychSurveys website.
2. Log in using your email.
3. Click the button that says "Weekly Diary Card."
4. Click the button that says "View Your Diary Cards."
5. Select the days you wish to view.
6. Click the button that says "View Weekly Diary Card."
7. Click the small button in the upper right-hand corner that says "PDF" to download a PDF file of your diary card (see below).



8. Navigate to the Canvas website and log in.
9. Choose the diary card assignment for the appropriate week.
10. Upload the PDF file to the assignment and click "Submit."

Appendix 12
Interview Sample Demographic and Treatment Characteristics

Table 6.

Interview Sample Demographic and Treatment Characteristics

Characteristic	Interview Participant						
	1	2	3	4	5	6	7
Diary Card Format	Digital	Digital	Paper	Paper	Paper	Digital	Digital
Lecture Format	Online	Online	In-Person	In-Person	Online	In-Person	Online
Academic Year	First Year	First Year	First Year	Fourth Year	First Year	First Year	Fifth Year
Gender Identity	Female	Female	Female	Female	Female	Nonbinary	Female
Race or Ethnicity	Asian or Southeast Asian	Asian or Southeast Asian	Multiracial	Asian or Southeast Asian	Asian or Southeast Asian	Multiracial	Middle Eastern or North African
Fidelity of Completion	8	8	8	8	8	8	5
Social Accessibility Score	4	2	2.75	4	4.75	1.25	3.25

Note. Fidelity of Completion is number of diary cards completed given eight total opportunities. Social Accessibility Score is AIM average score, where higher scores indicate higher levels of acceptability. Selections of more than one race or ethnicity were collapsed into the category, Multiracial.

Appendix 13
Specification Check Tables

Table 7.
Coefficients for Models Predicting Diary Card Completion Fidelity (Research Question 1)

Predictor	(1)	(2)	(3)	(4)	(5)	(6)
Diary Card Completion Fidelity	0.14	0.04	0.04	0.15	0.06	0.06 *
Lecture Format	-0.05	-0.04	-0.04	-0.04	-0.03	-0.03
With Disaggregated Race or Ethnicity & Gender Ientity						
White	-0.10			-0.10		
Latinx	-0.18			-0.18		
Black or African American	-0.23			-0.20		
Middle Eastern or North African	0.77 **			0.74 **		
Multiracial	-0.14			-0.14		
Male	0.02			0.02		
Non-Binary	-0.03			-0.04		
With Collapsed Race or Ethnicity & Gender Identity						
Historically Marginalized Race or Ethnicity (HMRE)		-0.01	-0.01		-0.01	-0.01
Historically Marginalized Gender Identity (HMGI)		<0.01	<0.01		<0.01	<0.01
With Age						
Age *z*-score	0.01	0.03	0.03			
With Academic Year						
Second Year				-0.04	-0.05	-0.05
Third Year				0.02	-0.01	-0.01
Fourth Year				-0.02	-0.04	-0.04
Other Year				0.05	0.12	0.12
Diary Card Format	0.10 *	0.10 *	0.10 *	0.09 *	0.11 *	0.11 *
With Clustered Standard Errors	no	no	yes	no	no	yes

Note. Diary Card Fidelity dummy coded with 1=imperfect fidelity, 0=perfect fidelity; Lecture Format dummy coded with 1=online, 0=in-person; Race or Ethnicity and Gender Identity effect coded (Asian or Southeast Asian and Female, repectively, served as reference groups); HMRE = Historically Marginalized Race or Ethnicity, effect coded with 1=HMRE, -1=non-HMRE; HMGI = Historically Marginalized Gender Identity, effect coded with 1=HMGI, -1=non-HMGI; Age centered as *z*-score; Academic Year effect coded (First Year served as reference group); Diary Card Format dummy coded with 1=digital, 0=paper/BAU.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8.
Coefficients for Models Predicting Anxiety Symptoms (Research Question 2)

Predictor	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Post-Survey Anxiety	-2.15	-0.73	-0.73	-0.99	-0.56	-0.56	5.71 ***	6.14 ***	6.14 ***	-1.24	-0.26	-0.26	-0.13	-0.31	-0.31	6.57 ***	6.40 ***	6.40 ***
Lecture Format	0.77	0.55	0.55	0.96	0.84	0.84	0.96	0.84	0.84	0.78	0.54	0.54	1.31	1.22	1.22	1.31	1.22	1.22
With Disaggregated Race or Ethnicity & Gender Ientity																		
White	-0.42			-1.07			-1.07			-0.69			-1.35			-1.35		
Latinx	-3.18			-0.78			-0.78			-2.99			-1.46			-1.46		
Black or African American	1.73			1.45			1.45			1.45			1.75			1.75		
Middle Eastern or North African	-1.86			-1.20			-1.20			-1.04			0.42			0.42		
Multiracial	1.85			0.89			0.89			1.66			0.43			0.43		
Male	1.35			0.74			0.74			1.32			0.65			0.65		
Non-Binary	-1.55			-1.27			-1.27			-1.45			-0.98			-0.98		
With Collapsed Race or Ethnicity & Gender Identity																		
Historically Marginalized Race or Ethnicity (HMRE)		1.06 *	1.06 *		0.86 *	0.86 *		0.86 *	0.86 *		1.10 *	1.10 *		0.79	0.79		0.79	0.79
Historically Marginalized Gender Identity (HMGI)		-0.64	-0.64		-0.15	-0.15		-0.15	-0.15		-0.63	-0.63		-0.18	-0.18		-0.18	-0.18
With Age																		
Age *z* -score	0.66	0.44	0.44	0.32	0.21	0.21	0.32	0.21	0.21									
With Baseline Anxiety																		
Pre-Survey Anxiety				-2.61 ***	-2.67 ***	-2.67 ***	3.12 ***	3.06 ***	3.06 ***				-2.76 ***	-2.80 ***	-2.80 ***	2.97 ***	2.93 ***	2.93 ***
With Academic Year																		
Second Year										-0.66	-0.40	-0.40	-0.86	-0.72	-0.72	-0.86	-0.72	-0.72
Third Year										-0.79	-1.00	-1.00	-0.36	-0.48	-0.48	-0.36	-0.48	-0.48
Fourth Year										1.97	1.88	1.88	2.50 *	2.45 *	2.45 *	2.50 *	2.45 *	2.45 *
Other Year										0.51	0.39	0.39	-1.26	-1.30	-1.30	-1.26	-1.30	-1.30
Diary Card Fidelity	-2.09	-1.89	-1.89	-4.28	-4.19	-4.19 ***	-4.28	-4.19	-4.19 ***	-1.93	-1.76	-1.76	-4.50	-4.42	-4.42 ***	-4.50	-4.42	-4.42 ***
Diary Card Format	-0.60	-0.58	-0.58	-1.15	-1.11	-1.11	-1.15	-1.11	-1.11	-0.66	-0.61	-0.61	-1.51	-1.45	-1.45 *	-1.51	-1.45	-1.45 *
Diary Card Fidelity x Format Interaction	2.55	2.24	2.24	5.13	4.93	4.93	5.13	4.93	4.93	2.46	2.24	2.24	5.46	5.45	5.45 *	5.46	5.45	5.45 *
Post or Change Score Used	Change	Change	Change	Change	Change	Change	Post	Post	Post	Change	Change	Change	Change	Change	Change	Post	Post	Post
With Clustered Standard Errors	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes

