

Mechanisms of Change within a Brief, Phone-Based, Behavioral Intervention for

Graduate Burnout

by

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Dissertation submitted in partial fulfillment of
the requirements for the degree of Doctor
of Philosophy in the Department of
Psychology and Neuroscience in the Graduate School
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ABSTRACT

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Abstract

Emerging changes in health care reform have further accelerated the need for brief and cost-effective interventions. As such, the current study tested the efficacy of two brief, phone-administered, behavioral interventions derived from behavioral activation (BA) in reducing burnout among graduate students. 66 adults currently enrolled in a doctoral program in the state of North Carolina and demonstrating current burnout were randomly assigned to one of three intervention conditions: 1) Reward: a brief intervention to help participants increase pleasant, rewarding behaviors, 2) Approach: a brief intervention to help participants approach important goals that they have been avoiding due to emotion (fear, stress, sadness) or 3) Control: a condition that involves monitoring only. All participants completed three days of daily monitoring, conducted through an online survey platform, in order to attain baseline indices of mood and activities. They then received a brief intervention over the phone and completed 7 days of additional online self-monitoring while completing the intervention. Participants completed a self-report packet assessing burnout, perceived stress, behavioral activation, experiential avoidance, mastery, anxiety and depression symptoms, quality of life, and functional impairment at baseline, post-intervention, and a 1-week follow-up assessment.

The study found that individuals in the Approach condition showed significant reductions in burnout post-intervention and at a one-week follow-up assessment, compared to individuals in the Control condition. In addition, individuals in the Approach condition showed significant improvements in well-being and significant increases in behavioral activation, compared to individuals in the Control condition. These findings suggest that a one-time intervention designed to help individuals approach challenging, avoided tasks may significantly improve indices of distress and dysfunction among doctoral-level graduate students.

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1. Introduction

Burnout is a syndrome of emotional exhaustion, cynicism, depersonalization, and reduced professional efficacy (Maslach, Schaufeli, & Leiter, 2001; Schaufeli, Salanova, González-Romá, & Bakker, 2002) that can have widespread negative consequences on both the individual and organization levels. Burnout has been most widely investigated in the context of the workplace, and this body of research has found that burnout is associated with increased use of sick leave and absenteeism, as well as increased mental health problems (Leiter & Maslach, 2000). Previous research on burnout in educational contexts has shown similar relationships with depression (Salmela-Aro, Kiuru, Leskinen, & Nurmi, 2009) and increased risk of dropout (Bask & Salmela-Aro, 2012; Turner & Berry, 2000; Wilson, Mason, & Ewing, 1997).

Graduate students in doctoral programs may be especially vulnerable to burnout, as this population faces a number of unique stressors that may adversely impact mental health, including 1) financial stress (Furr, Westefeld, McConnell, & Jenkins, 2001), 2) pressures related to conducting research and teaching, publishing, and finding employment, and 3) stress from the often ambiguous expectations of advisors (Hyun, Quinn, Madon, & Lustig, 2006). A recent literature review of burnout in healthcare graduate students found that students reported significantly higher burnout than age-matched peers, and that burnout adversely impacts mental health, empathy, and professional conduct (Bullock et al., 2017). In addition, previous research has

demonstrated that graduate students had significantly more frequent thoughts about quitting their studies than both medical students and residents (Toews et al., 1997).

Fortunately, utilization of mental health services has been shown to serve as a protective factor in the psychological transition to and successful completion of graduate programs (Benton, Robertson, Tseng, Newton, & Benson, 2003; Johnson & Huwe, 2002). However, despite these threats to the individual students and graduate programs, no interventions to date specifically target burnout in graduate student populations. Additionally, despite high rates of psychopathology and burnout in graduate populations, traditional (in-person) mental health services are under-utilized in these populations, perhaps due to barriers of time, stigma, and financial limitations (Furr, Westefeld, McConnell, & Jenkins, 2001). As such, it is important to develop and evaluate treatments for burnout that are effective and feasible. One way to move closer towards this goal is to identify which specific components of psychological interventions are effective in addressing which specific psychological processes maintaining dysfunction (e.g., avoidance, anhedonia). Another approach is to leverage technology as a tool to disseminate effective, brief interventions at low-cost to the patient and clinician.

Therefore, the current study tests the efficacy of two brief, phone-administered, behavioral interventions derived from specific components of an empirically-supported behavioral intervention, behavioral activation (BA; Addis & Martell, 2004; Martell, Addis, & Jacobson, 2001), in improving burnout among graduate students. Specifically,

individuals will be randomly assigned to one of three intervention conditions: 1) Reward: a brief intervention to help participants increase healthy, values-driven behaviors, 2) Approach: a brief intervention to help participants identify and decrease emotion-driven avoidance of important goals, or 3) Control: a control condition that involves monitoring only. In addition to assessing the feasibility of using these brief, phone-administered interventions to improve burnout, the current study will also aim to explore mechanisms of change produced by these specific strategies by assessing whether the two interventions differentially produce change in psychological constructs (mastery, pleasure, state affect, avoidance) that are thought to mediate treatment gains.

1.1 Research Investigating Interventions for Burnout

Due to substantial evidence highlighting the adverse consequences of burnout, there have been a number of investigations examining the impact of interventions for burnout. Interventions have primarily been conducted in workplace settings, and there are relatively few interventions targeting burnout among student populations. There have been two reviews examining the efficacy of burnout interventions in the workplace, which included interventions at the level of the individual, the organization, or both. A review by Awa, Plaumann, and Walter (2010) found that 80% of the 25 intervention studies reviewed led to reductions in burnout, with interventions targeting the individual resulting in short-term gains (6 months or less) and interventions targeting both the individual and the organization resulting in longer lasting gains (12

months or more). Individual interventions included cognitive behavioral training, psychotherapy, counseling, skill training, social support, relaxation training, and recreation. Organizational interventions targeted work performance appraisals, shift adjustments, and process restructuring. Of interventions using a randomized controlled design ($n = 14$), intervention duration ranged from 20 days to 6 months, and 70% of the 10 individual focused interventions significantly reduced burnout, the one organization focused intervention did not produce significant reductions in burnout, and 100% of the 3 interventions targeting the individual and the organization resulted in significant reductions in burnout (Awa, Plaumann, & Walter, 2010).

A recent meta-analysis reviewed interventions to reduce burnout specifically for physicians. This review found a small but significant reduction in burnout across studies (a 3 point drop on the emotional exhaustion domain on the Maslach Burnout Inventory). In general, organization-level interventions were more effective than physician-level interventions, and interventions were more effective for more experienced physicians, relative to less experienced practitioners (Panagioti et al., 2017). There have also been investigations examining burnout intervention for medical students at varying levels of training. One review of 19 investigations that targeted burnout at the level of individual and organization found that relaxation training appeared effective in reducing burnout, while mindfulness-based interventions produced mixed results (Williams, Tricomi, Gupta, & Janise, 2015). Organizational approaches included duty-hour restrictions and

conversion to a pass-fail grading system for medical residents and trainees. Half of all intervention approaches had at least one study demonstrating improvement in burnout (Williams et al., 2015).

In addition, there has been preliminary work investigating burnout interventions in university students. For example, Bresó, Schaufeli, and Salanova (2011) evaluated the efficacy of a 4-month cognitive behavioral intervention program for individuals, modeled after CBT for anxiety, to reduce burnout and improve self-efficacy. They found that the intervention increased engagement, performance, and self-efficacy, over above the control groups. Burnout decreased in both the intervention and control condition, which may indicate that the intervention did not significantly improve burnout over and above the impact of time, despite improvements in related constructs (Bresó, Schaufeli, & Salanova, 2011).

To date, there have been no interventions targeting burnout for graduate students across discipline. However, there have been preliminary studies targeting related constructs in healthcare graduate students. For example, Cohen and Miller (2009) investigated the impact of interpersonal mindfulness on well-being, and pilot data found improvements in emotional intelligence, social connectedness, perceived stress, and anxiety (Cohen & Miller, 2009). Barbosa and colleagues evaluated the impact of an 8-week mindfulness-based stress reduction on anxiety, empathy, and burnout for graduate healthcare students. Results indicated significant improvements in anxiety and

empathy post-intervention, but no significant differences in burnout between the intervention and control groups (Barbosa et al., 2013). Similar results were found by de Vibe and colleagues, who investigated the impact of mindfulness training on stress, burnout, well-being, and mental distress in medical and psychology students. Results found significant improvements in mental distress and well-being, but no impact on burnout (de Vibe et al., 2013).

Collectively, this work suggests that burnout in students is a distinct construct from mental distress, well-being, and other indices of mental health. Both cognitive behavioral interventions for anxiety and mindfulness-based interventions produced significant changes in indices of psychological functioning (e.g., stress, empathy, anxiety, well-being, mental distress, social connectedness, emotional intelligence, self-efficacy); however, they were not effective in reducing student burnout specifically. Literature from interventions on workplace burnout has shown that burnout is amenable to change through direct intervention on the individual, and more work is needed to identify interventions that are effective in reducing burnout within student populations. Additionally, no studies to date have evaluated interventions for graduate students across disciplines, and as discussed, this is a population at high risk for burnout, and burnout significantly impacts both personal and professional functioning. Therefore, research is needed to investigate interventions that target burnout for doctoral-level graduate student populations.

1.1 Behavioral Activation as a Candidate Intervention to Reduce Burnout

Behavioral activation (BA) is one example of a brief, behavioral intervention that is easy to disseminate (highly trainable, able to be delivered in a group format; Soleimani et al., 2015) and cost-effective (Dobson et al., 2008). BA was originally designed as a treatment for depression, and the theoretical orientation underlying the intervention conceptualizes depression as emerging from the combination of: 1) life events, 2) modified reinforcement schedules characterized by decreased response-contingent positive reinforcement, increased punishment, and negative reinforcement of depressed behavior, and 3) secondary problems with avoidance such as avoidant coping, inactivity, and rumination. In other words, depression is maintained by behavioral avoidance, whereby depressed behavior functions to avoid environmental contexts that provide low levels of positive reinforcement or high levels of punishment. The treatment therefore focuses on functional aspects of depressive behavior, highlighting the evolving transactions between a person and their environment over time, and identifying environmental triggers and ineffective coping responses involved in etiology and maintenance of depressive affect (Addis & Martell, 2004; Martell, Addis, & Jacobson, 2001).

The primary goals of BA are to decrease avoidance behavior and increase response-contingent positive reinforcement by: 1) increasing awareness of how internal and external stimuli result in negative emotions, which may establish a pattern of

avoidance, 2) helping the patient to reengage in healthy behaviors, and 3) assessing functions of behavior, so patients can make an active decision about whether to continue avoiding or to engage in more effective behaviors that may improve mood. To accomplish these goals, the treatment uses techniques that include: rating the mastery and pleasure associated with daily activities, activity scheduling to increase activities that build pleasure and mastery, and functional analysis to assess contingencies maintaining depressive behavior by identifying environment-behavior relations that may be measured objectively and reliably (Addis & Martell, 2004; Martell, Addis, & Jacobson, 2001; Lejuez, Hopko, & Hopko, 2002).

Given the particular challenges faced by graduate students, BA is one intervention that may be well suited to targeting processes maintaining burnout for this population. Specifically, school burnout is comprised of exhaustion, cynicism, and perceived inadequacy. BA may address these facets of burnout in several ways. First, because graduate students typically face multiple demands on their time and have multiple ongoing projects without clear deadlines, students may begin to avoid long-term tasks that do not provide immediate reinforcement or mastery. By blocking avoidance of long-term goals and breaking down tasks into specific achievable goals, one might expect reductions in perceived inadequacy. Second, approaching feared tasks may reduce time spent worrying and ruminating about progress towards long-term milestones, and may also decrease the perception of being overwhelmed by demands,

both of which are items on the exhaustion dimension of burnout. Finally, increasing values-consistent pleasant activities may improve work-life balance, reduce vulnerability to negative emotions, and decrease relationship impairment due to workload. In addition to fitting in the theoretical model provided by behavioral activation, BA is a structured, brief intervention with high face validity that has been successfully disseminated through technological platforms. Using BA principles in a brief intervention delivered using technology may help to make the intervention accessible for graduate students with limited time and financial resources.

1.2.1. Randomized Controlled Trials Investigating Behavioral Activation for Depression and Anxiety

Behavioral treatments have long-standing empirical evidence suggesting their efficacy in addressing mood disturbance. In a seminal dismantling study conducted by Jacobson and colleagues (1996), 150 outpatients with depression were randomly assigned to receive behavioral activation, full cognitive therapy, or a treatment that included both BA and skills to modify automatic thoughts. Results indicated that BA produced equivalent outcomes to full cognitive therapy (CT), and was equally effective as CT in altering negative thinking and dysfunctional attribution styles (Jacobson et al., 1996). Evidence suggesting that behavioral interventions alone are sufficient to treat depression stimulated a substantial resurgence of research into behavioral activation and related treatment approaches.

Behavioral activation (BA) and the brief 8 to 10-week version of behavioral activation (BATD; Lejuez, Hopko, & Hopko, 2002) have accumulated substantial empirical support in treating depression. For example, a meta-analysis conducted by Mazzucchelli, Kane, and Rees (2009) reviewed randomized controlled trials of behavioral activation for individuals diagnosed with major depressive disorder. This meta-analysis found clear evidence that BA is efficacious in treating depression in a clinically depressed adult sample (overall effect size = 0.78 in favor of BA over control conditions). Authors of this meta-analysis highlight the need for more research on the change processes that account for the observed outcomes. They also suggest further dismantling research in order to identify active treatment elements driving change, which could lead to even more efficient interventions based on behavioral activation components (Mazzucchelli, Kane, & Rees, 2009).

The latest meta-analysis to date was conducted by Ekers and colleagues (2014) and included 26 randomized controlled trials comparing BA to controls or anti-depressant medications. Results from this study supported prior work showing a large effect size (0.74) favoring BA across studies. This investigation also found that BA was as effective as medications in treating depression (Ekers et al., 2014). Collectively, this body of research provides strong evidence that BA is one effective treatment for depression. Given the relative cost-effectiveness of BA and its ability to be disseminated by multiple

service providers and in multiple formats, BA provides an attractive alternative to more comprehensive cognitive behavioral treatments.

In addition to substantial evidence supporting the efficacy of behavioral activation in improving symptoms of depression, BA has started to be applied to more diverse clinical populations. The majority of research has focused on the application of BA to anxiety and anxiety disorders. Soleimani and colleagues (2015) conducted an 8-week randomized trial comparing group behavioral activation to group cognitive therapy (CT) for undergraduate students with sub-syndromal anxiety and depressive symptoms. This investigation found that both BA and CT reduced severity of depression, anxiety, and stress and improved functional impairment, suggesting that BA can improve anxiety symptoms in undergraduates not diagnosed with a mood or anxiety disorder (Soleimani et al., 2015). This is the only randomized trial to date investigating the efficacy of BA in individuals with anxiety; however, there has been one single-case experimental evaluation and two case studies conducted using BA to treat anxiety disorders.

Hopko, Lejuez, and Hopko (2004) conducted 10 sessions of behavioral activation with a patient who presented with dysthymia, panic with agoraphobia, and academic stress. Following treatment, the patient showed decreased anxiety and depression, and increased quality of life (Hopko, Lejuez, & Hopko, 2004). Another case study conducted with an older adult male presenting with Generalized Anxiety Disorder and Social

Anxiety Disorder found that 12 weeks of individual behavioral activation resulted in decreased anxiety, depression, and stress. Further, the patient no longer met criteria for either anxiety disorder (Turner & Leach, 2009). Turner and Leach (2010) conducted three single-case experimental evaluations of Behavioral Activation Treatment of Anxiety (BATA) based on the protocol used during the 2009 case study. BATA applies principles of behavioral activation and BATD to increase approach-oriented, socially important behaviors in daily life and decrease habitual avoidance behaviors. Results from this investigation indicate that all three patients showed significant decreases in reported anxiety symptoms, which were maintained at follow-up (Turner & Leach, 2010). Collectively, these investigations provide preliminary evidence to support the efficacy of applying BA to treat anxiety disorders and dimensional anxiety symptoms.

In addition to investigations of BA to treat depression and anxiety, there have been three randomized controlled trials investigating BA in other psychiatric populations. Two randomized controlled trials have been conducted applying behavioral activation to comorbid depression and obesity. Both investigations found that BA resulted in significant improvements in depression symptoms and some elements of disordered eating; however, there was no significant improvement in binge eating disorder or weight change following BA compared to the control condition. The authors interpret these findings as evidence that BA is effective in addressing mood and activation levels, but that disordered eating behavior is likely driven by other

psychological processes not impacted by the intervention (Alfonsson, Parling, & Ghaderi, 2014; Pagoto et al., 2013).

Another RCT that investigated the use of BA for smoking cessation within depressed smokers found that individuals who received 8-sessions of group behavioral activation demonstrated greater smoking abstinence and reduced depression, compared to individuals who received standard smoking cessation strategies (MacPherson et al., 2010). Finally, there has been one pilot randomized trial conducted by Hopko and colleagues (2003), which applied BA to inpatient psychiatric patients. This investigation found that individuals who received BA reported lower depression post-treatment than individuals who received standard supportive treatment provided by the hospital (Hopko, Lejuez, LePage, Hopko, & McNeil, 2003). Collectively, these RCTs support the efficacy of BA in improving mood and some, but not all, mood-related behaviors; further work is needed to clarify which specific problem behaviors are improved using behavioral activation approaches.