Note. Pre- and Post-Survey Anxiety = total score of six Likert-scale survey items, Pre-Survey centered as z-score; Lecture Format dummy coded with 1=online, 0=in-person; Race or Ethnicity and Gender Identity effect coded (Asian or Southeast Asian and Female, repectively, served as reference groups); HMRE = Historically Marginalized Race or Ethnicity, effect coded with 1=HMRE, -1=non-HMRE; HMGI = Historically Marginalized Gender Identity, effect coded with 1=HMGI, -1=non-HMGI; Age centered as z-score; Academic Year effect coded (First Year served as reference group); Diary Card Fidelity dummy coded with 1=imperfect fidelity, 0=perfect fidelity; Diary Card Format dummy coded with 1=digital, 0=paper/BAU.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9.
Coefficients for Models Predicting Depression Symptoms (Research Question 3)

Predictor	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Post-Survey Depression	-4.00 **	-0.47	-0.47	-2.79 *	-0.33	-0.33	3.36 *	5.82 ***	5.82 ***	-2.92 *	0.02	0.02	-1.62	0.13	0.13	4.53 **	6.27 ***	6.27 ***
Lecture Format	1.30	0.82	0.82	1.17	0.77	0.77	1.17	0.77	0.77	1.37	0.88	0.88	1.39	1.03	1.03	1.39	1.03	1.03
With Disaggregated Race or Ethnicity & Gender Ientity																		
White	1.89			1.08			1.08			1.52			0.67			0.67		
Latinx	-5.22 *			-3.82			-3.82			-4.60			-3.78			-3.78		
Black or African American	0.09			0.48			0.48			-0.12			0.62			0.62		
Middle Eastern or North African	-4.91			-4.29			-4.29			-4.11			-2.92			-2.92		
Multiracial	4.40 **			3.71 **			3.71 **			3.93 **			3.08 *			3.08 *		
Male	1.01			0.64			0.64			1.07			0.67			0.67		
Non-Binary	-1.50			-0.95			-0.95			-1.56			-0.88			-0.88		
With Collapsed Race or Ethnicity & Gender Identity																		
Historically Marginalized Race or Ethnicity (HMRE)		0.81	0.81		0.82 *	0.82		0.82 *	0.82		0.84	0.84		0.79	0.79		0.79	0.79
Historically Marginalized Gender Identity (HMGI)		-0.35	-0.35		-0.22	-0.22		-0.22	-0.22		-0.35	-0.35		-0.25	-0.25		-0.25	-0.25
With Age																		
Age *z* -score	1.07 **	0.62	0.62	0.92 *	0.55	0.55	0.92 *	0.55	0.55									
With Baseline Depression																		
Pre-Survey Depression				-1.72 ***	-1.97 ***	-1.97 ***	3.58 ***	3.33 ***	3.33 ***				-1.81 ***	-2.03 ***	-2.03 ***	3.48 ***	3.27 ***	3.27 ***
With Academic Year																		
Second Year										-1.11	-0.73	-0.73	-1.31	-1.03	-1.03	-1.31	-1.03	-1.03
Third Year										-0.59	-0.85	-0.85	-0.14	-0.29	-0.29	-0.14	-0.29	-0.29
Fourth Year										1.19	1.06	1.06	1.54	1.41	1.41	1.54	1.41	1.41
Other Year										1.63	1.24	1.24	0.63	0.29	0.29	0.63	0.29	0.29
Diary Card Fidelity	0.49	0.96	0.96	-0.97	-0.78	-0.78	-0.97	-0.78	-0.78	0.67	1.03	1.03	-0.95	-0.83	-0.83	-0.95	-0.83	-0.83
Diary Card Format	0.23	0.21	0.21	-0.14	-0.18	-0.18	-0.14	-0.18	-0.18	0.18	0.19	0.19	-0.35	-0.37	-0.37	-0.35	-0.37	-0.37
Diary Card Fidelity x Format Interaction	-1.10	-1.98	-1.98	0.96	0.43	0.43	0.96	0.43	0.43	-1.32	-2.03	-2.03	0.92	0.58	0.58	0.92	0.58	0.58
Post or Change Score Used	Change	Change	Change	Change	Change	Change	Post	Post	Post	Change	Change	Change	Change	Change	Change	Post	Post	Post
With Clustered Standard Errors	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes

Note. Pre- and Post-survey Depression = total score of six Likert-scale survey items, Pre-Survey centered as z-score; Lecture Format dummy coded with 1=online, 0=in-person; Race or Ethnicity and Gender Identity effect coded (Asian or Southeast Asian and Female, repectively, served as reference groups); HMRE = Historically Marginalized Race or Ethnicity, effect coded with 1=HMRE, -1=non-HMRE; HMGI = Historically Marginalized Gender Identity, effect coded with 1=HMGI, -1=non-HMGI; Age centered as z-score; Academic Year effect coded (First Year served as reference group); Diary Card Fidelity dummy coded with 1=imperfect fidelity, 0=perfect fidelity; Diary Card Format dummy coded with 1=digital, 0=paper/BAU.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 10.
Coefficients for Models Predicting Emotion Regulation Symptoms (Research Question 4)

Predictor	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Post-Survey Emotion Regulation	-8.69 **	-1.65	-1.65	-5.41	-1.77	-1.77	25.38 ***	29.02 ***	29.02 ***	-6.55 *	-0.44	-0.44	-2.65	-0.32	-0.32	28.14 ***	30.46 ***	30.46 ***
Lecture Format	2.36	1.57	1.57	2.61	2.17	2.17	2.61	2.17	2.17	2.75	1.93	1.93	3.40	2.97	2.97	3.40	2.97	2.97
With Disaggregated Race or Ethnicity & Gender Ientity																		
White	2.66			0.64			0.64			2.09			-0.12			-0.12		
Latinx	-6.57			-6.13			-6.13			-5.91			-6.97			-6.97		
Black or African American	2.09			0.51			0.51			2.86			1.90			1.90		
Middle Eastern or North African	-8.54			-1.07			-1.07			-8.22			1.21			1.21		
Multiracial	5.03			3.27			3.27			4.42			2.23			2.23		
Male	3.96 *			2.29			2.29			4.01 *			2.20			2.20		
Non-Binary	-6.61 *			-4.22			-4.22			-6.69 *			-3.89			-3.89		
With Collapsed Race or Ethnicity & Gender Identity																		
Historically Marginalized Race or Ethnicity (HMRE)		1.07	1.07		0.95	0.95		0.95	0.95		1.10	1.10		0.87	0.87		0.87	0.87
Historically Marginalized Gender Identity (HMGI)		-0.95	-0.95		-0.30	-0.30		-0.30	-0.30		-0.93	-0.93		-0.32	-0.32		-0.32	-0.32
With Age																		
Age *z* -score	1.73 *	1.07	1.07	1.59 *	1.19	1.19	1.59 *	1.19	1.19									
With Baseline Emotion Regulation																		
Pre-Survey Emotion Regulation				-4.62 ***	-4.91 ***	-4.91 ***	9.03 ***	8.73 ***	8.73 ***				-4.91 ***	-5.14 ***	-5.14 ***	8.74 ***	8.51 ***	8.51 ***
With Academic Year																		
Second Year										-3.23	-2.43	-2.43	-4.02 **	-3.56 *	-3.56 *	-4.02 **	-3.56 *	-3.56 *
Third Year										-2.08	-2.43	-2.43	-1.33	-1.82	-1.82	-1.33	-1.82	-1.82
Fourth Year										3.94	4.14	4.14	5.61 *	5.48 *	5.48	5.61 *	5.48 *	5.48
Other Year										3.22	2.02	2.02	1.08	0.94	0.94	1.08	0.94	0.94
Diary Card Fidelity	-1.39	-0.74	-0.74	-4.10	-3.70	-3.70	-4.10	-3.70	-3.70	-1.15	-0.65	-0.65	-4.15	-3.82	-3.82	-4.15	-3.82	-3.82
Diary Card Format	0.98	1.03	1.03	0.56	0.57	0.57	0.56	0.57	0.57	0.70	0.78	0.78	-0.12	-0.01	-0.01	-0.12	-0.01	-0.01
Diary Card Fidelity x Format Interaction	0.98	-0.14	-0.14	4.84	4.67	4.67	4.84	4.67	4.67	0.57	-0.30	-0.30	4.77	4.85	4.85	4.77	4.85	4.85
Post or Change Score Used	Change	Change	Change	Change	Change	Change	Post	Post	Post	Change	Change	Change	Change	Change	Change	Post	Post	Post
With Clustered Standard Errors	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes

Note. Pre- and Post-Survey Emotion Regulation = total score of fifteen Likert-scale survey items, Pre-Survey centered as z-score; Lecture Format dummy coded with 1=online, 0=in-person; Race or Ethnicity and Gender Identity effect coded (Asian or Southeast Asian and Female, repectively, served as reference groups); HMRE = Historically Marginalized Race or Ethnicity, effect coded with 1=HMRE, -1=non-HMRE; HMGI = Historically Marginalized Gender Identity, effect coded with 1=HMGI, -1=non-HMGI; Age centered as z-score; Academic Year effect coded (First Year served as reference group); Diary Card Fidelity dummy coded with 1=imperfect fidelity, 0=perfect fidelity; Diary Card Format dummy coded with 1=digital, 0=paper/BAU.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 11.
Coefficients for Models Predicting Social Acceptability (Research Question 5)

Predictor	(1)	(2)	(3)	(4)	(5)	(6)
Social Acceptability	3.52 ***	3.90 ***	3.90 ***	3.54 ***	3.85 ***	3.85 ***
Lecture Format	0.11	0.09	0.09	0.15	0.17	0.17
With Disaggregated Race or Ethnicity & Gender Ientity						
White	-0.03			-0.08		
Latinx	1.50 **			1.40 **		
Black or African American	-0.80			-0.86		
Middle Eastern or North African	-0.67			-0.31		
Multiracial	-0.05			-0.14		
Male	0.33			0.33		
Non-Binary	-0.75 *			-0.69 *		
With Collapsed Race or Ethnicity & Gender Identity						
Historically Marginalized Race or Ethnicity (HMRE)		0.04	0.04		0.02	0.02
Historically Marginalized Gender Identity (HMGI)		0.01	0.01		-0.01	-0.01
With Age						
Age *z* -score	-0.01	0.01	0.01			
With Academic Year						
Second Year				0.10	0.05	0.05
Third Year				0.00	0.09	0.09
Fourth Year				0.16	0.29	0.29
Other Year				-0.42	-0.57 *	-0.57
Diary Card Fidelity	0.28	0.27	0.27	0.23	0.21	0.21
Diary Card Format	-0.28	-0.29	-0.29	-0.33 *	-0.37 *	-0.37 *
Diary Card Fidelity x Format Interaction	-0.08	-0.12	-0.12	0.03	0.06	0.06
With Clustered Standard Errors	no	no	yes	no	no	yes