In addition to RCTs, preliminary open trials, multiple-baseline investigations, and case studies have shown support for the use of behavioral activation in treating post-traumatic stress disorder (Mulick & Naugle, 2004; Gros et al., 2012; Jakupcak et al., 2006), bereavement in older adults (Acierno et al., 2011), patients with borderline personality disorder expressing suicidality (Hopko, Sanchez, Hopko, Dvir, & Lejuez, 2003), and anxious and depressed youth (Chu, Colognori, Weissman, & Bannon, 2009).

Behavioral activation has also been used to treat dimensional indices of distress and dysfunction, including psychosocial dysfunction (Hellerstein et al., 2015), obesity (Pagoto, Bodenlos, Schneider, Olendzki, & Spates, 2008), pain (Lundervold, Talley, & Buermann, 2008), pathological grief (Papa, Sewell, Garrison-Diehn, & Rummel, 2013), and negative symptoms (Mairs, Lovell, Campbell, & Keeley, 2011), as well as to improve well-being in non-clinical adults (Mazzucchelli, Rees, & Kane, 2009). To date, there are no randomized controlled trials investigating BA in these contexts, and more research is needed to support preliminary findings. However, this body of research provides preliminary evidence that BA is a versatile intervention that can be used to address a range of psychiatric conditions and dimensional indices of psychiatric disturbance.

1.2.2. Future Directions for Research Applying Behavioral Activation to Non-Depressed Samples

Based on the current literature, BA is a simple, cost-effective intervention that shows promise in treating not only depression, but also a variety of other indices of distress and dysfunction. Although BA has already been applied successfully to a wide range of adult clinical samples, there remain populations for whom BA is likely to be effective, but are yet unstudied. For example, given the strong evidence supporting BA as a treatment for depression, it is reasonable to speculate that behavioral interventions would likely improve mood disturbance and related processes in transdiagnostic clinical populations as well as non-clinical populations. In addition, given evidence that BA is effective in treating dysfunction outside of the depression spectrum, one promising line

of future research is investigating with greater clarity who will and will not benefit from behavioral activation and related behavioral strategies. Most relevant to the current investigation, given the relationship between depression and burnout (Ahola & Hakanen, 2007), it is reasonable to expect that behavioral activation principles would be effective in reducing burnout.

1.3 Dissemination of Behavioral Activation Using Non-Traditional Approaches

In addition to its versatility in addressing a range of clinical presentations, a primary strength of behavioral activation is that it is easily adaptable to non-traditional methods of dissemination. Preliminary work suggests that BA may be effective when disseminated through technological platforms and delivered by a range of health professionals. The ability to be flexibly applied outside of a traditional psychotherapy approach sets BA apart as a brief behavioral intervention that may be more cost-effective and accessible to populations who cannot or will not attend in-person, individual psychotherapy.

1.3.1. Research Investigating Non-Traditional Approaches to Behavioral Activation

When effective, psychotherapies delivered by non-specialists or via technological platforms can have the benefit of reducing cost of treatment. There is evidence that BA delivered by non-specialists is effective in treating depression. For example, patients with depression who were randomly assigned to BA delivered by mental health nurses

with no previous psychotherapy training or experience showed reduced depression post-treatment compared to individuals receiving treatment as usual (Ekers, Richards, McMillan, Bland, & Gilbody, 2011). Additionally, a meta-analysis of RCTs investigating BA found no moderating effect of therapist qualifications on outcome (Ekers, Richards, & Gilbody, 2008).

Another approach that may facilitate the delivery of cost-effective treatment to a wider variety of patients is the dissemination of effective psychotherapies delivered using mobile phone apps and web-based platforms. Comprehensive reviews of the benefits of using technology as a tool in psychotherapy have been conducted (e.g., Clough & Casey, 2011; Bee et al., 2008) and highlight the utility of technology-based interventions in their: accessibility to patients who do not have access to in-person psychotherapy; ability to help individuals who will not attend traditional psychotherapy due to stigma; flexibility in times of use; and relative cost-efficiency.

Consistent with this work, preliminary research has investigated the feasibility and efficacy of delivering BA using smartphone apps and web-based platforms. For example, Davidson and colleagues (2014) developed a BA-based web intervention for adolescents with depressed mood, which involved selecting and scheduling pleasant events. Although no efficacy data were presented, feasibility results indicated that 97% of adolescents who screened into the module for depression completed activity identification and scheduling, 87% of adolescents used the website for at least 15

minutes and 37.3% used the site for an hour or more (Davidson et al., 2014). Although this data highlights the feasibility of conducting initial BA scheduling and event scheduling online, the relatively low percentage of users who used the site for over an hour suggests that most participants likely did not return to the site weekly to re-schedule activities and report on activity completion. Therefore, having interventions that can be completed within a short timeframe may be necessary to contend with the challenges of attrition of use in most technology-based interventions.

Meyer and colleagues (2015) conducted an RCT investigating the efficacy of a cognitive behavioral online intervention for depression (Deprexis). Results from this investigation indicate that individuals in the Deprexis conditions showed significant reductions in depression, compared to individuals in care as usual or a waitlist control. This investigation provides evidence of the potential efficacy of interventions delivered solely using mobile technology; however, this study did not use BA specifically, but rather included elements of other CBTs, such as cognitive restructuring, problem solving, and acceptance/mindfulness (Meyer et al., 2015).

Two studies implementing BA using mobile phone apps have been conducted. Ly and colleagues (2014) conducted a randomized trial comparing mobile phone app delivered 8 weeks of behavioral activation or mindfulness-based guided self-help in a sample of adults with major depression. This study found that both interventions produce large pre-post effects on depression, and that both interventions produced

relatively equivalent improvements in depression symptoms. However, BA was more effective than mindfulness for individuals with severe depression, while mindfulness was more effective than BA for individuals with mild baseline depression (Ly et al., 2014). This study demonstrates the efficacy of BA administered via technology; however, it does not isolate components of the intervention to allow for identification of mechanistic factors driving improvement. Additionally, there was no control group, which makes it difficult to conclusively assess whether either intervention produced effects above and beyond what might be expected over time without intervention.

Ly and colleagues (2015) conducted an RCT comparing 10 sessions of traditional behavioral activation to smartphone-supported behavioral activation (4 sessions of BA and the use of a smartphone app). This investigation found that both conditions led to significant improvements in depression, with slightly lower effects achieved in the blended treatment group (smartphone-assisted, abbreviated BA) than have been found on meta-analyses on full BA. Because the blended treatment group did produce significant effects on depression and was associated with a 47% reduction in time spent by the therapist, this study highlights the potential for technology to assist in reducing dissemination costs for effective psychotherapies (Ly et al., 2015). This study did not include a condition that used the mobile phone app without in-person therapy sessions, and we therefore cannot draw conclusions about the efficacy of technology-based BA as a stand-alone intervention.

1.3.2. Limitations of Current Research Investigating the Dissemination of Behavioral Activation Using Non-Traditional Approaches

Collectively, this body of research highlights the potential of modifying BA to more cost-effective and accessible dissemination approaches. However, to date, no studies have investigated the implementation of BA over the phone or the application of technology-delivered BA with transdiagnostic samples. Additionally, none of these studies have leveraged technology as a way to monitor symptom change in real time in order to better clarify mechanistic processes within BA. The current study build upon this research in the following ways: 1) it is a brief intervention that can be completed during one phone session and monitored online for one week, which may help to address challenges to compliance with technology-based interventions that require sustained participation, 2) it applies behavioral activation interventions to the treatment of burnout in a mixed transdiagnostic sample of graduate students and graduate students who do not meet criteria for any psychiatric diagnosis but endorse significant distress and dysfunction, and 3) it experimentally manipulates treatment condition to examine differential effects of specific BA treatment components, rather than translating the full treatment into a mobile platform, which may assist in the identification of mechanisms of BA and contribute to research investigating the efficacy of brief, targeted interventions that can be delivered using technology.

1.4 Mechanisms of Change in Behavioral Activation

Despite substantial work investigating the efficacy of BA in a range of populations and formats, there is a relative lack of precision and clarity in defining the active mechanisms of change within BA that drive improvement in psychiatric symptoms. Identification of active processes driving change within psychotherapies is important for several reasons; most relevant to the current study is that mechanism clarification may help to foster the development of more efficient and targeted brief interventions, as researchers can isolate and deliver the specific interventions driving change and determine whether they are sufficient as stand-alone treatments. Purported mechanisms of change in BA include: 1) increasing the frequency, intensity, and quality of adaptive behaviors to the point that they are reinforced by the environment, 2) helping patients increase self-regulation abilities to achieve personal goals, 3) helping patients self-evaluate and self-administer rewards, 4) shifting from avoidance to an approach-based lifestyle, 5) undermining avoidance of private experiences, and 6) helping patients understand the functions of behavior in order to help them identify patterns of avoidance (for a review, see: Hayes, Villatte, Levin, & Hildebrandt, 2011). However, it is difficult to empirically evaluate these potential mediators because measurement of the purported mechanisms of change is often confounded by measurement of the behavior thought to produce the change, and it is difficult to

achieve the temporal specificity needed to identify changes that occur prior to reduction in depression (Hayes, Villatte, Levin, & Hildebrandt, 2011).

Despite these challenges, there is preliminary empirical work investigating mechanisms of change in behavioral activation, using a variety of different methodological approaches to assess BA processes. Large-scale randomized controlled trials are one effective method for elucidating mechanisms of change within psychotherapies; however, this method requires large sample sizes in order to power traditional mediation analyses. Due to the challenges in funding an investigation of such a large scale, alternative methods have been used to clarify processes of change within BA. For example, there has been research investigating correlational relationships between purported mechanisms and outcomes, single-participant assessment of mediators, multiple baseline approaches, mediation analyses conducted on concurrent assessments, and naturalistic approaches using ecological momentary assessment and other experience sampling methods can provide greater clarity about the temporal unfolding of change in real time. Although each method has its limitations, collectively these investigations provide preliminary empirical data linking active therapeutic components to specific outcome data.

1.4.1. Mechanisms of Change: Findings from Randomized Controlled Trials

Although BA is one of the most highly studied psychotherapies, with dozens of randomized controlled trials, almost none of these investigations have examined

mechanistic processes. The most recent meta-analysis and review of BA, conducted by Ekers and colleagues (2014) did examine moderating variables that impact improvements in BA interventions. This review identified baseline depression severity as the only variable that significantly moderated the effects of BA, with individuals with greater baseline depression severity benefitting more strongly from BA, compared to other CBTs (Ekers et al., 2014). Another RCT found that increases in activity were related to decreased depression during an 8-week course of behavioral activation; however, this finding was correlational in nature and does not necessarily reflect mediation (Bailey & Arco, 2010). In another RCT on BA for Latinos conducted by Santos and colleagues (2017), activation level and depression data were collected for 21 patients undergoing either BA for depression or treatment as usual (TAU). This investigation used cross-lagged correlations to evaluate the temporal sequence of changes in activation and depression. Results indicated that changes in activation preceded or co-occurred with changes in depression for 79% of the BA sample, while no patients in the TAU sample demonstrated this pattern (Santos et al., 2017). Although replication is needed in other samples with a larger sample size, this study provides preliminary evidence that increased activation is one factor driving improvements in depression during BA.

1.4.2. Mechanisms of Change: Findings from Correlational Studies

The most robust body of research examining processes of change within behavioral activation is correlational in nature. For example, the research that stimulated

the initial development of behavioral activation found a significant relationship between mood and the number of pleasant events individuals engaged in (e.g., Lewinsohn & Graf, 1973; Lewinsohn & MacPhillamy, 1974). Additionally, individuals with depression reported engaging in pleasant events less frequently and finding fewer events pleasant (MacPhillamy & Lewinsohn, 1974). More recent research has found that decreased depression during BA is correlated with increased positive events and behavioral activation (Armento & Hopko, 2007; Kanter, Mulick, Busch, Berlin, & Martell, 2007). These investigations provide evidence that pleasant events, behavioral activation, and improvements in depressed mood are related; however, because these studies are correlational in nature, we cannot draw conclusions about the directionality of these relationships.

1.4.3. Mechanisms of Change: Findings from Single-Participant Assessment of Mediators and Multiple Baseline Approaches

Single-participant assessment of mediators is one method of exploring mechanisms of change in which experimenters deliver an intervention, confirm that change occurred on both the potential mediator and relevant clinical outcome measures, and then confirm that changes in the mediator occurred at an expected time in the treatment protocol and before change on the outcome variable. To date, one investigation has used this approach to examine mechanisms of change in behavioral activation. This study followed four depressed adolescents undergoing BA and found that increased activation appeared to mediate changes in depression for two

participants, while decreases in dysfunctional thinking was not a plausible mediator for any subjects (Gaynor & Harris, 2008). Due to the small sample size, it is difficult to draw conclusions about the current data; however, this provides preliminary evidence that changes in activation may be more important than changes in cognition in driving improvement. This is not surprising, given the emphasis on behavioral change in BA and the relative lack of attention paid to directly changing cognition. More research is needed using larger samples and investigating additional potential mediators, such as avoidance, mastery, and environmental reward.

Folke and colleagues (2015) investigated mechanisms of change in BA using a multiple baseline design with repeated measures in which six adult inpatients with depressive symptoms were randomized to different lengths of standard care following by a 5-day, 10-session BA protocol. Although based on a small sample, four patients showed improvements in depression, activation, and avoidance. For most patients, change in activation and avoidance either co-occurred or preceded change in depression; however, these relationships were complicated by unstandardized metrics of measurement (Folke et al., 2015). Results provide preliminary support for avoidance and activation as mediators of gains in BA and also demonstrate feasibility for changing mood and behavior in a short period of time; however, it is difficult to draw conclusions due to small sample size, and further replication is needed to support these conclusions. Additionally, the inpatient population was receiving additional care that may have

confounded results, and inpatients have different constraints on the variety and types of behaviors possible. More research is needed to demonstrate generalizability outside this setting. Finally, it is unclear whether avoidance, activation, or both drove changes in depression symptoms; more research is needed to assess the differential impact of these mechanistic processes.

1.4.4. Mechanisms of Change: Findings from Naturalistic Approaches

Ecological momentary assessment (EMA) methodological approaches involve participants recording information about constructs of interest at specific intervals during their daily life (e.g., reporting their current mood 4 times per day). These approaches are useful in identifying temporal unfolding and variability of complex psychological processes and allow for examination of phenomena as they are occurring in a naturalistic setting. Numerous investigations have used EMA to assess mood-related constructs in daily life, two of which are particularly relevant to the current study. First, Hopko and colleagues (2003) used a daily diary EMA approach to examine response-contingent positive reinforcement among non-clinical, mildly depressed individuals. This study found that self-reported depression symptoms were correlated with low general activity and low pleasure in daily activities. Additionally, individuals who reported increased depression after 1 week had engaged in fewer activities that they reported produced immediate reward (Hopko, Armento, Cantu, Chambers, & Lejuez, 2003). Second, Hopko and Mullane (2008) used EMA methods to investigate

differences in the *types* of behavior associated with depression. This study found that patients with depression engaged in fewer social, physical, and educational behaviors and more work-related behavior, compared to non-depressed control subjects (Hopko & Mullane, 2008). Collectively, these studies highlight the relationship between behavior, environmental reward, and depressed mood; however, they are correlational in nature and it is difficult to draw conclusions about directionality.

1.4.5. Future Directions for Research Investigating Mechanisms of Change in Behavioral Activation

Although the current body of research provides preliminary insights into the mechanisms of change in BA driving improvement among individuals with depression, there are some limitations to this work that the current study attempts to address. First, no studies to date have investigated mechanisms of change in behavioral activation outside of depression, which makes it difficult to understand with precision what change processes drive improvements in symptoms outside of depressed mood. For example, it remains unclear whether both depressive and anxiety symptoms improve through the same mechanisms or whether different elements of the intervention differentially impact these two symptom sets. In order to better understand BA as a transdiagnostic intervention, it is important to clarify the active elements of the intervention that drive change in diverse outcome variables. The current study addresses this need by investigating the impact of BA interventions in a diverse sample of graduate students with burnout and using a variety of outcomes related to

psychological well-being (stress, quality of life, functional impairment, positive and negative mood, depression and anxiety symptoms, avoidance, environmental reward).

Second, while early research informing the development of BA focused primarily on the relationship between depressed mood and pleasant events, contemporary behavioral activation also includes strategies intended to increase mastery and block avoidance. It remains unclear whether both processes are necessary to produce changes in depressed mood or whether these strategies can be used in isolation to improve depression. Additionally, it is possible that both processes result in improvements in depressed mood, but by different pathways; clarification of what psychological processes are impacted by increasing pleasure versus approach would help to tailor depression interventions to the psychological processes conceptualized to maintain dysfunction. For example, if individuals were struggling with worthlessness and low self-worth, interventions designed to increase mastery and behavioral activation might be particularly effective; by contrast, individuals with anhedonia and poor environmental reward structures may benefit more quickly from increasing pleasurable events. Examining the relationships between specific interventions and changes in transdiagnostic processes tied to dysfunction (e.g., avoidance, mastery, environmental reward, behavioral activation, mood) can also help to identify when and for whom these treatments are likely to be effective within non-depressed samples. The current study addresses this limitation by investigating the differential impact of increasing pleasant

activities versus blocking avoidance on psychological outcomes of interest as well as psychological constructs thought to drive outcomes.