Note. Social Acceptability = mean score of four Likert-scale survey items; Lecture Format dummy coded with 1=online, 0=in-person; Race or Ethnicity and Gender Identity effect coded (Asian or Southeast Asian and Female, repectively, served as reference groups); HMRE = Historically Marginalized Race or Ethnicity, effect coded with 1=HMRE, -1=non-HMRE; HMGI = Historically Marginalized Gender Identity, effect coded with 1=HMGI, -1=non-HMGI; Age centered as z-score; Academic Year effect coded (First Year served as reference group); Diary Card Fidelity dummy coded with 1=imperfect fidelity, 0=perfect fidelity; Diary Card Format dummy coded with 1=digital, 0=paper/BAU.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix 14
Descriptive Statistics for Continuous Variables

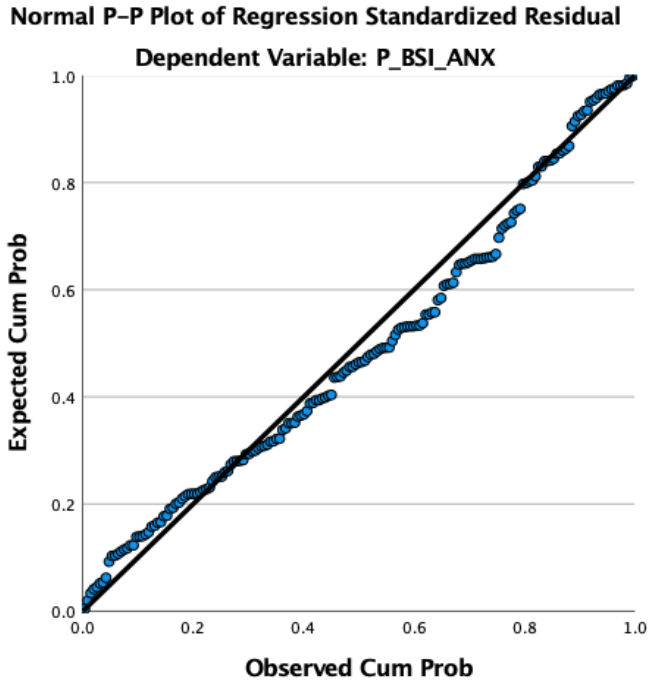
Table 12.

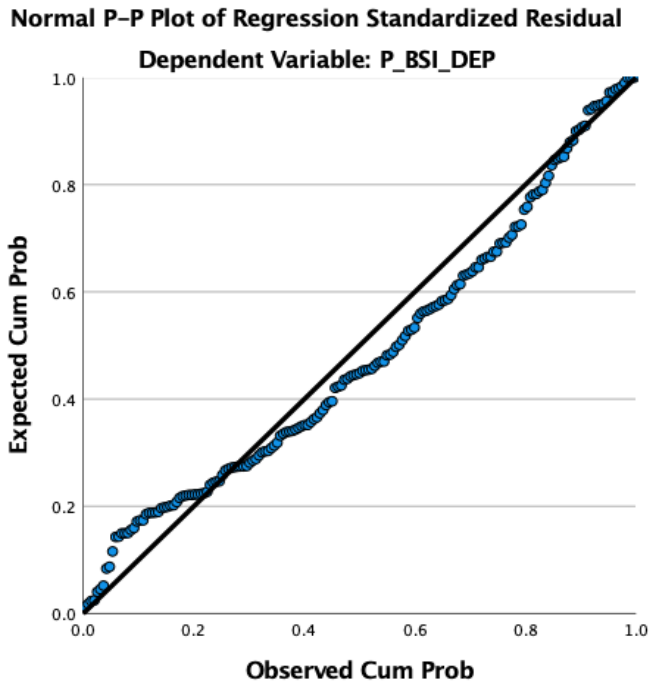
Descriptive Statistics for Continuous Variables

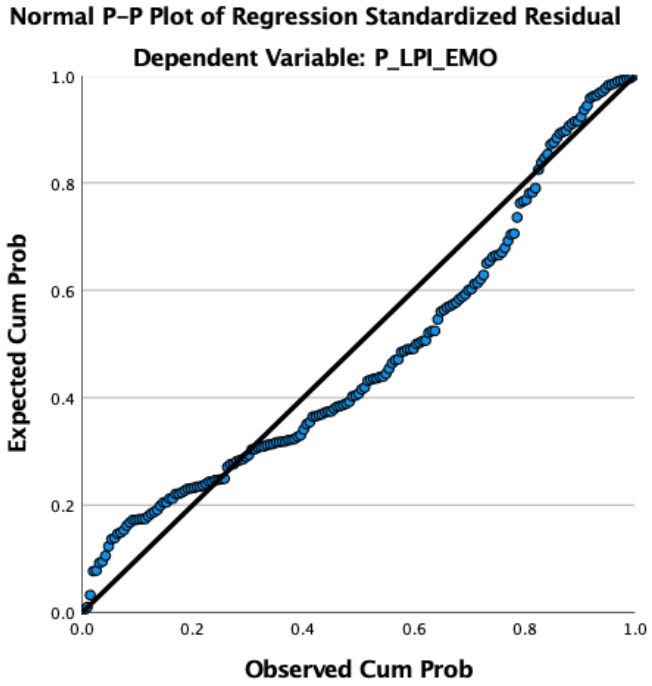
	Min	Max	*M*	*SD*	Skewness	Kurtosis
BSI Anxiety Post-Survey Score	0	21	6.2	5.5	0.7	-0.5
BSI Depression Post-Survey Score	0	23	6.2	5.6	0.9	0.2
R-LPI Emotion Regulation Post-Survey Score	15	65	30.2	13.2	0.7	-0.7
Z-score: BSI Anxiety Pre-Survey Score	-1.2	3.0	0	1	1.0	0.3
Z-score: BSI Depression Pre-Survey Score	-1.2	3.2	0	1	0.9	0.1
Z-score: R-LPI Emotion Regulation Pre-Survey Score	-1.2	2.8	0	1	0.9	-0.2
AIM Score	-2.8	1.2	0	1	-0.8	0.3