Finally, no studies to date have experimentally dismantled behavioral activation into distinct interventions to target avoidance and mastery versus pleasure and environmental reward. Experimental manipulation (rather than mediation analyses within an intervention package) allows for greater control and isolation of variables of interest, allowing for greater clarity of which specific outcomes are associated with increasing pleasure, blocking avoidance, or both. The current study addresses this limitation by randomly assigning participants to receive: an intervention that helps to increase reward and pleasurable activities, an intervention the helps participants block avoidance behavior, or a control condition that involves monitoring behavior and mood without making efforts to change behavior.

2. Current Study Aims

As discussed, an important goal in the field of clinical psychology is to develop brief, targeted interventions that are cost-effective and have the potential to help a range of psychiatric populations. Two potential steps that can move the field closer to this goal are to: 1) identify components of existing empirically-supported treatments that promote change in psychological processes maintaining dysfunction, and 2) leveraging technology to disseminate effective interventions at low-cost to the patient and clinician. As such, the primary aims of the current study are to:

Aim 1: Evaluate whether a brief (30-minute), phone-delivered intervention is effective in reducing burnout and stress in a graduate student sample.

- 1) Hypothesis 1a: Individuals in either intervention condition will show significant decreases in burnout, compared to individuals in the control condition.
- 2) Hypothesis 1b: Individuals in either intervention condition will show significant decreases in stress, compared to individuals in the control condition.

Aim 2: Evaluate whether the two interventions (Reward versus Approach) differentially impact psychological processes relevant to changes in burnout (mastery, environmental reward, behavioral activation and behavioral inhibition, avoidance, and daily affect).

- 3) Hypothesis 2a: Individuals in the Approach condition will show significant increases in mastery and significant decreases in avoidance and state negative affect, compared to both the Reward condition and the Control condition.
- 4) Hypothesis 2b: Individuals in the Reward condition will show significant increases in environmental reward, behavioral activation, and state positive affect, compared to both the Approach condition and the Control condition.

Aim 3 (Exploratory): Investigate whether there are any significant effects of the intervention in outcome and mechanistic variables of interest at a follow-up period one week after the intervention ends.

3. Methods

3.1 Participants

Participants included graduate students currently enrolled in a doctoral program in North Carolina ($n = 66$) who reported high levels of school burnout. Participants were

recruited via brochures and flyers posted around Duke University, Duke University Medical Center, and University of North Carolina – Chapel Hill; through website postings (e.g., Dukelist, Cognitive Behavioral Research and Treatment Center website, websites listing available clinical trials); and through emails sent to graduate student listservs. Finally, participants were recruited from a database with names of graduate students from Duke University who expressed willingness to be contacted for subsequent studies following a mental health assessment study (university-approved IRB number D0572). Interested individuals were instructed to call the Study Coordinator (Caitlin Fang, M.A.), who conducted a phone screen to determine study eligibility (listed in Table 1 below).

Table 1: Inclusion and Exclusion Criteria

<u>Inclusion</u>	<u>Exclusion</u>
<u>(1) Currently enrolled in any in-person (not online) Ph.D. program in the state of North Carolina</u>	<u>(1) Current mania</u>
<u>(2) Demonstrating above average levels of burnout (School Burnout Inventory total score \geq 30)</u>	<u>(2) Meets criteria for any psychotic symptoms</u>
<u>(3) Has regular access to the Internet</u>	<u>3) Suicidal ideation (endorsing >3 on question 2 of the SBQ-R; endorsing active suicidal ideation in the past month on follow-up suicide risk protocol)</u>
	<u>(4) Are currently in psychotherapy, have been in psychotherapy in the past 8 weeks, or are planning to start psychotherapy during the course of the 10-day study</u>

	<u>(5) Have had any changes in psychiatric medications in the past 8 weeks, are not taking medications as prescribed, or are planning to change medications during the course of the 10-day study</u>
<u>(4) Is able to read and understand English</u>	<u>(6) Are currently taking benzodiazepines PRN</u>
<u>(5) Has a Social Security Number</u>	<u>(7) Are under 18 years old</u>

3.2 Recruitment and Screening

Participants were recruited without regard to gender or ethnic/racial background. Children under the age of 18 were not included in the study, as the target population was doctoral-level graduate students, and individuals under 18 would be rare and likely not reflective of the larger graduate student population. Prospective participants were directed by recruitment materials to contact the study coordinator, Caitlin Fang, M.A., to complete a phone screen (approximately 15 minutes) to determine study eligibility. During this time, the study coordinator collected verbal consent prior to beginning the questions. As part of this verbal consenting process, all participants were asked whether they are able to read and understand English. Because the study requires answering questions in English over the Internet, participants who were unable to read/understand English were excluded from the study at that time.

The phone screen included an assessment of demographic information, burnout, a brief diagnostic screening assessment for mania and psychosis, a brief screening for suicidality, a question about whether the subject is legally able to provide informed

consent, and two questions to assess whether they are currently receiving psychiatric treatment or taking medication for psychiatric reasons. These questions were intended to screen out individuals who did not meet inclusion criteria in Table 1. The specific measures included the:

- **School Burnout Inventory** (SBI; Salmela-Aro, Kiuru, Lerkinen, & Nurmi, 2009): a 9-item self-report questionnaire that assesses clinically relevant indices of burnout in the context of school, including exhaustion at schoolwork, cynicism toward the meaning of school, and sense of inadequacy at school. Items are rated on a 6-point Likert scale ranging from 1 (completely disagree) to 6 (completely agree).
- **Mini International Neuropsychiatric Interview** (M.I.N.I.; Sheehan & Lecrubier, 1992): this interview was used to obtain information about psychiatric diagnoses. For the phone screen, only the screening questions were used to assess rule out criteria of current psychotic disorders or mania. The full M.I.N.I was administered to participants who qualified at the phone screen after they provided informed consent.
- **Suicide Behaviors Questionnaire – Revised** (SBQ-R; Osman et al., 2001): a 4-item self-report questionnaire that assesses suicidal behaviors (suicidal ideation, suicide attempts).

Participants who expressed suicidal ideation in the past year (a score >3 on Question 2 of the Suicide Behaviors Questionnaire – Revised) were asked whether they have had any active suicidal ideation in the last month, using the Suicide Risk Assessment protocol. No participants were screened out due to suicidality; however, there was a plan in place to provide any participants expressing current ideation with a suicide crisis hotline and encouraged to contact the hotline. Additionally, no participants were screened out due to the presence of psychopathology; however, there was a protocol in place to provide a list of resources to seek clinical services to these

participants. No participants were excluded due to impaired ability to provide consent or comprehend English. Of the 134 participants who completed the phone screen, 68 were ruled out. The majority of participants were ruled out because they did not meet the required degree of burnout (78%, $n = 53$), 11 other participants were ruled out because they were currently in therapy, 2 were ruled out because of recent changes to psychiatric medications, and one was ruled out because he was not currently in a doctoral program in North Carolina.

Participants who met inclusion criteria during the phone screen were provided access to the electronic informed consent form. The consent process was conducted electronically through the Duke-approved Redcap website. Individuals read through the consent form, and were provided copies of both the consent and Duke's Notice of Privacy Practices. After reading through the consent form, they were instructed to contact the study coordinator with any questions they had prior to providing informed consent. They provided informed consent (date and time stamped through Redcap) and indicated that they had received Duke's Notice of Privacy Practices prior to beginning the study. Participants who signed electronic informed consent were randomly assigned to one of the three conditions: Reward ($n = 16$), Approach ($n = 29$), or Control ($n = 18$) using Redcap's randomization feature.

3.3 Procedure: Orientation and Baseline Monitoring

After signing electronic informed consent, participants were directed through Redcap to contact the study coordinator to complete study orientation over the phone (~35 minutes). They were told to have access to a computer during this orientation phone call in order to review online study measures with the coordinator. During the call, the study coordinator completed a full diagnostic interview over the phone to collect relevant clinical information about the sample. This was done using the Mini International Neuropsychiatric Interview (M.I.N.I.; Sheehan & Lecrubier, 1992), an interview that assesses whether participants meet current or historic diagnostic criteria for the following disorders: mood disorders, anxiety disorders, substance use disorders, obsessive-compulsive disorder, eating disorders, and post-traumatic stress disorder.

Following the interview, the coordinator directed the participants to view the daily assessment measures on Redcap, a Duke-approved survey site. The daily measures include: the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegan, 1988), the Daily Activity Monitoring Form, and a questionnaire that assessed mediating processes of mastery, avoidance, work-life balance, and environmental reward (full versions included in Appendices A-C). The participant and study coordinator completed a practice set of daily questionnaires together, having the subject answer questions for the past 24 hours. The participant was given the opportunity to ask any questions they had about the forms, and were informed that they would receive an email prompt

nightly at 11PM reminding them to complete the daily questionnaires. Finally, they scheduled a time four days later for a 25-minute phone call with the study coordinator to orient them to the next phase of the study.

3.3.1 Baseline Self-Report Data

After completing the daily measures during the phone orientation, participants were directed by Redcap to complete an online questionnaire packet administered via Redcap. The self-report packet includes measures to collect demographic data, information about psychiatric treatment history, and baseline indices of burnout, perceived stress, experiential avoidance, functional impairment, symptoms of depression and anxiety, environmental reward, mastery, quality of life, and behavioral activation (See Measures section for more information about measures; full version of the modified measure of the School Burnout Inventory is included in Appendix D).

3.3.2 Monitoring Phase

All subjects then completed three days of daily monitoring using the Daily Activity Monitoring Form and mood ratings using the PANAS, both administered through Duke Redcap. This monitoring phase will provide a baseline index of mood, as indicated by mean scores of positive mood over the three-day period (PANAS-P) and mean scores of negative mood over-the three-day period (PANAS-N). The results from the Redcap online survey were imported to an SPSS database, which could only be accessed by the study staff using a username and password.

3.4 Intervention Conditions

After providing consent, all participants were randomly assigned to one of three intervention conditions: 1) Reward: a brief intervention to help participants increase pleasant, rewarding behaviors, 2) Approach: a brief intervention to help participants approach important goals that they have been avoiding due to emotion (fear, stress, sadness) or 3) Control: a condition that involves monitoring only. The purpose of the Reward condition is to increase the frequency, intensity, and quality of adaptive behaviors in order to increase reinforcement from the environment, which evaluates one process thought to drive change in behavioral activation. The purpose of the Approach condition is to shift from avoidance to an approach-based lifestyle, which evaluates another process thought to drive change in behavioral activation. Phone orientation and baseline monitoring procedures were identical for all subjects. After completing three days of monitoring, all subjects completed a scheduled call in which the intervention procedure was described.

3.4.1 Control Condition

Following the three-day monitoring period, individuals in the Control Condition were prompted to call the study coordinator at their scheduled time. During the phone call (up to 30 minutes), participants in the Control condition talked with the study coordinator to: 1) answer questions about the monitoring, 2) increase motivation and compliance with monitoring, and 3) describe in detail the activities they plan to

complete over the next week, including: specific start and end times to activities, contextual information about where they completed each activity, and information about whether there were other people present while they completed each activity. This discussion was intended to control for attention, time spent talking to another person, and attention to daily activities. Participants in the Control condition then completed one additional week of daily monitoring with express instructions to not make any changes to their daily behavior.

3.4.2 Reward Condition

Following the three-day monitoring period, individuals in the Reward Condition were directed to an additional questionnaire via Redcap (See Appendix F) to identify activities that they find/would find pleasant or rewarding in various life domains (i.e., family, recreation/leisure, physical/mental health, friendships, romantic relationships, work/education). Participants were asked to generate between 1-4 pleasant activities that they were not currently engaging in for three domains of their choice and rated the level of enjoyment for each activity and how difficult it would be to complete each activity. After completing the measure, participants in the Reward condition were prompted to call the study coordinator at their scheduled time. During the phone call (up to 30 minutes), participants in the Reward condition talked with the study coordinator to: 1) answer questions about the monitoring, 2) increase motivation and compliance with monitoring, 3) orient to the relationship between behavior and mood, 4) introduce the

rationale for changing behavior in order to enhance mood, 5) identify seven pleasant activities for the participant to complete over the next week, 6) review the daily monitoring form with the participant and help them to identify times to schedule the activities for the next week, and 7) problem-solve potential barriers to completing the scheduled activities. Participants in the Reward condition then completed one additional week of daily monitoring with instructions to complete approximately one pleasant activity per day and highlight completion on their daily monitoring forms.

3.4.3 Approach Condition

At the end of the questionnaire packet, individuals in the Approach Condition were directed to an additional questionnaire via Redcap (See Appendix G) to identify activities that are valuable to the person, but that the person has been avoiding due to emotion (anxiety, low mood). The person was prompted to identify things that are important, but challenging due to negative emotions, in multiple life domains (i.e., family, recreation/leisure, physical/mental health, friendships, romantic relationships, work/education) and rated the level of distress associated with the behavior and the level of avoidance associated with the behavior. After completing the measure, participants were prompted to call the study coordinator at their scheduled time. During the phone call (up to 30 minutes), participants in the Approach condition talked with the study coordinator to: 1) answer questions about the monitoring, 2) increase motivation and compliance with monitoring, 3) orient to the cost of avoidance, 4) introduce the

rationale for blocking avoidance in order to enhance mood, 5) identify activities characterized by high emotional avoidance and break these activities down into seven achievable steps, 6) review the daily monitoring form with the participant and help them to identify times to schedule the activities for the next week, and 7) problem-solve potential barriers to completing the scheduled activities. Participants in the Approach condition then completed one additional week of daily monitoring with instructions to complete approximately one challenging activity per day and highlight completion on their daily monitoring forms.

3.5 Intervention Procedures

For every condition, the study coordinator conducted the phone intervention using a standardized script (See Appendix E). After the call, all participants completed one additional week of daily monitoring. In order to identify the number of scheduled activities completed and the timing of these activities, participants in both intervention conditions included a * on their Daily Activity Monitoring form next to all scheduled activities that they completed as part of the intervention.

3.5.1 Post-Intervention Questionnaires

At the end of the week, all participants completed a post-intervention online questionnaire packet through Redcap, which included the same measures included in the baseline questionnaire packet (except the DDS, which was only completed at baseline). There was one additional brief questionnaire that served as a manipulation

check and assessed feasibility, acceptability, and urges to dropout following the intervention. For the manipulation check, participants rated the extent to which their behavior over the past week was similar or different to their typical behavior.

Specifically, participants reported: 1) how frequently they engaged in pleasant activities during the past week, compared to a typical week, 2) how frequently they engaged in mastery-building activities during the past week, compared to a typical week, 3) whether anything out of the ordinary happened in the last week that significantly impacted their mood or behavior, and 4) how closely they followed instructions provided during the intervention call.

Feasibility and acceptability were assessed using the following questions: 1) how enjoyable was the intervention, 2) how likely would they be to complete the intervention again, 3) how challenging was the intervention to complete, 4) what were the most helpful and unhelpful components of the intervention, 5) how connected did they feel with the person conducting the intervention, and 6) which condition they believed would be most helpful. Finally, post-intervention urges to dropout were rated using the same scale used in baseline assessment.

3.5.2 Follow-Up

One week after the completion of the intervention, participants completed one final self-report packet administered through Redcap to provide follow-up self-report data. They were directed to a debriefing summary of the study and directed to call the

study coordinator to collect payment information. Participants received a check by mail as compensation for study participation. If participants had any questions about the study, they were welcome to contact the study Principal Investigator, Dr. M. Zachary Rosenthal or the study coordinator, Caitlin Fang.

3.5.3 Participant Compensation

Participants were compensated \$50 for completing the study, defined as: 1) completing at least 80% of the Daily Questionnaires (8 total), 2) completing both the orientation and intervention phone calls, and 3) completing all 3 self-report packets.

3.6 Measures

3.6.1 Daily Measures

Daily measures were completed via Duke Redcap every day throughout the 10-day study, including both the three-day monitoring phase and the one-week intervention phase. Daily measures included assessment of mood, daily activities, and psychological processes thought to mediate changes in burnout.

The Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegan, 1988) was used to assess affect. The PANAS is a 20-item self-report measure that assesses positive and negative emotions participants have experienced over the past 24 hours. Participants rated the extent to which they have felt 20 different emotions over the past 24 hours using a 5-point Likert scale ranging from 1 (very slightly or not at all) to 5 (extremely). The internal reliability for the validation samples was good for positive

affect ($\alpha = .86-.90$) and negative affect ($\alpha = .84-.87$). In the current study, the Cronbach's alpha was .89 for the positive affect scale and .85 for the negative affect scale.

The Daily Activity Monitoring Form is a self-report measure that was used to assess activities over the course of a 24-hour period. Participants described what they were doing during specific time periods over the course of the day, and then rated the extent to which they enjoyed the activity on a scale from 0 (not at all enjoyable) to 10 (extremely enjoyable) and the importance of the activity on a scale from 0 (not at all important) to 10 (extremely important).

Psychological processes thought to mediate changes in burnout were measured using a 5-item questionnaire that assesses daily perceptions of self-efficacy, avoidance, approach of mastery-building activities, reward, and work-life balance.

3.6.2 Self-Report Questionnaire Packet

A self-report questionnaire packet was completed at baseline, post-intervention, and at a 1-week follow-up post-intervention. The self-report questionnaire packet included the following measures (the DDS and THI-M are only administered at baseline and are not collected post-intervention or at follow-up):

The Demographic Data Survey (DDS): The DDS is a 27-item self-report measure that collects demographic information (gender, age, race, income), as well as information about sleep quality, caffeine consumption, and self-report data about current or past psychiatric problems.

Treatment History Interview – Modified (THI-M): The THI-M was used to obtain information about psychiatric treatment history. This questionnaire asks questions about participants' history of psychiatric treatment, prior hospitalizations, and medication history.

Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983): The PSS is a 10-item self-report measure that measures the perception of stress. Participants rate the frequency with which things have felt unpredictable, uncontrollable, and overwhelming on a 5-point Likert scale ranging from 0 (never) to 4 (very often). The PSS demonstrates adequate internal and test-retest reliability, with Cronbach's α ranging from .84 to .86 in test samples, and shows predicted correlations with related self-report and behavioral metrics (Cohen, Kamarck, & Mermelstein, 1983). Cronbach's α for the current study were .18, .26, and .31 for each timepoint.

Pearlin's Mastery Scale (Pearlin & Schooler, 1978): The Pearlin Mastery Scale is a 7-item self-report questionnaire that assesses a dimension of self-concept reflecting the extent to which people see themselves as being in control of the forces that importantly impact their lives. Participants rate the extent to which they agree with statements on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). The Pearlin Mastery Scale demonstrates good internal validity and construct and predictive validity (Marshall & Lang, 1990). Cronbach's α for the current study ranged from .77 to .82 for the three assessment timepoints.

Inventory of Depression and Anxiety Symptoms (IDAS; Watson et al., 2007): The IDAS is a 64-item self-report questionnaire that assesses symptoms of mood and anxiety disorders. Participants rate the extent to which they experienced symptoms in the past two weeks on a 5-point Likert scale ranging from 1 (not at all) to 5 (extremely). The IDAS has 12 subscales: Well-Being, Panic, Suicidality, Lassitude, Insomnia, Social Anxiety, Ill Temper, Traumatic Intrusions, Appetite Loss, Appetite Gain, Dysphoria, and General Depression. The IDAS demonstrates strong convergent validity with measures assessing related constructs of interest, and adequate internal consistency, with Cronbach's α above .80 on the majority of scales across samples (Watson et al., 2007). Cronbach's α for the current study ranged from .87 to .90 for the three assessment timepoints.

The Environmental Reward Observation Scale (EROS; Armento & Hopko, 2007): The EROS is a 10-item self-report questionnaire that assesses subjective reward value of environmental activities. Participants rate the extent to which they agree with statements on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). The EROS demonstrates strong internal consistency (Cronbach's alpha was .85) and test-retest reliability, as well as strong convergent and divergent validity (Armento & Hopko, 2007). Cronbach's α for the current study ranged from .76 to .83 for the three assessment timepoints.

School Burnout Inventory (SBI; Salmela-Aro, Kiuru, Lerkinen, & Nurmi, 2009): The SBI is a 9-item self-report questionnaire that assesses clinically relevant indices of

burnout in the context of school, including exhaustion at schoolwork, cynicism toward the meaning of school, and sense of inadequacy at school. Items are rated on a 6-point Likert scale ranging from 1 (completely disagree) to 6 (completely agree). For the current study, we modified the SBI to address the workload relevant to graduate students. Cronbach's α for the current study ranged from .63 to .82 for the three assessment timepoints.

Brief Experiential Avoidance Questionnaire (BEAQ; Gámez et al., 2014): The BEAQ is a 15-item self-report questionnaire that assesses experiential avoidance. Participants rate the extent to which they agree with statements on a 6-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree). The BEAQ demonstrates good internal consistent and strong convergent validity (Gámez et al., 2014). Cronbach's α for the current study ranged from .80 to .85 for the three assessment timepoints.

Modified Work and Social Adjustment Scale (MWSAS): The MWSAS is a 5-item self-report questionnaire that assesses the extent to which mental health symptoms impact functioning. Participants rate the extent to which mental health issues impact work, social life, leisure, and daily functioning on a 9-point Likert scale ranging from 0 (no impairment at all) to 8 (very severe impairment). The MWSAS was based on the Work and Social Adjustment scale, modified to have language specific to graduate students. Cronbach's α for the current study ranged from .84 to .86 for the three assessment timepoints.

World Health Organization Quality of Life - BREF (WHOQOL-BREF; WHOQOL Group): The WHOQOL-BREF is a 26-item self-report questionnaire that assesses quality of life. Participants rate their satisfaction with their physical health, psychological health, level of independence, social relations, environment, and spirituality/religion/personal beliefs. The WHOQOL-BREF demonstrates good internal consistency, discriminant and construct validity, and reliability (Skevington, Lotfy, & O'Connell, 2004). Cronbach's α for the current study ranged from .42, to .61 for each timepoint. Reliability was not consistently improved when looking at individual subscales.

Behavioral Activation for Depression Scale (BADSD; Kanter, Mulick, Busch, Berlin, & Martell, 2007): The BADSD is a 25-item self-report questionnaire that assesses behaviors believed to be responsible for change in behavioral activation. Participants rate the extent to which statements are true for them during the past week on a 7-point Likert scale ranging from 0 (*not at all*) to 6 (*completely*). The BADSD produces 4 subscales: Activation, Avoidance/Rumination, Work/School Impairment, and Social Impairment. The BADSD shows good factor structure, internal consistency, and test-retest reliability (Kanter, Mulick, Busch, Berlin, & Martell, 2007). Cronbach's α for the current study ranged from .82-.89 for the three assessment timepoints.

3.7 Sample Size Considerations and Power Analysis

Because there is no standard method for conducting a power analysis for multilevel models, we used a conservative approach to calculating sample size and

estimated the sample required to detect a medium effect (0.4) using an ANOVA framework. The resulting sample of 66 is a conservative estimate, given that mixed modeling is a more advanced statistical approach.

4. Results

Participants were primarily young ($M = 27.1$; $SD = 3.0$), Caucasian (71.9%, $n = 46$) female (76.6%, $n = 49$) graduate students enrolled in doctoral programs in the state of North Carolina. The majority of participants was currently in a relationship (65.6%, $n = 42$), and did not have children (93.8%, $n = 60$). Full demographic descriptive information is listed in Table 2.

Table 2: Demographic Characteristics

Age (years) ^a	27.1 (3.0)
Female	76.6% ($n = 49$)
Racial Background ^b	
Caucasian	71.9% ($n = 46$)
Asian (or Asian American)	18.8% ($n = 12$)
African American	9.4% ($n = 6$)
East Indian	3.1% ($n = 2$)
Middle Eastern/Arab	3.1% ($n = 2$)
Other	3.1% ($n = 2$)
Hispanic Ethnicity	12.5% ($n = 8$)

Marital Status	
Married	15.6% (n = 10)
In a Relationship (Not Married)	50.0% (n = 32)
Single/Separated	34.4% (n = 22)
Has Children	6.3% (n = 4)

*Note.

^a M (SD) reported

^b *Racial background was assessed with the option of selecting each category that applied, so percentages will not total to 100%.*

In addition to demographic data, we collected additional background information relevant to their academic program. As shown in Table 3, there was significant variability in the length of time participants had been in their program, as well as in the types of doctoral programs.

Table 3: Academic Descriptives

Year in Program	
1	18.8% (n = 12)
2	14.1% (n = 9)
3	18.8% (n = 12)
4	21.9% (n = 14)
5	17.2% (n = 11)
6	6.3% (n = 4)
7+	3.1% (n = 2)
Field of Study	

Biomedical	43.8% (n = 28)
Social Sciences	14.1% (n = 9)
Humanities	15.6% (n = 10)
Engineering	17.2% (n = 11)
Business and Mathematics	9.4% (n = 6)
Urges to Drop Out at Baseline	
No Thoughts of Dropping Out	25.0% (n = 16)
Fleeting Thoughts of Dropping Out	56.3% (n = 36)
Active Consideration of Dropping Out	17.2% (n = 11)
Active Steps Taken to Leave	1.6% (n = 1)

To be included in the study, participants had to have a burnout score of at least 30 on the School Burnout Inventory, reflecting moderate to severe burnout, compared to the norm sample of students ($M = 23.78$; Salmela-Aro, Kiuru, Lerkinen, & Nurmi, 2009). In addition, many participants reported high levels of dysfunction on other categorical and dimensional indices of dysfunction. For example, 48.4% met full criteria for a current psychiatric disorder, as assessed by the Mini-International Psychiatric Interview (M.I.N.I.; Sheehan & Lecrubier, 1992), with 38.7% meeting criteria for a current anxiety disorder, and 24.2% meeting criteria for a current depressive disorder. In addition, participants showed above average levels of stress ($M = 21.7$), compared to control group norms ($M = 12.9$; Cohen, Kamarck, & Mermelstein, 1994) as assessed by the Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983). Clinical descriptives are listed in Table 4.

Table 4: Clinical Descriptives

Current Depressive Disorder	24.2% (n = 16)
Current Major Depressive Disorder	14.5% (n = 9)
Current Dysthymic Disorder	12.9% (n = 8)
Current Anxiety Disorder	38.7% (n = 24)
Current Generalized Anxiety	31.1% (n = 19)
Current Panic Disorder	8.1% (n = 5)
Current Agoraphobia	3.2% (n = 2)
Current Social Phobia	9.7% (n = 6)
Current Post-Traumatic Stress Disorder	4.8% (n = 3)
Current Substance Dependence	3.2% (n = 2)
Burnout	M = 37.57; SD = 5.80
Perceived Stress	M = 21.71; SD = 2.92

4.1 Data Integrity Procedures

All de-identified data was downloaded from Duke Redcap into SPSS.

Frequencies were run on all variables of interest to identify errors in data collection (data values that fall outside of the possible response parameters), as well as partial reports (participant only completed part of the daily questionnaire). Any errors were coded as missing data. In the event of partial reports, random missing data was included in analyses to increase the likelihood of model convergence unless <5% of the data is completed (Garson, 2013). In order to identify patterns in missing data, we examined

whether attrition rates or rates of missing data were significantly different across conditions, which indicated no significant differences in missing data across groups.

4.2 Aim 1: The Impact of Intervention on Burnout and Stress

The primary study aim was to evaluate whether a brief (30-minute), phone-delivered intervention is effective in reducing burnout and stress in a graduate student sample. To evaluate this aim, we conducted two two-way mixed ANOVA analyses with dependent variables on burnout and stress, respectively.

4.2.1. The Impact of Intervention on Burnout

A two-way mixed ANOVA was conducted to assess whether the intervention generated significant changes in burnout compared to the control condition. We hypothesized that individuals in either intervention condition will show significant decreases in burnout, compared to individuals in the control condition. Preliminary tests were conducted to determine whether the data met assumptions needed to complete this analysis. There were two outliers in the data, as assessed by inspection of a boxplot for values greater than 1.5 box-lengths from the edge of the box. No other outliers were identified, and outliers were removed in all subsequent analyses. Burnout total score was normally distributed, as assessed by Shapiro-Wilk's test ($p > .05$). There was homogeneity of variances and covariances, as assessed by Levene's test of homogeneity of variance ($p > .05$) and Box's test of equality of covariance matrices ($p = .184$) respectively. Mauchly's test of sphericity indicated that the assumption of sphericity was

violated for the two-way interaction, $\chi^2(2) = 6.44, p = .040$, indicating that the result is biased in that it too easily returns a statistically significant result. However, a epsilon (ϵ) correction was applied to adjust the degrees of freedom used in calculating the p -value. Maxwell & Delaney (2003) suggest using the Greenhouse-Geisser correction, which was used in interpreting all subsequent results.

There was a statistically significant interaction between the intervention and time on burnout, $F(3.57, 91) = 2.87, p = .032$, partial $\eta^2 = .101$, using the value of epsilon (ϵ) as estimated by the Greenhouse-Geisser method. Because there was a significant interaction effect, we then conducted three tests to assess simple main effects. There was a significant main effect of group on burnout at post-intervention, $F(2,56) = 5.82, p = .005$, partial $\eta^2 = .17$, and follow-up, $F(2,51) = 4.87, p = .012$, partial $\eta^2 = .16$, and as expected, no significant main effect of group at baseline ($p = .43$). Post-hoc analyses indicated that post-intervention burnout was statistically significantly lower in the approach condition ($p = .004$; Cohen's $d = 1.26$) compared to the control condition. These results remained at the follow-up assessment, with individuals in the approach condition showing significantly lower burnout than individuals in the control condition ($p = .014$; Cohen's $d = 1.11$). The main effect of time showed a statistically significant difference in burnout at the different time points, $F(1.8, 91) = 10.28, p < .0005$, partial $\eta^2 = .17$.

Consistent with our hypothesis, the same pattern emerges if you collapse both intervention groups to evaluate whether there were differential changes in burnout for

individuals in any intervention versus control subjects. There was a significant main effect of group on burnout. $F(1,52) = 4.71, p = .035, \text{partial } \eta^2 = .08$, with individuals in either intervention condition showing significantly lower burnout than individuals in the control condition. Changes in burnout are displayed in Figure 1.

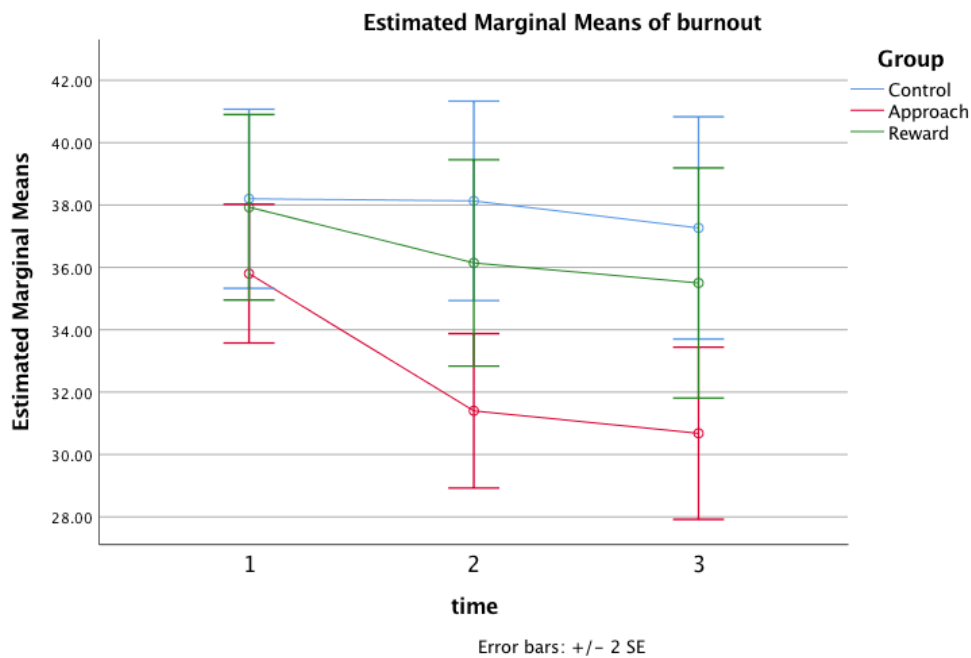


Figure 1: Burnout scores by group over time

4.3 Aim 1b: The Impact of Intervention on Perceived Stress

Reliability statistics on the Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983) for the current sample demonstrated inadequate internal validity (Cronbach’s α ranging from .18 to .31). Because the scale typically demonstrates good internal validity, we conducted additional tests to assess potential sources of error in the

data. First, all questions were checked to ensure that they were accurately input into the Redcap online assessment platform. Because Redcap downloads data automatically into SPSS, it is unlikely that data entry errors accounted for abnormal reliability statistics; however, I manually entered 10% of data to ensure accuracy of data transfer from the Redcap platform. Manual entry indicated that 100% of data was accurately transferred from Redcap to SPSS. Reverse coding syntax was reviewed for accuracy, and 10% was manually recoded, which also indicated accuracy in reverse coding. We then assessed whether a single item was artificially reducing reliability, but there was no significant or consistent improvement from removing single items from the scale.

Upon assessing inter-item correlations, there was no consistent patterns between items that showed low correlations; however, there were some items that had lower correlations with others, including “how often have you felt that things were going your way?”, “how often have you been upset because of something that happened unexpectedly?”, and “how often have you been angered by things outside of your control?”. However, removing these items did not improve reliability statistics to the point that running analyses on this measure would yield meaningful results (Cronbach’s $\alpha < .6$). Based on this assessment, this measure is not valid in the current sample, and alternative measures of perceived stress should be used. Alternative methods for assessing changes in dimensional indices of dysfunction were explored, and poor reliability of perceived stress was noted as a limitation.

In order to address whether there were changes in other outcome measures relevant to perceived stress, we conducted analyses on general depression symptom scores, well-being scores, and functional impairment. Because there were no a priori hypotheses about these outcome variables, results should be viewed as exploratory in nature and interpreted with caution.

A two-way mixed ANOVA was conducted to assess whether the intervention generated significant changes in general depression scores compared to the control condition. Preliminary tests were conducted to determine whether the data met assumptions needed to complete this analysis. There were three outliers in the data, as assessed by inspection of a boxplot for values greater than 1.5 box-lengths from the edge of the box. No other outliers were identified, and outliers were removed in all subsequent analyses. General depression scores were normally distributed, as assessed by Shapiro-Wilk's test ($p > .05$). There was homogeneity of variances and covariances, as assessed by Levene's test of homogeneity of variance ($p > .05$) and Box's test of equality of covariance matrices ($p = .60$) respectively. There was no significant interaction effect of group*time ($p = .17$) or main effect of group ($p = .91$).