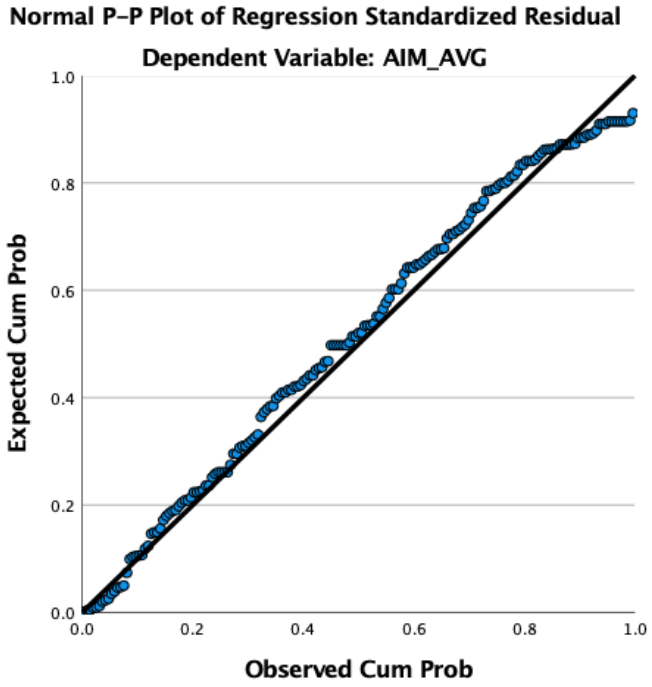
Note. BSI = Brief Symptom Inventory-18; R-LPI = Revised Life Problems Inventory. Pre-intervention survey scores centered as *z*-scores for ease of interpretation.

Appendix 15
P-P Plots for Regression Models Two through Five






Normal P-P Plot of Regression Standardized Residual
Dependent Variable: P_LPI_EMO
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0


Normal P-P Plot of Regression Standardized Residual
Dependent Variable: AIM_AVG
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0

Appendix 16
Zero-Order Correlations for Models One through Five

Table 13.

Descriptives and Zero-Order Correlations for Model Predicting Diary Card Fidelity

Measure	*M*	*(SD)*	1.	2.	3.	4.	5.	6.	7.	8.
Outcomes										
1. Diary Card Fidelity	0.08	(0.27)	--							
Block 1 Predictors										
2. Lecture Format	0.23	(0.42)	-0.01	--						
3. HMRE Status	0.52	(0.85)	-0.03	0.25 **	--					
4. HMGI Status	0.30	(0.96)	-0.01	-0.09	-0.11	--				
5. Second Year	-0.16	(0.86)	-0.07	0.18 *	-0.03	-0.04	--			
6. Third Year	-0.34	(0.68)	-0.01	0.16 *	0.02	-0.04	0.70 **	--		
7. Fourth Year	-0.39	(0.62)	-0.02	0.15 *	-0.01	-0.06	0.75 **	0.78 **	--	
8. Other Year	-0.40	(0.59)	0.02	0.20 **	-0.05	-0.11	0.78 **	0.80 **	0.83 **	--
Block 2 Predictor										
9. Diary Card Format	0.49	(0.50)	0.17 *	0.23 **	0.10	-0.08	-0.10	-0.05	-0.04	-0.10

Note. N=181. Diary Card Fidelity dummy coded with 1=imperfect fidelity, 0=perfect fidelity; Lecture Format dummy coded with 1=online, 0=in-person; HMRE = Historically Marginalized Race or Ethnicity, effect coded with 1=HMRE, -1=non-HMRE; HMGI = Historically Marginalized Gender Identity, effect coded with 1=HMGI, -1=non-HMGI; Academic Year effect coded (First Year served as reference group); Diary Card Format dummy coded with 1=digital, 0=paper/BAU.

* $p < .05$, ** $p < .01$

Table 14.

Descriptives and Zero-Order Correlations for Model Predicting Post-Survey Anxiety

Measure	*M*	*(SD)*	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
Outcomes													
1. Post-Survey Anxiety	6.18	(5.49)	--										
Block 1 Predictors													
2. Lecture Format	0.23	(0.42)	0.07	--									
3. HMRE Status	0.52	(0.85)	0.08	0.25 **	--								
4. HMGI Status	0.30	(0.96)	0.06	-0.09	-0.11	--							
5. Second Year	-0.16	(0.86)	-0.11	0.18 *	-0.03	-0.04	--						
6. Third Year	-0.34	(0.68)	-0.06	0.16 *	0.02	-0.04	0.70 **	--					
7. Fourth Year	-0.39	(0.62)	-0.01	0.15 *	-0.01	-0.06	0.75 **	0.78 **	--				
8. Other Year	-0.40	(0.59)	-0.11	0.20 **	-0.05	-0.11	0.78 **	0.80 **	0.83 **	--			
9. Pre-Survey Anxiety	<0.01	(1.00)	0.55 **	-0.02	-0.09	0.19 **	-0.16 *	-0.11	-0.12	-0.19 **	--		
Block 2 Predictor													
10. Diary Card Fidelity	0.08	(0.27)	-0.06	-0.01	-0.03	-0.01	-0.07	-0.01	-0.02	0.02	-0.04	--	
Block 3 Predictor													
11. Diary Card Format	0.49	(0.50)	-0.10	0.23 **	0.10	-0.08	-0.10	-0.05	-0.04	-0.10	-0.08	0.17 *	--
Block 4 Predictor													
12. Fidelity*Format	0.06	(0.24)	<0.01	-0.03	-0.08	-0.01	-0.06	0.03	0.01	0.06	0.01	0.88 **	0.26 **

Note. N= 181. Pre- and Post-Survey Anxiety = total score of six Likert-scale survey items, Pre-Survey centered as *z* -score; Lecture Format dummy coded with 1=online, 0=in-person; HMRE = Historically Marginalized Race or Ethnicity, effect coded with 1=HMRE, -1=non-HMRE; HMGI = Historically Marginalized Gender Identity, effect coded with 1=HMGI, -1=non-HMGI; Academic Year effect coded (First Year served as reference group); Diary Card Fidelity dummy coded with 1=imperfect fidelity, 0=perfect fidelity; Diary Card Format dummy coded with 1=digital, 0=paper/BAU.

* $p < .05$, ** $p < .01$

Table 15.