A two-way mixed ANOVA was conducted to assess whether the intervention generated significant changes in well-being scores compared to the control condition. Preliminary tests were conducted to determine whether the data met assumptions needed to complete this analysis. There were four outliers in the data, as assessed by

inspection of a boxplot for values greater than 1.5 box-lengths from the edge of the box. No other outliers were identified, and outliers were removed in all subsequent analyses. Well-being scores were not normally distributed at baseline for the approach condition, as assessed by Shapiro-Wilk's test ($p = .03$). However, because there was no consistent pattern of abnormality across groups, transformations were not possible, and we proceeded with analyses, as ANOVA methods are robust in spite of normality violations. There was homogeneity of variances and covariances, as assessed by Levene's test of homogeneity of variance ($p > .05$) and Box's test of equality of covariance matrices ($p = .19$) respectively. There was no statistically significant interaction effect ($p = .55$), so we assessed main effects.

There was no significant main effect of time, though there was a trend towards significance ($p = .06$). There was a significant main effect of group, $F(2, 47) = 5.16, p = .009$, partial $\eta^2 = .18$. Pairwise comparisons showed a significant difference between the control group and the approach condition ($p = .01$; Cohen's $d = 1.23$) in which individuals in the approach condition showed significant increases in well-being relative to individuals in the control condition. A similar pattern emerged with the reward condition, whereby individuals in the reward condition showed increased well-being compared to the control condition ($p = .045$; Cohen's $d = 1.14$). Changes in well-being are displayed in Figure 2.

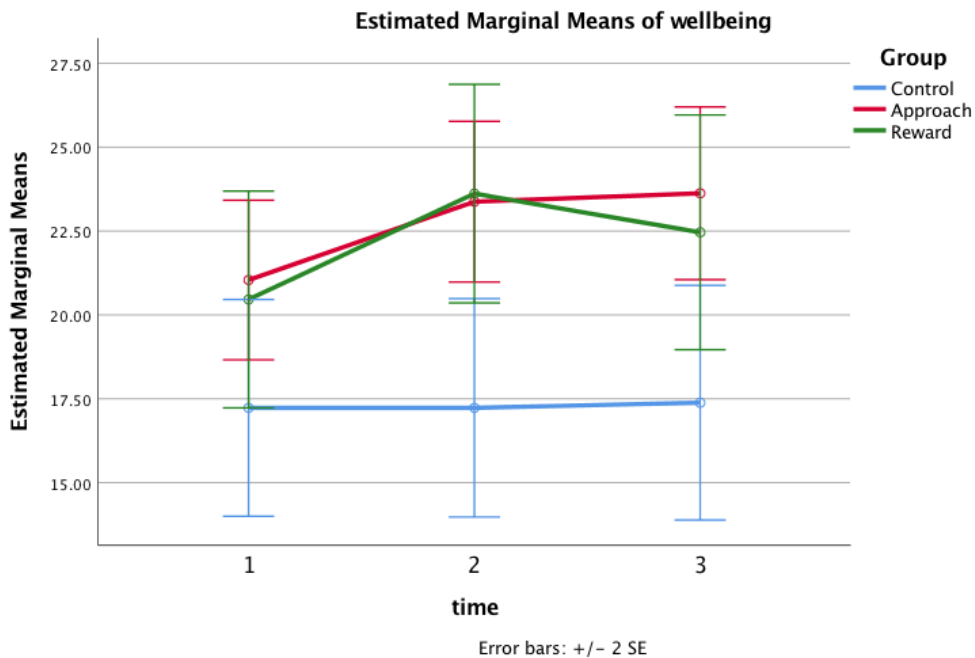


Figure 2: Well-being scores by group over time

Finally, a two-way mixed ANOVA was conducted to assess whether the intervention generated significant changes in functional impairment scores compared to the control condition. Preliminary tests were conducted to determine whether the data met assumptions needed to complete this analysis. There was one outlier in the data, as assessed by inspection of a boxplot for values greater than 1.5 box-lengths from the edge of the box. No other outliers were identified, and the outlier was removed in all subsequent analyses. Functional impairment scores were normally distributed, as assessed by Shapiro-Wilk's test ($p > .05$). There was homogeneity of variances and covariances, as assessed by Levene's test of homogeneity of variance ($p > .05$) and Box's test of equality of covariance matrices ($p = .15$) respectively. There was no significant

interaction effect of group*time, $F(3.3, 84.5) = .56, p = .66$, using the Greenhouse-Geisser adjustment to account for violation of sphericity. The main effect of group was not significant, $F(2,51) = 1.11, p = .34$, suggesting no significant differences between groups in functional impairment over time.

4.4 Aim 2a: The Impact of an Approach Intervention on Candidate Mechanisms of Change

The second aim was to evaluate whether the Approach intervention differentially impacts psychological processes relevant to changes in burnout. We hypothesized that individuals in the Approach condition would show significant increases in mastery and significant decreases in avoidance and state negative affect, compared to both the Reward condition and the Control condition.

4.4.1 The Impact of Approach on Mastery

A two-way mixed ANOVA was conducted to assess whether the Approach condition generated significant improvements in perceived mastery compared to the other two conditions. For the first analysis, the Pearlin Mastery Scale was the dependent variable assessed. There were two outliers in the data, as assessed by inspection of a boxplot for values greater than 1.5 box-lengths from the edge of the box. No other outliers were identified, and the outliers were removed. Pearlin total score was normally distributed, as assessed by Shapiro-Wilk's test ($p > .05$). There was homogeneity of variances and covariances, as assessed by Levene's test of homogeneity of variance ($p > .05$) and Box's test of equality of covariance matrices ($p = .77$) respectively. Mauchly's test

of sphericity indicated that the assumption of sphericity was met for the two-way interaction, $\chi^2(2) = 5.05, p = .08$. There was no statistically significant interaction between the intervention and time on burnout, $F(4, 98) = 0.91, p = .46$, partial $\eta^2 = .04$. There was no significant main effect of time ($p = .16$) or group ($p = .10$). In the absence of a main effect of group, pairwise comparisons were not conducted.

A multi-level modeling approach (Goldstein, 1995) was used to analyze daily ratings of activity importance as a second measure of mastery. Participants listed daily activities hour by hour each day during baseline (3 days) and intervention (7 days) monitoring. For each activity, participants rated the perceived importance of the activity, defined as how much they felt a sense of pride and accomplishment in having completed the activity. For these analyses, the average of mean daily importance ratings during the intervention period was used as the outcome measure, with average of mean daily importance ratings during the baseline period included as a covariate. Restricted maximum likelihood (REML) was used as the estimation algorithm used to calculate parameter estimates (Garson, 2013). Results found no between group differences in average intervention importance ratings, $F(2, 49) = .51, p = .61$, and as expected baseline importance ratings significantly predicted intervention importance ratings ($p = .007$).

4.4.2 The Impact of Approach on Avoidance

A two-way mixed ANOVA was conducted to assess whether the approach condition generated significant reductions in avoidance compared to the other two

conditions. For the first analysis, the Avoidance scale of the Behavioral Activation for Depression Scale was the dependent variable assessed. There was one outlier in the data, as assessed by inspection of a boxplot for values greater than 1.5 box-lengths from the edge of the box. No other outliers were identified, and the outlier was removed.

Avoidance scores were not normally distributed; however, we ran analyses despite this violation because there was no consistent pattern in normality violations across time points, and ANOVA approaches are robust despite normality violations. There was homogeneity of variances and covariances, as assessed by Levene's test of homogeneity of variance ($p > .05$) and Box's test of equality of covariance matrices ($p = .29$) respectively. There was no significant interaction effect, $F(3.55, 63.29) = .217, p = .09$ (using the Greenhouse-Geisser correction to account for violation of sphericity), and there was no significant main effect of group, $F(2, 49) = .49, p = .61$.

Given the trend towards significance in the interaction effect, we tested simple main effects of group and time as a conservative approach to ensure that interpretation of global main effects did not produce misleading results. Tests of simple main effects showed a trend towards significance for approach versus control, in which individuals in the approach condition showed lower avoidance than individuals in the control condition ($p = .07$); however, this finding did not reach statistical significance.

For the second analysis, total scores on the Brief Experiential Avoidance Questionnaire was the dependent variable assessed. There were two outliers in the data,

as assessed by inspection of a boxplot for values greater than 1.5 box-lengths from the edge of the box. No other outliers were identified, and the outliers were removed. Avoidance scores were not normally distributed; however, we ran analyses despite this violation because there was no consistent pattern in normality violations across time points, and ANOVA approaches are robust despite normality violations. There was homogeneity of variances and covariances, as assessed by Levene's test of homogeneity of variance ($p > .05$) and Box's test of equality of covariance matrices ($p = .27$) respectively. There was no significant interaction effect, $F(3.6, 98) = .83, p = .50$ (using the Greenhouse-Geisser correction to account for violation of sphericity), and we therefore examined main effects. There was a significant main effect of time, $F(1, 49) = 3.43, p = .04$, suggesting that there was a significant difference in levels of avoidance at the different timepoints. There was no significant main effect of group, $F(1, 49) = .58, p = .56$, suggesting that there were no significant differences between groups on experiential avoidance.

4.4.3 The Impact of Approach on Negative Affect

Multilevel modeling was used to examine changes in daily ratings of negative affect over time by group (Bauer & Curran, 2015). Preliminary data analyses indicated acceptable normality statistics for negative affect scores on the PANAS (skew = 1.4; kurtosis = 2.2). Negative affect scores on the daily PANAS were used as the dependent variable with time (defined in analyses as baseline monitoring phase versus intervention

monitoring phase) and group included as fixed effects, and time included as a random effect. An unstructured covariance structure was used during initial analyses, as there are no imposed assumptions using this approach; however, the model was not able to converge. We therefore used the model with the lowest value on the Bayesian Information Criterion, which was the Autoregressive(1) covariance structure.

Results indicated no significant interaction effect, $F(2, 69.3) = 2.63, p = .08$, though there was a trend towards significance. Because interpreting main effects in the presence of an interaction effect could result in misleading results, we conducted additional assessment to determine whether an interaction effect may warrant assessing simple main effects by group. Plotting values by group over time did reveal an interaction effect, as seen in Figure 3 below, suggesting that changes in negative affect over time varied by group.

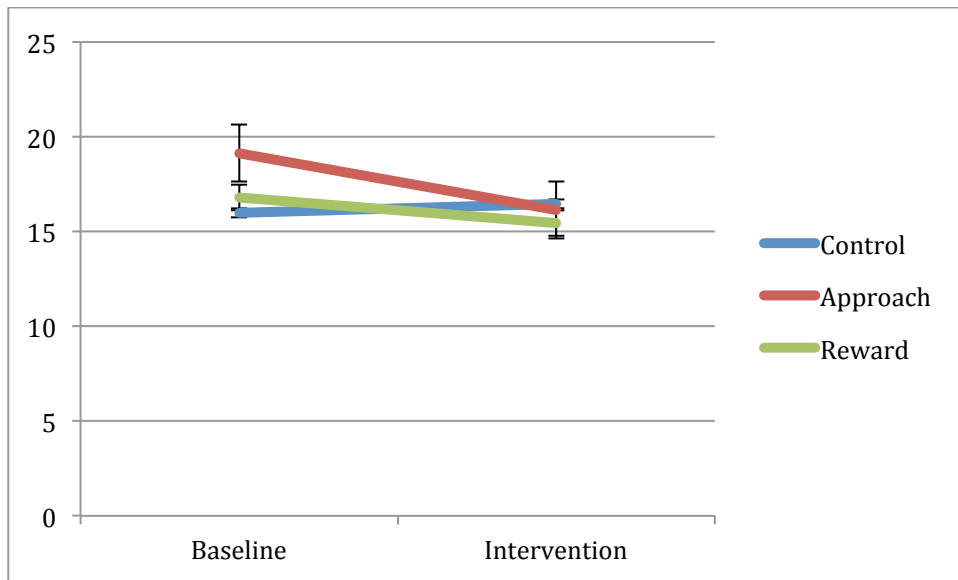


Figure 3: Negative affect scores by group over time

We therefore conducted tests of simple main effects by group. There was a significant simple main effect of time on negative affect for individuals in the approach condition, $F(1, 27.6) = 13.03, p = .001, \text{Cohen's } d = .49$. Individuals in the approach condition showed significantly lower mean ratings of negative affect during the intervention phase, compared to the baseline phase. There was no significant simple main effect of time on negative affect for individuals in the reward condition, $F(1, 14.5) = 1.14, p = .30$, which indicates that for individuals in the reward group, there was no significant difference in the mean ratings of negative affect during the intervention monitoring phase compared to the baseline monitoring phase. There was no significant main effect of time on negative affect for individuals in the control condition, $F(1, 15.6) = .03, p = .86$. This suggests that individuals in the control condition did not report

significant changes in daily negative affect in the intervention phase, compared to the baseline monitoring phase.

4.5 Aim 2b: The Impact of a Reward Intervention on Candidate Mechanisms of Change

Our final primary aim was to evaluate whether the Reward intervention differentially impacts psychological processes relevant to changes in burnout. We hypothesized that individuals in the Reward condition will show significant increases in environmental reward, behavioral activation, and state positive affect, compared to both the Approach condition and the Control condition.

4.5.1 The Impact of Reward on Environmental Reward

A two-way mixed ANOVA was conducted to assess whether the Reward condition generated significant increases in environmental reward compared to the other two conditions. For the first analysis, the Environmental Reward Observation Scale was the dependent variable assessed. There were five outliers in the data, as assessed by inspection of a boxplot for values greater than 1.5 box-lengths from the edge of the box. No other outliers were identified, and the outliers were removed. There was one violation of normality assumptions, as indicated by Shapiro-Wilk normality tests ($p = .03$); however, there was no consistent pattern of abnormality across conditions for that time point, and therefore transforming the data would have led to misleading results. Because ANOVA methods are robust despite normality violations, we chose to conduct analyses without transforming the variable. There was homogeneity of variances as

assessed by Levine's test of homogeneity of variances ($p = .09$). We conducted further analyses despite this violation; however, results should be interpreted with caution.

Mauchly's test of sphericity indicated that the assumption of sphericity was met for the two-way interaction, $\chi^2(2) = 1.19, p = .55$.

Findings indicate that there was a statistically significant interaction between the intervention and time on reward, $F(4, 98) = 2.85, p = .03$, partial $\eta^2 = .10$. Due to the presence of a significant interaction, we then conducted analyses to assess simple main effects. There was a trend towards a significant main effect of group on environmental reward at follow-up, $F(2,49) = 3.19, p = .05$, partial $\eta^2 = .12$, and no significant main effect of group at baseline ($p = .66$) or post-intervention ($p = .07$). Contrary to our hypotheses, post-hoc analyses indicated that follow-up environmental reward was higher in the approach condition ($p = .05$; Cohen's $d = .81$) compared to the control condition. These results were not significant at post-intervention, though there was a trend towards significance ($p = .07$). Changes in environmental reward are displayed in Figure 4.

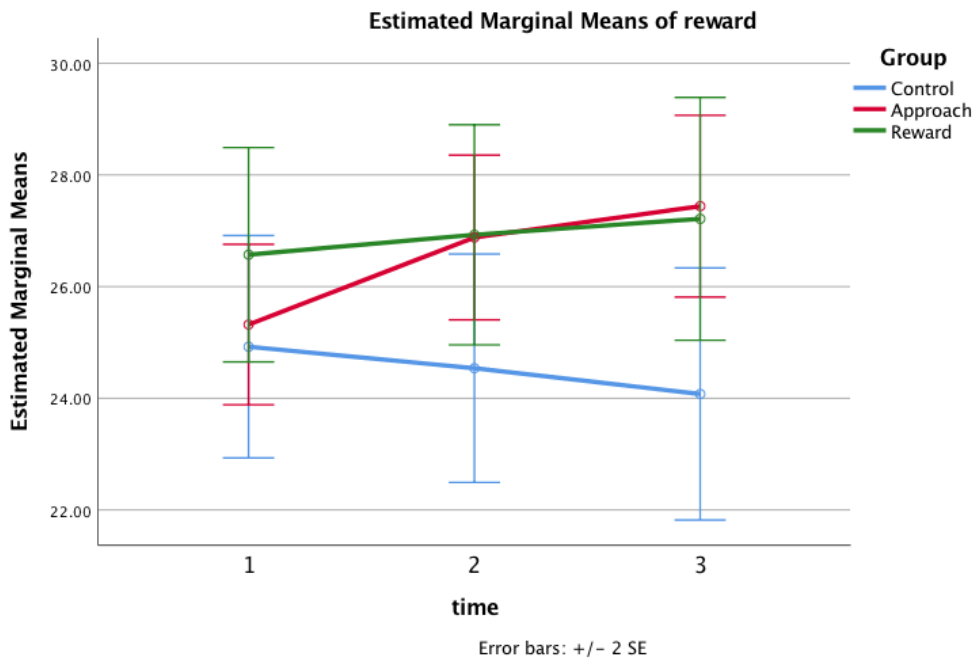


Figure 4: Environment reward scores by group over time

Multilevel modeling was used to examine changes in ratings of enjoyment from daily activities over time by group (Bauer & Curran, 2015). Preliminary data analyses indicated acceptable normality statistics for daily ratings of enjoyment (skew = .10; kurtosis = .20). Mean daily enjoyment ratings were the dependent variable, with time (defined in analyses as baseline monitoring phase versus intervention monitoring phase) and group included as fixed effects, and time included as a random effect. An unstructured covariance structure was used during initial analyses, as there are no imposed assumptions using this approach; however, the model was not able to converge given the low sample size. We therefore used the model with the lowest value on the

Bayesian Information Criterion, which was the Compound Variance covariance structure.

Results indicated no significant interaction effect, $F(2, 60.1) = .44, p = .65$, suggesting that changes in enjoyment over time did not vary by group. There was no main effect of group, $F(2,90.3) = .05, p = .95$ or time, $t(61.2) = -.16, p = .87$, suggesting that average ratings of enjoyment of daily activities did not significantly differ by group or by time period (baseline versus intervention).

4.5.2 The Impact of Reward on Behavioral Activation

A two-way mixed ANOVA was conducted to assess whether the reward condition generated significant increases in activation compared to the other two conditions. For the first analysis, the Activation scale of the Behavioral Activation for Depression Scale was the dependent variable assessed. There were three outliers in the data, as assessed by inspection of a boxplot for values greater than 1.5 box-lengths from the edge of the box. No other outliers were identified, and the outliers were removed. There was one violation of normality assumptions, as indicated by Shapiro-Wilk normality tests ($p = .04$); however, there was no consistent pattern of abnormality across conditions for that time point, and therefore transforming the data would have led to misleading results. Because ANOVA methods are robust despite normality violations, we chose to conduct analyses without transforming the variable. There was homogeneity of variances and covariances, as assessed by Levene's test of homogeneity

of variance ($p > .05$) and Box's test of equality of covariance matrices ($p = .30$) respectively. Mauchly's test of sphericity indicated that the assumption of sphericity was met for the two-way interaction, $\chi^2(2) = 4.07, p = .13$.

Findings indicate that there was a statistically significant interaction between the intervention and time on activation, $F(4, 94) = 2.72, p = .03$, partial $\eta^2 = .104$. Due to the presence of a significant interaction, we then conducted analyses to assess simple main effects. There was a trend towards a significant main effect of group on activation at post-intervention, $F(2,56) = 3.11, p = .052$, partial $\eta^2 = .10$, and no significant main effect of group at baseline ($p = .98$) or follow-up ($p = .62$). Post-hoc analyses indicated that post-intervention activation was statistically significantly higher in the approach condition ($p = .04$; Cohen's $d = .81$) compared to the control condition. These results were no longer significant at the follow-up assessment. The main effect of time showed a statistically significant difference in activation at the different time points, $F(2, 94) = 3.60, p = .03$, partial $\eta^2 = .07$.

4.5.3 The Impact of Reward on Positive Affect

Multilevel modeling was used to examine changes in positive affect over time by group (Bauer & Curran, 2015). Preliminary data analyses indicated acceptable normality statistics for positive affect scores on the PANAS (skew = .29; kurtosis = -.57). Positive affect scores on the PANAS was used as the dependent variable with time and group included as fixed effects, and time included as a random effect. An unstructured

covariance structure was used during initial analyses, as there are no imposed assumptions using this approach; however, the model was not able to converge given the low sample size. We therefore used the model with the lowest value on the Bayesian Information Criterion, which was the Heterogeneous Compound Symmetry covariance structure.

Results indicate a significant interaction effect of group*time, which suggests that there is a significant difference in the rate of change in positive affect over time (slope) between groups, $F(2, 59.6) = 3.928, p = .025$. Due to the presence of a significant interaction effect, we did not interpret main effects, but rather conducted tests of simple main effects of group. There was a significant main effect of time for the control group, indicating a significant difference in positive affect between the baseline monitoring and the intervention monitoring, $t(16.1) = -2.45, p = .026$, Cohen's $d = .41$, which reflects a significant decrease in positive affect during the intervention phase, compared to the baseline phase. There were no significant main effects of group for individuals in the approach ($p = .20$) or reward ($p = .20$) conditions, suggesting that there was no significant difference in positive affect between baseline and intervention phases for the intervention groups. Changes in positive affect scores are shown in Figure 5.

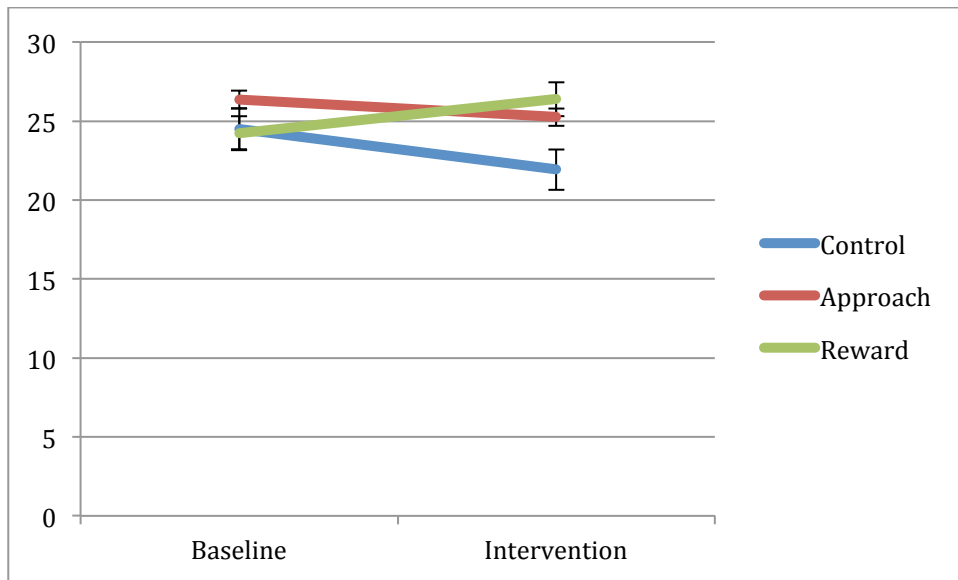


Figure 5: Positive affect scores over time by group

5. Discussion

The current study investigates the efficacy of a brief, behavioral intervention for improving burnout among doctoral-level graduate students. To date, there have been no investigations of psychological interventions within a global graduate student population, despite evidence that graduate students report high levels of depression and anxiety, and face unique stressors that likely strain mental well-being. As such, the current investigation addresses an important gap in current research by beginning to clarify what is effective in addressing the mental health challenges faced by graduate students.

In addition, the current study adds to the body of literature focused on the dissemination of cost-effective, accessible evidence-based treatments in several ways. First, all study interventions were conducted over the phone, with daily monitoring and

assessments completed online, therefore increasing accessibility to individuals who cannot or will not attend traditional in-person psychotherapies due to time, financial limitations, or stigma. In addition, the intervention was very brief (approximately 25 minutes per subject), which means that this intervention could be easily implemented on a large scale without significant investment of time or financial resources. Finally, the study dismantled two mechanisms of change within behavioral activation in order to assess whether specific mechanisms of change differentially drive improvements in indices of psychological distress and dysfunction.

5.1 Feasibility and Acceptability

Of the 66 participants consented into the study, 64 completed all three days of baseline monitoring, and 60 participants completed the entire study through the post-intervention assessments. 55 participants completed the one-week follow-up, and of those, 4 participants failed to complete follow-up monitoring due to a glitch in the scheduled emails sent to remind participants to complete follow-up assessments.

Overall, there was a 91% retention rate for the intervention and the 7-day monitoring phase following the intervention. In addition, 94.2% of all participants, including control subjects, reported willingness to take part in the intervention again. Considering that the study population was graduate students struggling with burnout and the fact that daily monitoring was relatively labor-intensive (participants had to report hour-by-hour activities, rate the enjoyment and importance of each activity, and respond to additional

questions about avoidance, mastery, and mood), this data suggests high study feasibility for brief phone-based interventions and online monitoring.

At the end of the study, all participants rated the degree to which they enjoyed the intervention, they found it challenging, and they found it effective in reducing burnout. For enjoyment, individuals in the control condition rated the degree to which they enjoyed intervention as 4.5 out of 10, where 0 is *not enjoyable at all* and 10 is *extremely enjoyable*. Individuals in the approach condition rated enjoyment as a 6.8, and individuals in the reward condition rated enjoyment as a 7.3. This data suggests that both intervention groups reported acceptable enjoyment of the intervention, with participants in the reward condition reporting the highest enjoyment. For difficulty, individuals in the control condition rated the degree to which they found the intervention challenging as 1.5 out of 10, where 0 is *not challenging at all* and 10 is *extremely challenging*. Individuals in the approach condition rated difficulty as a 5.4, and individuals in the reward condition rated difficulty as a 4.7. This indicates that daily monitoring was perceived as very unchallenging, while both interventions required more effort. Finally, for burnout, individuals in the control condition rated the degree to which they felt the intervention was effective in reducing burnout as 3.5 out of 10, where 0 is *not effective at all* and 10 is *extremely effective*. Individuals in the approach condition rated efficacy as a 6.0, and individuals in the reward condition rated efficacy as a 5.8.

Finally, across conditions, there was a shift in the distribution of urges to dropout from baseline to post-intervention. As seen in Figure 6, post-intervention, a higher proportion of participants reported no thoughts of dropping out and a lower proportion reported active consideration of dropping out or taking steps to drop out.

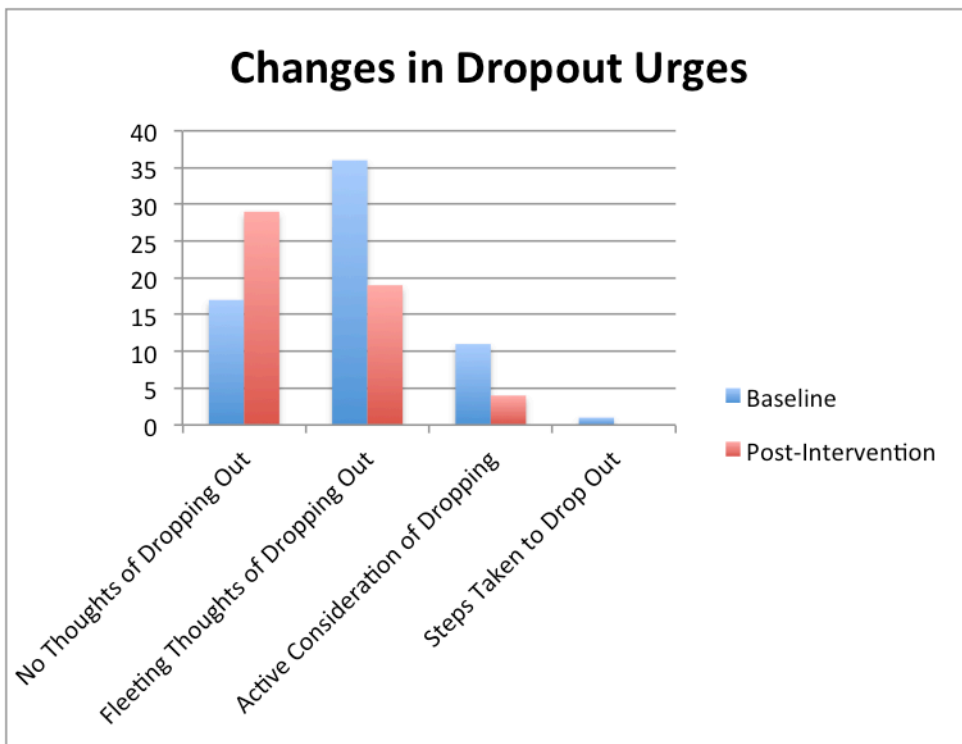


Figure 6: Changes in Urges to Drop Out of Program at Baseline and Post-Intervention

Collectively, feasibility and acceptability data indicates that participants were willing to participate in a 10-day monitoring study with a brief phone-based intervention, and participants in the intervention conditions rated the study as more effective, enjoyable, and challenging than participants in the control condition.

5.2 Summary of Primary Findings: Aim 1

5.2.1 The Impact of Study Interventions on Burnout

The primary aim of the current study was to assess whether the two brief interventions generated improvements in burnout and perceived stress, over and above a control condition in which individuals talked to the study therapist about planned daily activities and then completed seven days of daily monitoring of mood and activities online. Results indicate that individuals in the Approach condition, in which participants identify stressful tasks that they have been avoiding and then to break these tasks down into 7 small steps that they completed over the next week to facilitate approach of importance life goals, reported significantly lower burnout than individuals in the Control condition both post-intervention and at a one-week follow-up assessment. Specifically, the mean score on the School Burnout Inventory (SBI) in the Approach condition at baseline was 36.9, and post-intervention mean score on the SBI was 32.4 with scores reducing to 31.5 at follow-up. This represents a slightly larger decrease in burnout than that found in a recent meta-analysis of burnout interventions for physicians (Panagioti et al., 2017), which found an average of a 3 point decrease on the Maslach Burnout Inventory Emotion Exhaustion subscale (Maslach, Jackson, Leiter, Schaufeli, & Schwab, 1986), which is also a 9-item inventory with a total score of 54.

Although more work is needed to assess whether these gains are maintained over time, the current study contributes to literature on burnout in that it is the first

intervention that reduced burnout in a graduate student population over and above the control condition. Other investigations targeting graduate student populations have investigated the impact of mindfulness (Cohen & Miller, 2009) and mindfulness-based stress reductions (Barbosa et al., 2013; de Vibe et al., 2013), as well as CBT for testing anxiety (Bresó, Schaufeli, & Salanova, 2011). Although they found a number of improvements in anxiety, self-efficacy, empathy, and emotional intelligence, there were no significant improvements in burnout specifically. Based on current findings, helping graduate students to identify patterns of avoidance, break down large tasks into manageable action items, and schedule tasks over the course of the week generates significant reductions in burnout.

There are several potential reasons why an approach-based behavioral intervention would lead to significant reductions in burnout. First, blocking procrastination of avoided tasks may promote reductions in guilt and anxiety, which may contribute to overall burnout. In addition, breaking down feared tasks into manageable action items may help to increase perceived control and reduce the likelihood that students will be too overwhelmed by important projects to begin the work. Third, in completing small and achievable tasks, participants may have increased self-efficacy, either because of an increased internal sense of pride and accomplishment or through environmental reinforcement from advisors or departments.

5.2.2 The Impact of Study Interventions on Perceived Stress

Unfortunately, we were unable to evaluate the impact of the intervention of perceived stress due to low internal validity for the scale used to assess stress. We therefore investigated alternate metrics of psychological dysfunction, including general depression scores, functional impairment, and well-being. These findings should be interpreted with caution, as they were not based on a priori hypotheses. The study found no significant between-group differences in general depression or functional impairment; however, both intervention groups showed significant improvements in well-being. The well-being subscale of the IDAS reflects high energy and positive affect, and the current study found that an interventions that blocks avoidance and an intervention that increases pleasant activities both are effective in improving this dimension of functioning, over and above the control condition. We would expect that the reward condition, which increases pleasant activities, would lead to improvements in positive affect; however, blocking avoidance also was effective in improving well-being, potentially through improvements in energy and motivation or by increased self-efficacy and pride.

Collectively, these findings suggest that a one-time intervention that helps individuals to approach difficult tasks that they have been avoiding significantly improves burnout and well-being, over and above the influences of time (e.g., regression to the mean), attention and validation from a clinician (e.g., control condition talking

about their daily activities). Increasing engagement in pleasant activities also significantly improves well-being, but does not differentially impact burnout.

5.3 Summary of Primary Findings: Aim 2

The second aim of the current study was to evaluate whether the two interventions (Reward versus Approach) differentially impact psychological processes relevant to changes in burnout (mastery, environmental reward, behavioral activation and behavioral inhibition, avoidance, and daily affect).

5.3.1 The Impact of Approach on Mastery, Avoidance, and Negative Affect

The current study hypothesizes that mastery, avoidance, and negative affect were mechanisms of change that differentially improved in the approach condition, relative to the reward and control conditions. Contrary to study hypotheses, there were no significant between-group differences in mastery, as assessed by the Pearlin Mastery Scale (Pearlin & Schooler, 1978). We hypothesized that approaching challenging tasks would promote a sense of control and accomplishment, and one possible explanation for the null finding is that this scale assesses “the extent to which one regards one’s life-chances as being under one’s own control in contrast to being fatalistically ruled” (Pearlin & Schooler, 1978). Therefore, although there may have been changes in perceived self-efficacy or accomplishment following the intervention, this may not have changed perceptions that one’s future is controlled by external forces. Given the

particular demands of graduate school, as well as the unpredictable nature of many experiments run by participants, it makes sense that despite hard work, there are elements that feel uncontrollable that could dictate success in accomplishing important milestones within their programs. In order to more precisely understand what, if any, impact approaching feared tasks has on mastery, future studies should also include measures of self-efficacy and perceived accomplishment.