Descriptives and Zero-Order Correlations for Model Predicting Post-Survey Depression

Measure	*M*	*(SD)*	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
Outcomes													
1. Post-Survey Depression	6.24	(5.61)	--										
Block 1 Predictors													
2. Lecture Format	0.23	(0.42)	0.07	--									
3. HMRE Status	0.52	(0.85)	0.12	0.25 **	--								
4. HMGI Status	0.30	(0.96)	-0.02	-0.09	-0.11	--							
5. Second Year	-0.16	(0.86)	-0.09	0.18 *	-0.03	-0.04	--						
6. Third Year	-0.34	(0.68)	0.01	0.16 *	0.02	-0.04	0.70 **	--					
7. Fourth Year	-0.39	(0.62)	0.02	0.15 *	-0.01	-0.06	0.75 **	0.78 **	--				
8. Other Year	-0.40	(0.60)	-0.04	0.20 **	-0.05	-0.11	0.78 **	0.80 **	0.83 **	--			
9. Pre-Survey Depression	<0.01	(1.00)	0.58 **	-0.05	-0.03	0.08	-0.12	-0.02	-0.06	-0.11	--		
Block 2 Predictor													
10. Diary Card Fidelity	0.08	(0.27)	-0.02	-0.01	-0.03	-0.01	-0.07	-0.01	-0.02	0.02	<0.01	--	
Block 3 Predictor													
11. Diary Card Format	0.49	(0.50)	-0.03	0.23 **	0.10	-0.08	-0.10	-0.05	-0.04	-0.10	-0.07	0.17 *	--
Block 4 Predictor													
12. Fidelity*Format	0.06	(0.24)	0.01	-0.03	-0.08	-0.01	-0.06	0.03	0.01	0.06	0.05	0.88 **	0.26 **

Note. $N = 181$. Pre- and Post-Durvey Depression = total score of six Likert-scale survey items, Pre-Survey centered as *z*-score; Lecture Format dummy coded with 1=online, 0=in-person; HMRE = Historically Marginalized Race or Ethnicity, effect coded with 1=HMRE, -1=non-HMRE; HMGI = Historically Marginalized Gender Identity, effect coded with 1=HMGI, -1=non-HMGI; Academic Year effect coded (First Year served as reference group); Diary Card Fidelity dummy coded with 1=imperfect fidelity, 0=perfect fidelity; Diary Card Format dummy coded with 1=digital, 0=paper/BAU.

* $p < .05$, ** $p < .01$

Table 16.

Descriptives and Zero-Order Correlations for Model Predicting Post-Survey Emotion Regulation

Measure	*M*	*(SD)*	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
Outcomes													
1. Post-Survey Emotion Regulation	30.20	(13.15)	--										
Block 1 Predictors													
2. Lecture Format	0.23	(0.42)	0.12	--									
3. HMRE Status	0.52	(0.85)	0.05	0.25 **	--								
4. HMGI Status	0.30	(0.96)	0.03	-0.09	-0.11	--							
5. Second Year	-0.16	(0.86)	-0.11	0.18 *	-0.03	-0.04	--						
6. Third Year	-0.34	(0.68)	<0.01	0.16 *	0.02	-0.04	0.70 **	--					
7. Fourth Year	-0.39	(0.62)	0.06	0.15 *	-0.01	-0.06	0.75 **	0.78 **	--				
8. Other Year	-0.40	(0.59)	-0.01	0.20 **	-0.05	-0.11	0.78 **	0.80 **	0.83 **	--			
9. Pre-Survey Emotion Regulation	<0.01	(1.00)	0.67 **	0.02	-0.04	0.12	-0.09	-0.01	-0.01	-0.05	--		
Block 2 Predictor													
10. Diary Card Fidelity	0.08	(0.27)	0.03	-0.01	-0.03	-0.01	-0.07	-0.01	-0.02	0.02	0.04	--	
Block 3 Predictor													
11. Diary Card Format	0.49	(0.50)	0.04	0.23 **	0.10	-0.08	-0.10	-0.05	-0.04	-0.10	-0.01	0.17 *	--
Block 4 Predictor													
12. Fidelity*Format	0.06	(0.24)	0.08	-0.03	-0.08	-0.01	-0.06	0.03	0.01	0.06	0.08	0.88 **	0.26 **

Note. N= 181. Pre- and Post-Survey Emotion Regulation = total score of fifteen Likert-scale survey items, Pre-Survey centered as z-score; Lecture Format dummy coded with 1=online, 0=in-person; HMRE = Historically Marginalized Race or Ethnicity, effect coded with 1=HMRE, -1=non-HMRE; HMGI = Historically Marginalized Gender Identity, effect coded with 1=HMGI, -1=non-HMGI; Academic Year effect coded (First Year served as reference group); Diary Card Fidelity dummy coded with 1=imperfect fidelity, 0=perfect fidelity; Diary Card Format dummy coded with 1=digital, 0=paper/BAU.

* $p < .05$, ** $p < .01$

Table 17.

Descriptives and Zero-Order Correlations for Model Predicting Social Acceptability

Measure	*M*	*(SD)*	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Outcomes												
1. Social Acceptability	3.82	(0.99)	--									
Block 1 Predictors												
2. Lecture Format	0.23	(0.42)	0.01	--								
3. HMRE Status	0.52	(0.85)	0.03	0.25 **	--							
4. HMGI Status	0.30	(0.96)	0.01	-0.09	-0.11	--						
5. Second Year	-0.16	(0.86)	-0.02	0.18 *	-0.03	-0.04	--					
6. Third Year	-0.34	(0.68)	-0.02	0.16 *	0.02	-0.04	0.70 **	--				
7. Fourth Year	-0.39	(0.62)	-0.01	0.15 *	-0.01	-0.06	0.75 **	0.78 **	--			
8. Other Year	-0.40	(0.60)	-0.08	0.20 **	-0.05	-0.11	0.78 **	0.80 **	0.83 **	--		
Block 2 Predictor												
9. Diary Card Fidelity	0.08	(0.27)	0.02	-0.01	-0.03	-0.01	-0.07	-0.01	-0.02	0.02	--	
Block 3 Predictor												
10. Diary Card Format	0.49	(0.50)	-0.13	0.23 **	0.10	-0.08	-0.10	-0.05	-0.04	-0.10	0.17 *	--
Block 4 Predictor												
11. Fidelity*Format	0.06	(0.24)	-0.01	-0.03	-0.08	-0.01	-0.06	0.03	0.01	0.06	0.88 **	0.26 **

Note. N= 181. Social Acceptability = mean score of four Likert-scale survey items; Lecture Format dummy coded with 1=online, 0=in-person; HMRE = Historically Marginalized Race or Ethnicity, effect coded with 1=HMRE, -1=non-HMRE; HMGI = Historically Marginalized Gender Identity, effect coded with 1=HMGI, -1=non-HMGI; Academic Year effect coded (First Year served as reference group); Diary Card Fidelity dummy coded with 1=imperfect fidelity, 0=perfect fidelity; Diary Card Format dummy coded with 1=digital, 0=paper/BAU.