Contrary to study hypotheses, there was also no change in avoidance, as assessed by the Brief Experiential Avoidance Questionnaire (Gámez et al., 2014) or the Rumination/Avoidance subscale of the Behavioral Activation for Depression Scale (BADs; Kanter, Mulick, Busch, Berlin, & Martell, 2007), though there was a trend towards significance for reductions in avoidance on the BADs in the approach condition, relative to the control condition. We hypothesized that reduced avoidance of feared tasks would be one mechanism by which the approach condition reduced burnout. One potential explanation for the null finding on the BEAQ is that this measure assesses experiential avoidance, or unwillingness to stay in contact with distressing emotions, thoughts, memories, or sensations (Gámez et al., 2014). Although behavioral approach does require tolerance of unpleasant emotions in the short-term, it is possible that completing feared tasks actually serves the function of immediately reducing anxiety or guilt. Therefore, it is possible that individuals benefit from behavioral approach without learning emotional acceptance or willingness to be mindful of difficult

emotions or experiences. This is consistent with findings that behavioral avoidance, assessed by the BADS, did decrease in the approach condition, though not to statistical significance.

Consistent with hypotheses, there was a significant reduction in negative affect for individuals in the approach condition, relative to the control condition. We expected that approaching important but feared goals would result in decreased negative affect because accomplishing tasks may result in an immediate reduction in anxiety and guilt over procrastination. Anecdotally, many graduate students report that the cognitive load generated by ruminating about tasks that they are avoiding is more aversive than the tasks themselves. Therefore, by blocking avoidance of these tasks, one would expect to feel relief from the negative emotions generated by procrastination and avoidance. Results suggest that reduction in negative affect may be one factor driving improvements for individuals in the approach condition.

5.3.2 The Impact of Reward on Environmental Reward, Behavioral Activation, and Positive Affect

The current study hypothesizes that environmental reward, behavioral activation, and positive affect were mechanisms of change that differentially improved in the reward condition, relative to the approach and control conditions. Contrary to study hypotheses, there were no significant differences between groups post-intervention on environmental reward, as assessed by the Environmental Reward

Observation Scale; however, individuals in the approach condition showed significantly higher reward at follow-up than individuals in the control condition.

One explanation for this finding is that approaching challenging tasks resulted in positive reinforcement from the environment. In addition, several items on the scale assess the extent to which people are satisfied with their accomplishments and the way they spend their time. Engaging in difficult values-consistent behaviors may be challenging in the moment, but generate a sense of pride and accomplishment once completed. It is worth noting that there was an increase in environmental reward in the reward condition as well; however, baseline scores were higher in the reward condition than the approach condition, so the rate of change was less dramatic. Additional studies with larger samples should replicate this work to assess whether there are significant changes in the reward condition that were not detected in the current study due to power limitations. There were no between-group differences in daily ratings of enjoyment of activities across groups.

Contrary to study hypotheses, there were significant improvements in behavioral activation post-intervention for individuals in the approach condition, relative to the control condition, but no significant differences between the reward and control groups. Although the activation scale assesses general activity level, more than half of the scale assesses mastery-building experiences such as "I made good decisions about what type of activation and/or situations I put myself in," "I was an active person and

accomplished the goals I set out to do,” “I did things even though they were hard because they fit in with my long-term goals for myself,” and “I did something hard to do but it was worth it.” It therefore makes sense that individuals in the approach condition would show improvements on this scale. One might expect to see differential changes in work-life balance for individuals in the reward condition, but increasing pleasant events did not result in the predicted increase in global activation as assessed by this measure.

Finally, the control group showed a significant decrease in positive affect post-intervention, and there were no other significant between-group differences in positive affect over time. However, individuals in the reward condition did show an increase in positive affect while individuals in the approach condition showed a decrease in positive affect. It is possible that with additional power, analyses on the reward group would have been significant. Alternatively, it is possible that daily pleasant activities do not promote the expected increase in positive affect within this population because graduate students are already over-extended and assigning pleasant activities without additional intervention on mindfulness of positive emotions may actually generate increased stress rather than pleasure.

Though further analyses are required to assess formal mediation processes, these results suggest that increasing behavioral activation and reducing negative affect may be mechanisms driving improvement in burnout for individuals engaging in the approach intervention. In addition, individuals in both intervention groups may have had a buffer

against the decrease in positive emotion seen in the control group, in which increasing activities that are pleasurable or important prevented mood from decreasing over time. Finally, engagement in difficult avoided tasks may result in added benefits of reward from the environment or longer term satisfaction with the way they are spending their time.

5.4 Strengths of Study

The current study adds to the literature investigating brief, accessible behavioral interventions in the following ways: first, the current study is the first to demonstrate that a brief intervention is effective in reducing burnout for graduate student populations. If replicated, this approach would be easy to disseminate on a larger scale and has the potential to improve individual psychological functioning, as well as academic productivity and retention.

Second, the current study provides preliminary feasibility data on using behavioral activation strategies in populations outside of depressed samples. In order to better understand BA as a transdiagnostic intervention, it is important to clarify the active elements of the intervention that drive change. The current study assesses differential changes not only in burnout, but also in other transdiagnostic, dimensional indices of distress and psychological well-being, including: positive and negative affect, functional impairment, symptoms of depression, well-being, environmental reward, and activation following the interventions. As such, this study begins to address questions of

whether behavioral activation is effective in addressing psychological processes underlying dysfunction outside of depression. Additionally, the study methodology permits inferences about *how* these changes occur by examining two mechanisms of change within an empirically supported intervention with principles of change yet to be elucidated. Specifically, the current study parses apart specific components of behavioral activation (increasing approach-oriented behaviors and blocking avoidance versus increasing pleasant and rewarding activities) to assess differential changes within psychological processes thought to mediate clinical improvement (mastery, environmental reward, engagement in activating behaviors).

Third, the current study uses technology as a platform to disseminate psychological interventions. Technology is one promising modality that can make existing interventions more accessible and affordable to a wider range of individuals with psychiatric dysfunction. Because BA is a highly structured intervention based on simple behavioral change principles, it is easily translated to technological platforms and does not require as much clinician input and orientation as other cognitive behavioral therapies. BATD has already begun to utilize technology as a way to make BA simpler for the client, with mobile apps such as Behavioral Apptivation allowing clients to complete behavioral monitoring through technology. Because the integration of technology into clinical practice is a promising step in disseminating interventions to individuals who either cannot or will not attend traditional psychotherapy, the current

study adds to this literature by demonstrating acceptability and feasibility of utilizing technology to disseminate brief interventions in student populations.

Finally, the current study is the first to evaluate a psychological intervention for doctoral graduate students. Doctoral-level graduate students face a number of unique stressors that may adversely impact mental health. Given these challenges, it is not surprising that the only large-scale investigation conducted to date characterizing graduate student mental health found high rates of mental health problems amongst the student body. At the University of California – Berkeley, nearly half (44.7%) of respondents reported emotional or stress-related problems in the past year and 57.7% reported having a colleague with emotional or stress-related problems in the last year (Hyun, Quinn, Madon, & Lustig, 2006). Further, 9.9% of graduate students seriously considered suicide in the last 12 months (Brandes, 2010). Anecdotal evidence suggests that the findings in the Berkeley study are reflective of national trends, and are particularly prominent in the graduate research community. Unfortunately, despite evidence of significant mental health challenges, there had been no studies to date evaluating interventions designed for global graduate student populations. As such, the current study investigated the acceptability, feasibility, and efficacy of using a brief technology-delivered intervention to improve burnout in a graduate student sample.

5.5 Study Limitations

The study represents the first investigation of a novel intervention tested in a population of graduate students to reduce burnout. Despite its strengths and innovation, there are several limitations worth noting when interpreting current study findings.

5.5.1 Limitations of the Intervention Design and Execution

The strongest limitation is that there was only one therapist conducting study interventions, and the therapist also served as the study coordinator. This limits results in two primary ways: first, it introduces the potential for bias and second, it makes it difficult to determine whether the intervention itself was effective versus non-specific factors attributable to the therapist. Although it will be important to replicate findings using other study therapists who are blind to study hypotheses, a number of steps were taken to mitigate the impact of this limitation. First, we used a standardized script for all control and intervention phone calls to minimize bias that would be introduced through an unstructured treatment call. Second, the study therapist and participants both rated perceived warmth, validation, and rapport during the phone calls to assess whether there were differential levels of non-specific therapeutic factors between groups. These ratings indicate that there were no significant differences between groups on perceived level of connection with the therapist, $F(2, 48) = 2.43, p = .10$. There is no reason to believe that the intervention would not be as effective when delivered by another therapist;

however, further investigation is needed to confirm the intervention's efficacy when delivered by other mental health professionals.

In addition to this primary limitation, there are other potential limitations to the interventions selected for the study. One drawback to using BA, as opposed to other cognitive behavioral approaches in which the mechanisms have been more intensively investigated, is that the current study is simultaneously: 1) evaluating an intervention for a population (graduate students) that has no empirical literature establishing what works, 2) evaluating the efficacy of conducting novel interventions administered using technology, 3) applying behavioral activation to enhance mood and functioning, rather than treat depression symptoms, *and* 4) exploring mechanisms in behavioral activation. Because so many of the elements of the current study are innovative and under-studied, it may be difficult to generalize study findings to other samples and methodological approaches. Although it may be preferable to have preliminary data examining traditional BA for graduate student samples or to have data on mechanistic processes in BA for depressed samples, the innovation at multiple levels of study design is one reason this study is impactful. It is difficult to draw firm conclusions about the generalizability of study findings. However, this limitation is offset by the possible benefits of examining specific psychological processes at the mechanistic level, which can inform the development of brief, targeted interventions that can be applied and tested in other populations.

5.5.2 Limitations in the Control Condition

The Control condition for the current study involves daily monitoring of mood, activities, pleasure, and mastery with instruction to not intentionally alter behavior. Although intended as a Control condition, reactivity effects to self-monitoring have been well-documented in the empirical literature (e.g., Kazdin, 1974). This body of research suggests that the act of monitoring itself may promote behavioral change due to changes in self-regulation (monitoring, evaluation, and reinforcement), changes in environmental reinforcement (increasing the saliency of reward or punishment through the act of monitoring), and cuing of salient behaviors by the monitoring device or individual providing instructions (e.g., Nelson & Hayes, 1981; Mace & Kratochwill, 1985). Self-monitoring has been tied to behavioral change in the context of weight loss (for a review, Burke, Wang, & Sevick, 2011).

Given this body of research, the monitoring condition is not a true control condition, in the sense that one would expect no effect of the control on outcomes of interest. The drawbacks of using self-monitoring as the Control condition are that: 1) it is more difficult to attain a significant effect between groups when the Control condition itself may be generating behavioral change and mood improvement, and 2) it is difficult to identify whether improvements attained from baseline to post-intervention are accounted for by monitoring or by time and regression to the mean. Despite these limitations, the use of an active control group is beneficial in that it allows for greater

precision in identifying specific explanatory processes of change within each active intervention. If the study employed a Control condition without active monitoring, it would be difficult to determine whether any identified impact of the intervention was attributable to the instructed behavioral change intervention or to the general effects of monitoring. Therefore, the study allows for clarification about whether adding an additional intervention produces differential gains or whether self-monitoring alone may be a viable intervention for mood enhancement among graduate students.

5.5.3 Limitations in Sampling

There are also limitations in sampling in this study. All participants were doctoral students in the state of North Carolina, and the vast majority of participants were from one large university. Further investigation is needed to determine whether current findings generalize to other populations of graduate students. In addition, randomization completed using the Redcap platform led to unequal sample sizes in the conditions, which resulted in a relatively small sample in the Reward condition relative to the Approach and Control conditions. Due to the small sample in one condition, analyses conducted on the Reward condition may be under-powered, and it is possible that we did not have a sufficient sample to detect effects that were present. Particularly with analyses in which there was a trend towards significance in the Reward condition, more research is needed with larger samples to determine whether a true effect is present.

5.5.4 Limitations in Measures Selected

Finally, because data collection was conducted primarily online, the majority of outcome measures were self-report assessments. The drawbacks of using self-report assessments (e.g., response bias, reliance on participants' insight, individual differences in responding styles; Paulhus & Vazire, 2007) have been well documented; however using behavioral or physiological assessments to assess these constructs would have precluded the possibility of conducting the study entirely online with minimal added burden to the subject. Because one aim of the study was to generate an accessible and brief intervention that did not require in-person therapist contact, self-report measures provided important data without compromising this study aim.

In addition to reliance on self-report, two measures in the study, the Perceived Stress Scale and the World Health Organization – Quality of Life (BREF) questionnaire, showed poor internal validity. Poor reliability did not appear to be driven by problems with data entry or coding, and more work is needed to determine why these constructs were unreliable in this population. Future work should consider using alternate measures to assess these constructs in graduate student populations.

5.6 Future Directions

Despite these limitations, the current study made several important contributions to the current burnout literature. First, it was the first study to date that evaluated an intervention specifically for doctoral-level graduate students. Second, it

was the first study to date that evaluated an intervention for students that resulted in significant changes in burnout. Third, the study dismantled one well-investigated behavioral intervention (behavioral activation) to assess relative effects of interventions targeting reward (increasing pleasant activities) and approach (increasing engagement in challenging values-consistent activities that individuals had been avoiding), which gives preliminary data pointing to differential processes of change within this intervention.

Moving forward, findings should be replicated in larger samples in order to increase power to detect significant effects. In addition, future studies would benefit from using multiple treatment providers who are blinded to initial assessment data as well as study hypotheses. Longer follow-up periods are needed to assess whether treatment gains are sustained over time, and future investigations using this data could investigate mediation analyses to investigate whether changes in hypothesized mechanisms of change are driving improvements in primary outcome measures.

Additionally, although one primary benefit to the intervention is that it is brief, cost-effective, and accessible, future studies could also investigate modifications to the intervention protocol, including in-person sessions, multiple follow-up sessions via phone for added accountability and support, and efficacy of study interventions without the daily monitoring component. Finally, while interventions at the level of the individual are an important first step, it is also necessary to investigate interventions for

burnout at a systems level, including the organization, lab culture, and mentor relationships.

6. Conclusions

While future investigation is important to replicate and extend study findings, the current work was the first to investigate the efficacy of a brief intervention, delivered via technology, to improve burnout and other indices of distress and dysfunction for graduate student populations. Results indicate that an intervention that helps individuals to identify values-consistent activities that they have been avoiding and approach these tasks is effective in reducing burnout, improving well-being, and reducing negative affect, compared to a control condition. In addition, an intervention that helps individuals increase pleasant activities led to significant improvements in well-being, compared to a control condition. While individuals in the control condition showed a significant decrease in positive affect over time, individuals in either intervention condition did not show this decrease in positive affect.

These findings indicate that complex processes such as burnout and well-being are amenable to change through targeted behavioral interventions that can be easily disseminated via phone and online. The potential to easily disseminate a cost-effective intervention that can reach individuals who cannot or will not attend traditional in-person psychotherapies may help to address issues in retention, productivity, and well-being for graduate student populations.

Appendix A

PANAS Questionnaire

This scale consists of a number of words that describe different feelings and emotions. Read each item and then list the number from the scale below next to each word. **Indicate to what extent you feel this way right now, that is, at the present moment *OR* indicate the extent you have felt this way over the past week (circle the instructions you followed when taking this measure)**

1	2	3	4	5
Very Slightly or Not at All	A Little	Moderately	Quite a Bit	Extremely

- | | |
|-----------------------|----------------------|
| _____ 1. Interested | _____ 11. Irritable |
| _____ 2. Distressed | _____ 12. Alert |
| _____ 3. Excited | _____ 13. Ashamed |
| _____ 4. Upset | _____ 14. Inspired |
| _____ 5. Strong | _____ 15. Nervous |
| _____ 6. Guilty | _____ 16. Determined |
| _____ 7. Scared | _____ 17. Attentive |
| _____ 8. Hostile | _____ 18. Jittery |
| _____ 9. Enthusiastic | _____ 19. Active |
| _____ 10. Proud | _____ 20. Afraid |

Appendix B

Daily Activity Monitoring Form

	Activity	Enjoyment 0-10	Importance 0-10
5am to 6am			
6 to 7			
7 to 8			
8 to 9			
9 to 10			
10 to 11			
11 to 12			
12 to 1pm			
1 to 2			
2 to 3			
3 to 4			
4 to 5			
5 to 6			
6 to 7			
7 to 8			
8 to 9			
9 to 10			
10 to 11			
11 to 12			
12 to 1am			
1 to 2			
2 to 5			

Appendix C

Daily Assessment of Mediating Processes

1. "To what extent did you feel a sense of accomplishment over the past 24 hours?" Participants respond on a 11-point Likert scale ranging from 0 (*no accomplishment at all*) to 10 (*extremely high sense of accomplishment*)
2. To what extent did you avoid/procrastinate doing important tasks (e.g., writing a paper, responding to stressful emails) over the past 24 hours?" Participants respond on a 11-point Likert scale ranging from 0 (*no avoidance at all*) to 10 (*extremely high avoidance*)
3. To what extent did you engage in important, but challenging, tasks (e.g., writing a paper, responding to stressful emails) over the past 24 hours?". Participants respond on a 11-point Likert scale ranging from 0 (*no engagement at all*) to 10 (*extremely high engagement*)
4. To what extent did you derive enjoyment and pleasure from your activities over the past 24 hours?" Participants respond on a 11-point Likert scale ranging from 0 (*no enjoyment at all*) to 10 (*extremely high enjoyment*).
5. "To what extent do you feel that you have had an appropriate balance of work and recreational activities over the past 24 hours?" Participants respond on a 11-point Likert scale ranging from 0 (*no balance at all*) to 10 (*extremely high balance*)

Appendix D

School Burnout Inventory

Please choose the alternative that best describes your situation (estimation from previous month):

- 1 = Completely disagree
- 2 = Partly disagree
- 3 = Disagree
- 4 = Partly agree
- 5 = Agree
- 6 = Completely agree

1. I feel overwhelmed by my graduate program _____
2. I feel a lack of motivation in my graduate program and often think of giving up _____
3. I often have feelings of inadequacy in my graduate program _____
4. I often sleep badly because of matters related to my graduate program _____
5. I feel that I am losing interest in my graduate program _____
6. I'm continually wondering whether my graduate program has any meaning _____
7. I brood over matters related to my graduate program a lot during my free time _____
8. I used to have higher expectations of my graduate program than I do now _____
9. The pressure of my graduate program causes me problems in my close relationships with others _____

Appendix E

Phone Coaching Instructions

Orientation/Background

“There is a lot of research that shows that changing your behavior can lead to rapid improvements in mood and emotional well-being. There are two types of behaviors that have been shown to be particularly effective in changing mood.

The first type are behaviors that build “mastery,” which means tasks that give you a sense of pride or accomplishment. These activities are not necessarily inherently pleasant, but they are things that challenge you and are important in some way. For example, doing the dishes or finishing a paper for school might be activities that give you a sense of accomplishment, even though they might be difficult to get started.

The second type are behaviors that build “pleasure,” which means activities that give you a sense of reward or pleasure as you are doing them. These activities can be meaningful (e.g., spending time with friends) or simply fun (e.g., lying in the sun by the pool), but they typically are not done as a “means to an end.” They typically are experienced as fun and pleasurable as they are happening, rather than providing delayed gratification.

Instructions

For the next week, we will be asking you to focus on activities that build [pleasure or mastery, depending on condition; review definition]. You completed the

online form to begin to help us identify together some activities that are likely to build [pleasure or mastery]. Let's review these together.

- Review each activity together, making sure they are highly pleasurable or highly important but avoided.
- Ensure that each activity is achievable in a time period that can be completed in one day. If not, help the participant break down the activity together

Scheduling

One part of interventions that use behavioral change to improve mood is to actively schedule activities for the week. This helps to increase the likelihood that you will remember to do the activity, and helps make sure you can actually do the activities, given your busy schedule. Let's look through your schedule together and select some times for you to complete the activities we just selected.

- Identify specific time slots to complete each activity and enter them into their progress tracking sheet.

Problem Solving

Changing our behavior is often difficult to do. Let's think through together what might get in the way of you completing these activities over the next week and brainstorm what we can do to address these concerns.

- Identify potential barriers and create a plan for how they can cope with common barriers (e.g., motivation, time)

Appendix F

Reward Intervention Worksheet

Listed below are a series of life domains that people may value in life. Please read through the following prompts and consider which of these domains you find particularly meaningful.

- **Family:** What kind of relationships do you want to have with your family? What sort of brother / sister / mother / father / aunt / uncle / niece / nephew do you want to be? How do you want to be in those relationships?
- **Marriage/Couple/Intimacy:** What kind of husband / wife / partner do you want to be? What kind of relationship do you want to be a part of? What sort of partnership do you want to build? What kind of person do you want to be in a relationship?
- **Friendships/Social Life:** What sort of friend do you want to be? What friendships is it important to cultivate? How would you like to act towards your friends? What kind of social life matters to you?
- **Career/Employment:** What kind of work is valuable to you? What qualities do you want to bring as an employee? What kind of work relationships would you like to build? What kind of work matters to you?
- **Education/Personal Growth and Development:** How would you like to grow as a person? What kind of skills would you like to develop? What matters to you about education and learning? What would you like to know more about?
- **Recreation/Fun/Leisure:** How would you like to enjoy yourself? What relaxes you? When are you most playful?
- **Spirituality:** What kind of relationship do you want with God / nature / the Earth?
- **Citizenship/Environment/Community:** What kind of environment do you want to be a part of? How do you want to contribute to your community? What kind of citizen would you like to be?
- **Health/Well-Being:** What kind of values do you have regarding your physical wellbeing? How important to you is your health? How do you want to look after yourself?

1. Please select 3 life domains that you find particularly meaningful to you at this time in your life. Keep in mind that these do not have to be the domains that you currently devote the most time to - they are just the things that you find important.

- Family (1)
- Marriage/couple/intimacy (2)
- Friendships/social life (3)
- Career/employment (4)
- Education/personal growth and development (5)
- Recreation/fun/leisure (6)
- Spirituality (7)
- Citizenship/environment/community (8)
- Health/well-being (9)

Now we ask that you spend some time thinking about your values within the life domains you just selected. Our values reflect what we find meaningful in life. They are what you care about, deep down, and what you consider to be important. Everybody's values are different, and they can change over time. They reflect how we want to engage with the world, with the people around us, and with ourselves. Values are different from goals. Put crudely, goals can be achieved whereas values are more like directions that we want to head in. For example we might have the value of being a good parent which may require a lifetime's effort, and the specific achievable goal of getting our children to school on time. Or we might have the goal of going for a jog while placing value upon our physical health.

2. For each of the domains write a brief description of your values (e.g. to be a caring partner [marriage], to never stop learning [personal development], to deepen my relationship with nature [spirituality]). Then rate each domain according to how important it is to you (0 = not important, 10 = very important). Finally, give each domain a rating according to how successfully you have lived your life in accordance with this value in the past month (0 = not at all well, 10 = very well).

	Description of your values (1)	Importance (2)	Success (3)
Domain 1:			
Domain 2:			
Domain 3:			

3. Now, for each domain, we ask that you identify activities that you have found fun or rewarding in the past or believe you would find rewarding. Please list between 2-4 pleasant activities that you have not done for the past month, but would like to be doing more regularly. Then, please rate how much you believe you would enjoy the activity (0 = not at all enjoyable, 10 = very enjoyable) and how difficult you think it would be to complete the activity in the next week (0 = extremely easy, 10 = impossible).

	Activity (1)	Enjoyment (2)	Difficulty (3)
Domain 1, Activity 1			
Domain 1, Activity 2			
Domain 1, Activity 3			
Domain 1, Activity 4			

Domain 2, Activity 1			
Domain 2, Activity 2			
Domain 2, Activity 3			
Domain 2, Activity 4			
Domain 3, Activity 1			
Domain 3, Activity 2			
Domain 3, Activity 3			
Domain 3, Activity 4			

Appendix G

Approach Intervention Worksheet

Listed below are a series of life domains that people may value in life. Please read through the following prompts and consider which of these domains you find particularly meaningful.

- **Family:** What kind of relationships do you want to have with your family? What sort of brother / sister / mother / father / aunt / uncle / niece / nephew do you want to be? How do you want to be in those relationships?
- **Marriage/Couple/Intimacy:** What kind of husband / wife / partner do you want to be? What kind of relationship do you want to be a part of? What sort of partnership do you want to build? What kind of person do you want to be in a relationship?
- **Friendships/Social Life:** What sort of friend do you want to be? What friendships is it important to cultivate? How would you like to act towards your friends? What kind of social life matters to you?
- **Career/Employment:** What kind of work is valuable to you? What qualities do you want to bring as an employee? What kind of work relationships would you like to build? What kind of work matters to you?
- **Education/Personal Growth and Development:** How would you like to grow as a person? What kind of skills would you like to develop? What matters to you about education and learning? What would you like to know more about?
- **Recreation/Fun/Leisure:** How would you like to enjoy yourself? What relaxes you? When are you most playful?
- **Spirituality:** What kind of relationship do you want with God / nature / the Earth?
- **Citizenship/Environment/Community:** What kind of environment do you want to be a part of? How do you want to contribute to your community? What kind of citizen would you like to be?
- **Health/Well-Being:** What kind of values do you have regarding your physical wellbeing? How important to you is your health? How do you want to look after yourself?

1. Please select 3 life domains that you find particularly meaningful to you at this time in your life. Keep in mind that these do not have to be the domains that you currently devote the most time to - they are just the things that you find important.

- Family (1)
- Marriage/couple/intimacy (2)
- Friendships/social life (3)
- Career/employment (4)
- Education/personal growth and development (5)
- Recreation/fun/leisure (6)
- Spirituality (7)
- Citizenship/environment/community (8)
- Health/well-being (9)

Now we ask that you spend some time thinking about things that are important to you within the life domains you just selected, but that you have been avoiding because they may generate unpleasant emotions. Some examples may include:

- Friendships: It is important to me that I meet new people and build my social support network, but I get anxious when I think about being around a group of strangers.
- Career/Employment: It is important to me that I publish papers in my field, but I feel overwhelmed thinking about starting to write.
- Recreation/Fun/Leisure: It is important to me that I take time to see my friends, but I feel too overwhelmed and down to motivate myself to do anything after work.

There are a number of ways in which we might avoid. We might procrastinate by doing other things, we may try not to think about stressful things, or we may rationalize reasons why those things aren't priorities right now. The domains listed above are

valued by some people; some you may think are important, and others that don't matter so much to you. There are no 'right' answers. Read the descriptions and think about what makes for a meaningful life that you could value, and then the things you might be doing to avoid important activities.

2. For each of the domains write a brief description of activities that are important to you, but that you have been avoiding (e.g. to be a communicative partner [marriage], to be a productive scholar [education], to deepen my relationship with nature [spirituality]). Then rate each activity according to how important it is to you (0 = not important, 10 = very important). Finally, give each domain a rating according to how much you have been avoiding the activity in the past month (0 = no avoidance at all, 10 = extreme avoidance).

	Description of important activity (1)	Importance (2)	Avoidance (3)
Domain 1:			
Domain 2:			
Domain 3:			

3. Now, for each domain, we ask that you identify small, achievable activities that you could accomplish in 30 minutes to 1 hour that would bring you closer to the thing you have been avoiding. Please list between 2-4 activities that you have not done for the past month, but would like to be doing more regularly. Then, please rate how much you believe you would feel pride and accomplishment from completing the activity (0 = no

pride at all, 10 = extremely proud) and how challenging you think it would be to complete the activity in the next week (0 = extremely easy, 10 = impossible).

	Activity (1)	Enjoyment (2)	Difficulty (3)
Domain 1, Activity 1			
Domain 1, Activity 2			
Domain 1, Activity 3			
Domain 1, Activity 4			
Domain 2, Activity 1			
Domain 2, Activity 2			
Domain 2, Activity 3			
Domain 2, Activity 4			
Domain 3, Activity 1			
Domain 3, Activity 2			
Domain 3, Activity 3			
Domain 3, Activity 4			

Appendix H

Demographic Data Survey (DDS)

1. **Sex (please circle):** Male Female Other
2. **Age (in years)** _____
3. **Were you born in the United States (please circle):** YES NO

If you were not born in the United States:

3a in what country were you born? _____

3b. At what age did you move here? _____

4. **Is your ethnic background Hispanic or Latino? (Please circle):** YES NO
5. **What is your racial background?** _____

1=White/Caucasian

2=Native American, American Indian, or Alaska Native

3=Black or African American

4=Chinese or Chinese American

5=Japanese or Japanese American

6=Korean or Korean American

7=Other Asian or other Asian American (includes India, Malaysia, Pakistan, Philippines)

8=East Indian

9=Middle Eastern/Arab

10=Native Hawaiian or other Pacific Islander

11=Other (Please specify _____)

12=More than one other racial group (List all
: _____)

6. **What is your current marital status?** _____

1. Single never married [currently in a relationship]
2. Single never married [not currently in a relationship]
3. Widowed
4. Married
5. Separated
6. Divorced

7. **What is your current living situation?** _____

1. Living alone

- 2. Living with roommates
- 3. Living with romantic partner
- 4. Living with parents
- 5. Other (Please specify _____)

8. How many children do you have? _____

8a. If you have children, how many are currently living with you? _____

9. Salary Range: *(In a year, please check which category best reflects your personal income [gross salary/pre-tax] or combined income if married)*

- _____ 0 - \$10,000
- _____ \$10,001 - \$20,000
- _____ \$20,001 - \$40,000
- _____ \$40,001 - \$65,000
- _____ \$65,001 - \$100,000
- _____ more than \$100,000

10. Do you currently have financial support from your family of origin (e.g., parents, grandparents, other family or family friends)? YES NO

10a. If yes, please specify average amount received monthly _____

11. Do you currently have financial income from sources outside of your doctoral program or spouse's income? YES NO

11a. If yes, please specify average amount received monthly _____

11b. If yes, please specify the source of additional income _____

12. Do you currently have debt from student loans? YES NO

12a. If yes, please specify amount due monthly _____

12b. If you are not currently repaying debt, total amount of deferred debt _____

13. Do you currently have credit card debt? YES NO

13a. If yes, please specify total amount _____

14. Is your current income covering your household expenses? YES NO

15. Family of Origin Salary Range: *(please check combined income if parents/caregivers are married [gross/pre-tax])*

- 0 - \$10,000
- \$10,001 - \$20,000
- \$20,001 - \$40,000
- \$40,001 - \$65,000
- \$65,001 - \$100,000
- more than \$100,000

16. How many of your immediate family (e.g., children, siblings, parents, spouse) live in your geographic area (within a 50-mile radius of you)? _____

17. Have you drunk caffeinated beverages in the past month? YES NO

17a. If yes, number of cups per day (on average):

- <1
- 1-2
- 3-4
- 5-6
- 7-8
- 9-10
- 10+

18. Please list any mental health or addiction problems you had prior to beginning your graduate program:

19. Please list any mental health or addiction problems you have had beginning your graduate program:

20. Please list any physical health problems that present problems:

21. Please list your primary graduate program or department (e.g., clinical psychology, cell and molecular biology, etc.): _____

22. Year in Program:

- _____ 1
- _____ 2
- _____ 3
- _____ 4
- _____ 5
- _____ 6
- _____ 7+

23. Number of classes you are currently enrolled in _____

24. During your graduate career, have you ever been placed on academic probation (please circle): YES NO

25. In a typical week over the last 12 months, how many hours have you spent on:

- _____ Research
- _____ Academic classwork
- _____ Teaching responsibilities
- _____ Other professional development (e.g. networking, informational interviewing)
- _____ Service activities, volunteering, or community outreach
- _____ Household responsibilities
- _____ Recreational activities

26. How frequently do you meet with your advisor (select one):

- _____ More than once per week
- _____ Weekly
- _____ Every other week
- _____ Monthly

- Less than once per month
- As needed (specify _____)

27. Would you ideally meet with your advisor (select one):

- More frequently than you currently do
- The same amount as you currently do
- Less frequently than you currently do

28. In the past twelve months, please indicate the frequency with which you have thought about dropping out of/leaving your graduate program (select one):

- Never
- Once or twice in the past year
- Once/twice per semester
- Monthly
- More than once a month
- Weekly
- More than once a week
- Daily

29. In the past twelve months, which of the following four scenarios best describes how you feel about continuing your graduate training (select one):

- No thoughts about dropping out/leaving
- Fleeting thoughts about dropping out/leaving, with no intent to act on thoughts
- Active consideration of dropping out/leaving, with no action taken
- Active steps taken to leave program

30. In the past twelve months, have you experienced an emotional or stress-related event that significantly affected your academic performance (Please Circle): YES NO

Appendix I

Modified Work and Social Adjustment Scale

For the following items, please rate the extent to which mental-health related problems (e.g., stress, anxiety, depression) have impacted your functioning in different life domains:

	0 <i>No Impairment At All</i>							8 <i>Very Severe Impairment</i>	
Because of mental health challenges, my ability to work is impaired.	0	1	2	3	4	5	6	7	
Because of mental health challenges, my home management (cleaning, tidying, shopping, cooking, looking after home or children, paying bills) is impaired.	0	1	2	3	4	5	6	7	
Because of mental health challenges, my social leisure activities (with other people, such as parties, bars, clubs, outings, visits, dating, home entertainment) are impaired.	0	1	2	3	4	5	6	7	
Because of mental health challenges, my private leisure activities (done alone, such as reading, gardening, collecting, sewing, walking alone) are impaired.	0	1	2	3	4	5	6	7	

Because of mental health challenges, my ability to form and maintain close relationships with others, including those I live with, is impaired.	0	1	2	3	4	5	6	7
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Biography

Caitlin M. Fang was born in Brookline, Massachusetts and raised in Weston, MA. She received a Bachelor of Arts degree in Psychology, with a minor in Women's Studies and a Certificate in the Study of Sexualities, from Duke University in Durham, NC, in May of 2010. Her senior thesis was a review on emotion regulation deficits in borderline personality disorder. Ms. Fang completed her doctoral work in Clinical Psychology at Duke University with a focus on research investigating emotion regulation, as well as the development and evaluation of brief, evidence-based interventions. Under the mentorship of M. Zachary Rosenthal, she has co-authored 7 publications that have been published in a diverse set of peer-reviewed journals, as well as one book chapter. As a doctoral student, Ms. Fang served as the primary mentor for multiple undergraduate researchers conducting independent empirical research projects and co-developed a blended learning curriculum to train community clinicians in cognitive behavioral therapies. For this work, she was awarded a Summer Research Fellowship and a position as a mentor in Duke's Vertical Integration Program. As part of her doctoral studies, Ms. Fang completed a clinical Internship at Duke University Medical Center in the Adult Cognitive Behavioral Therapy track. Ms. Fang lives with her dog in Durham, North Carolina, and will pursue post-doctoral training at Duke University Medical Center.