* $p < .05$, ** $p < .01$

Appendix 17
Regression Models One through Five

Table 18.
Model Predicting Diary Card Fidelity (Research Question 1)

	Block 1					Block 2				
	R^2_{change}	R^2_{total}	R^2_{adj}	*b*	sr^2	R^2_{change}	R^2_{total}	R^2_{adj}	*b*	sr^2
Model Fit	0.02	0.02	-0.02			0.04 *	0.06	0.01		
Coefficients										
Intercept				0.10 **					0.06 *	
Lecture Format				<0.01	<0.01				-0.03	<0.01
HMRE Status				-0.01	<0.01				-0.01	<0.01
HMGI Status				<0.01	<0.01				<0.01	<0.01
Second Year				-0.06	0.01				-0.05	0.01
Third Year				<0.01	<0.01				-0.01	<0.01
Fourth Year				-0.02	<0.01				-0.04	<0.01
Other Year				0.10	0.01				0.12	0.02
Diary Card Format									0.11 *	0.04

Note. N=181. Block 1 F-change test df = 7, 173; Block 2 df = 1, 172. Diary Card Fidelity dummy coded with 1=imperfect fidelity, 0=perfect fidelity; Lecture Format dummy coded with 1=online, 0=in-person; HMRE = Historically Marginalized Race or Ethnicity, effect coded with 1=HMRE, -1=non-HMRE; HMGI = Historically Marginalized Gender Identity, effect coded with 1=HMGI, -1=non-HMGI; Academic Year effect coded (First Year served as reference group); Diary Card Format dummy coded with 1=digital, 0=paper/BAU.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 19.
Model Predicting Post-Survey Anxiety (Research Question 2)

	Block 1					Block 2					Block 3					Block 4				
	R^2_{change}	R^2_{total}	R^2_{adj}	*b*	sr^2	R^2_{change}	R^2_{total}	R^2_{adj}	*b*	sr^2	R^2_{change}	R^2_{total}	R^2_{adj}	*b*	sr^2	R^2_{change}	R^2_{total}	R^2_{adj}	*b*	sr^2
Model Fit	0.34 ***	0.34 ***	0.31			<0.01	0.35 ***	0.31			0.01	0.35 ***	0.32			0.01	0.37 ***	0.32		
Coefficients																				
Intercept				5.94 ***					6.00 ***					6.39 ***					6.40 ***	
Lecture Format				0.72	<0.01				0.72	<0.01				1.05	0.01				1.22	0.01
HMRE Status				0.73	0.01				0.73	0.01				0.73	0.01				0.79	0.01
HMGI Status				-0.16	<0.01				-0.16	<0.01				-0.19	<0.01				-0.18	<0.01
Second Year				-0.71	<0.01				-0.75	<0.01				-0.81	0.01				-0.72	<0.01
Third Year				-0.52	<0.01				-0.52	<0.01				-0.45	<0.01				-0.48	<0.01
Fourth Year				2.23	0.02				2.21	0.02				2.40	0.02				2.45 *	0.02
Other Year				-0.76	<0.01				-0.70	<0.01				-1.01	<0.01				-1.30	<0.01
Pre-Survey Anxiety				3.08 ***	0.29				3.08 ***	0.29				3.02 ***	0.27				2.93 ***	0.25
Diary Card Fidelity									-0.65	<0.01				-0.29	<0.01				-4.42 ***	0.01
Diary Card Format														-1.08	0.01				-1.45 *	0.01
Fidelity*Format																			5.45 *	0.01

Note. N=181. Block 1 F-change test df = 8, 172; Block 2 df = 1, 171; Block 3 df = 1, 170; Block 4 df = 1, 169. Pre- and Post-Survey Anxiety = total score of six Likert-scale survey items, Pre-Survey centered as z-score; Lecture Format dummy coded with 1=online, 0=in-person; HMRE = Historically Marginalized Race or Ethnicity, effect coded with 1=HMRE, -1=non-HMRE; HMGI = Historically Marginalized Gender Identity, effect coded with 1=HMGI, -1=non-HMGI; Academic Year effect coded (First Year served as reference group); Diary Card Fidelity dummy coded with 1=imperfect fidelity, 0=perfect fidelity; Diary Card Format dummy coded with 1=digital,

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 20.
Model Predicting Post-Survey Depression (Research Question 3)

	Block 1					Block 2					Block 3					Block 4				
	R^2_{change}	R^2_{total}	R^2_{adj}	*b*	sr^2	R^2_{change}	R^2_{total}	R^2_{adj}	*b*	sr^2	R^2_{change}	R^2_{total}	R^2_{adj}	*b*	sr^2	R^2_{change}	R^2_{total}	R^2_{adj}	*b*	sr^2
Model Fit	0.38 ***	0.38 ***	0.35			<0.01	0.38 ***	0.35			<0.01	0.38 ***	0.34			<0.01	0.38 ***	0.34		
Coefficients																				
Intercept				6.10 ***					6.15 ***					6.27 ***					6.27 ***	
Lecture Format				0.92	<0.01				0.92	<0.01				1.02	<0.01				1.03	0.01
HMRE Status				0.78	0.01				0.78	0.01				0.78	0.01				0.79	0.01
HMGI Status				-0.24	<0.01				-0.24	<0.01				-0.25	<0.01				-0.25	<0.01
Second Year				-0.99	0.01				-1.02	0.01				-1.04	0.01				-1.03	0.01
Third Year				-0.31	<0.01				-0.31	<0.01				-0.29	<0.01				-0.29	<0.01
Fourth Year				1.36	0.01				1.35	0.01				1.41	0.01				1.41	0.01
Other Year				0.36	<0.01				0.41	<0.01				0.32	<0.01				0.29	<0.01
Pre-Survey Depression				3.30 ***	0.33				3.30 ***	0.33				3.28 ***	0.33				3.27 ***	0.32
Diary Card Fidelity									-0.51	<0.01				-0.39	<0.01				-0.83	<0.01
Diary Card Format														-0.33	<0.01				-0.37	<0.01
Fidelity*Format																			0.58	<0.01

Note. N=181. Block 1 F-change test df = 8, 172; Block 2 df = 1, 171; Block 3 df = 1, 170; Block 4 df = 1, 169. Pre- and Post-survey Depression = total score of six Likert-scale survey items, Pre-Survey centered as z-score; Lecture Format dummy coded with 1=online, 0=in-person; HMRE = Historically Marginalized Race or Ethnicity, effect coded with 1=HMRE, -1=non-HMRE; HMGI = Historically Marginalized Gender Identity, effect coded with 1=HMGI, -1=non-HMGI; Academic Year effect coded (First Year served as reference group); Diary Card Fidelity dummy coded with 1=imperfect fidelity, 0=perfect fidelity; Diary Card Format dummy coded with 1=digital, 0=paper/BAU.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 21.
Model Predicting Post-Survey Emotion Regulation (Research Question 4)

	Block 1					Block 2					Block 3					Block 4				
	R^2_{change}	R^2_{total}	R^2_{adj}	*b*	sr^2	R^2_{change}	R^2_{total}	R^2_{adj}	*b*	sr^2	R^2_{change}	R^2_{total}	R^2_{adj}	*b*	sr^2	R^2_{change}	R^2_{total}	R^2_{adj}	*b*	sr^2
Model Fit	0.49 ***	0.49 ***	0.47			<0.01	0.49 ***	0.46			<0.01	0.49 ***	0.46			<0.01	0.49 ***	0.46		
Coefficients																				
Intercept				30.56 ***					30.56 ***					30.45 ***					30.46 ***	
Lecture Format				2.92	0.01				2.92	0.01				2.83	0.01				2.97	0.01
HMRE Status				0.82	<0.01				0.82	<0.01				0.81	<0.01				0.87	<0.01
HMGI Status				-0.33	<0.01				-0.33	<0.01				-0.32	<0.01				-0.32	<0.01
Second Year				-3.66 **	0.02				-3.66 **	0.02				-3.64 **	0.02				-3.56 *	0.02
Third Year				-1.78	<0.01				-1.78	<0.01				-1.79	<0.01				-1.82	<0.01
Fourth Year				5.48	0.02				5.48	0.02				5.43	0.02				5.48	0.02
Other Year				1.08	<0.01				1.08	<0.01				1.16	<0.01				0.94	<0.01
Pre-Survey Emotion Regulation				8.57 ***	0.41				8.57 ***	0.41				8.57 ***	0.41				8.51 ***	0.40
Diary Card Fidelity									-0.06	<0.01				-0.16	<0.01				-3.82	<0.01
Diary Card Format														0.31	<0.01				-0.01	<0.01
Fidelity*Format																			4.85	<0.01

Note. N=181. Block 1 F-change test df = 8, 172; Block 2 df = 1, 171; Block 3 df = 1, 170; Block 4 df = 1, 169. Pre- and Post-Survey Emotion Regulation = total score of fifteen Likert-scale survey items, Pre-Survey centered as z-score; Lecture Format dummy coded with 1=online, 0=in-person; HMRE = Historically Marginalized Race or Ethnicity, effect coded with 1=HMRE, -1=non-HMRE; HMGI = Historically Marginalized Gender Identity, effect coded with 1=HMGI, -1=non-HMGI; Academic Year effect coded (First Year served as reference group); Diary Card Fidelity dummy coded with 1=imperfect fidelity, 0=perfect fidelity; Diary Card Format dummy coded with 1=digital, 0=paper/BAU.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 22.
Model Predicting Social Acceptability (Research Question 5)

	Block 1					Block 2					Block 3					Block 4				
	R^2_{change}	R^2_{total}	R^2_{adj}	*b*	sr^2	R^2_{change}	R^2_{total}	R^2_{adj}	*b*	sr^2	R^2_{change}	R^2_{total}	R^2_{adj}	*b*	sr^2	R^2_{change}	R^2_{total}	R^2_{adj}	*b*	sr^2
Model Fit	0.02	0.02	-0.02			<0.01	0.02	-0.03			0.03 *	0.05	<0.01			<0.01	0.05	-0.01		
Coefficients																				
Intercept				3.74 ***					3.72 ***					3.85 ***					3.85 ***	
Lecture Format				0.06	<0.01				0.06	<0.01				0.17	<0.01				0.17	<0.01
HMRE Status				0.01	<0.01				0.02	<0.01				0.02	<0.01				0.02	<0.01
HMGI Status				0.00	<0.01				0.00	<0.01				-0.01	<0.01				-0.01	<0.01
Second Year				0.06	<0.01				0.07	<0.01				0.05	<0.01				0.05	<0.01
Third Year				0.07	<0.01				0.07	<0.01				0.09	<0.01				0.09	<0.01
Fourth Year				0.22	0.01				0.23	0.01				0.29	0.01				0.29	0.01
Other Year				-0.46	0.02				-0.47	0.02				-0.57	0.02				-0.57	0.02
Diary Card Fidelity									0.13	<0.01				0.25	<0.01				0.21	<0.01
Diary Card Format														-0.36 *	0.03				-0.37 *	<0.01
Fidelity*Format																			0.06	<0.01

Note. N=181. Block 1 F-change test df = 7, 173; Block 2 df = 1, 172; Block 3 df = 1, 171; Block 4 df = 1, 170. Social Acceptability = mean score of four Likert-scale survey items; Lecture Format dummy coded with 1=online, 0=in-person; HMRE = Historically Marginalized Race or Ethnicity, effect coded with 1=HMRE, -1=non-HMRE; HMGI = Historically Marginalized Gender Identity, effect coded with 1=HMGI, -1=non-HMGI; Academic Year effect coded (First Year served as reference group); Diary Card Fidelity dummy coded with 1=imperfect fidelity, 0=perfect fidelity; Diary Card Format dummy coded with 1=digital, 0=paper/BAU.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Appendix 18
Predicted Post-Survey Anxiety using Interaction of Diary Card Fidelity and Format