THE ROLE OF PAIN CATASTROPHIZING, BODY MASS INDEX, AND SEX IN EXERCISE RATES AMONG PARTICIPANTS IN AN ORGANIZATIONAL WELLNESS PROGRAM

by

JULIE CUNNINGHAM

BEVERLY THORN, COMMITTEE CHAIR
NATALIE DAUTOVICH
REBECCA KELLY
MARTHA CROWTHER
STEVE PRENTICE-DUNN

A DISSERTATION

Submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Department of Psychology in the Graduate School of the University of Alabama

TUSCALOOSA, ALABAMA

2016
ABSTRACT

Maladaptive cognitions that emerge in response to exercise-related pain detract from sports participation among athletes, yet these same cognitive patterns have not been widely studied among individuals engaging in non-competitive physical activity. The present study examined pain catastrophizing – a cognitive construct that is characterized as a ‘negative mental set’ that may be adopted in the face of pain stimuli—among participants engaged in an organizational wellness program. The primary aim was to determine if either dispositional or situational pain catastrophizing predict exercise rates among these participants. Additionally, this investigation examined exercise rates and pain catastrophizing among two groups that have historically had lower rates of physical activity: individuals with obesity and women. Participants were 373 faculty and staff members at the University of Alabama who were participating in Crimson Couch to 5K, a program that trains individuals to run or walk a 5K event at the end of 9 weeks. Participants completed measures at the beginning, middle, and end of the program, which assessed pain catastrophizing, biometric information, aerobic exercise rates, and a range of health-related variables. Neither dispositional nor situational pain catastrophizing predicted exercise rates at the conclusion of the program. There were no differences in exercise rates or pain catastrophizing between men and women. However, BMI predicted a small percentage of the variance for baseline exercise rates as well as dispositional and situational catastrophizing. Future research will encompass the development of a new measure to assess a broader and more applicable range of negative cognitions that emerge in response to exercise-related pain.
LIST OF ABBREVIATIONS AND SYMBOLS

\( a \) Cronbach’s index of internal consistency

\( \beta \) (SE) The standard effort the regression coefficient

\( \text{beta} \) The probability that a statistic will generate a false-negative result

\( df \) Degrees of freedom: number of values free to vary after certain restrictions have been placed on the data

\( F \) Fisher’s \( F \) ratio: A ratio of two variances

\( M \) Mean: the sum of a set of measurements divided by the number of measurements in the set

\( N \) Size of the sample

\( \eta \) The linear predictor for a linear regression model

\( p \) Probability associated with the occurrence under the null hypothesis of a value as extreme as or more extreme than the observed value

\( r \) Pearson product-moment correlation

\( R^2 \) Coefficient of determination: proportion of variability in a dataset that is accounted for by the statistical model

\( t \) Computed value of \( t \) test

\( \text{SD} \) Standard deviation: a measure of variability from the mean

\(< \) Less than

\( > \) Greater than

\( = \) Equal to
ACKNOWLEDGEMENTS

I am grateful to have had the help and support of a number of colleagues, friends, and family throughout this long process. First, I am so appreciative of my advisor, Bev Thorn, for the numerous discussions—all the brainstorming and problem solving, her always wise and reassuring words, and for being a shining example of what it means to be a ‘health-y’ psychologist. I’d also like to thank all my committee members, Natalie Dautovich, Martha Crowther, Steve Prentice-Dunn, and Rebecca Kelly for their invaluable input and genuine interest and support of this project. In particular, I am grateful to Rebecca Kelly for affording me the opportunity to work with her department, the Office of Health Promotion and Wellness, and become involved with Crimson Couch to 5K. Additionally, I am thankful for the assistance of all the members of the Health Promotion and Wellness Team who have welcomed me and been so accommodating. I am indebted to all the participants of this project who shared their enthusiasm, insights, and, of course, time. Finally, I’d like to thank my wonderful lab-mates of the Pain Management Team for all their support – both instrumental and emotional – in this endeavor.
CONTENTS

ABSTRACT .............................................................................................................. ii

LIST OF ABBREVIATIONS AND SYMBOLS .................................................. iii

ACKNOWLEDGEMENTS ....................................................................................... iv

LIST OF TABLES .................................................................................................. vi

1. INTRODUCTION ............................................................................................... 1

2. THE CURRENT STUDY .................................................................................... 26

3. METHOD .......................................................................................................... 30

4. RESULTS .......................................................................................................... 39

5. DISCUSSION .................................................................................................. 51

REFERENCES ...................................................................................................... 69

APPENDIX ............................................................................................................ 78
LIST OF TABLES

1. Participant Means and Standard Deviations (SD) for Health-Related Variables Measured at Time 1 and Time 3 of Crimson Couch to 5K .................................................41

2. Means and Standard Deviations (SD) for PCS Variables.................................................43

3. Correlation Matrix for Crimson Couch to 5K Variables.....................................................45

4. Summary of Hierarchical Multiple Regression Analyses for Catastrophizing Variables Predicting Time 3 Exercise Rates.................................................................47

5. Summary of Hierarchical Multiple Regression Analyses for BMI Predicting Exercise Rates.................................................................................................................49

6. Summary of Hierarchical Multiple Regression Analyses for BMI Predicting Catastrophizing Variables..............................................................50
Introduction

High rates of physical inactivity contribute to a variety of health conditions and decreased life expectancy, posing a serious threat to the majority of American adults. Most people are aware, to some degree, of the detriment of a sedentary lifestyle and numerous health initiatives designed to promote exercise exist, yet physical inactivity continues to be a significant societal problem. Certain groups, including women and individuals with obesity, appear to be particularly at risk for engaging in low exercise rates. Initial research within the context of exercise and sports suggests that cognitive and emotional experiences related to physical activity contribute to a range of outcomes including dropout rates and level of participation in these activities. A burgeoning area of research has begun to explore the role of one particular cognitive factor, catastrophic thinking, within athlete populations. Results suggest that the thoughts and feelings individuals have in response to exercise-related pain influences their future engagement (or lack thereof) in their respective sport. Is it possible that within general physical activity contexts, cognitive variables such as pain catastrophizing may play a role in shaping exercise rates?

Physical Activity

The health benefits of regular physical activity have been documented time and again through research, with this information being widely disseminated to encourage people to adopt more active and healthy lifestyles. Adults who consistently engage in physical activity outlive those who have adopted a more sedentary lifestyle and are less likely to be affected by a variety of debilitating diseases including coronary heart disease, hypertension, diabetes, and colon
cancer. In addition to its preventative characteristics, physical activity enhances bone and joint health and general functioning of the cardiovascular system (U.S. Department of Health and Human Services, 1996). The psychological effects of adopting an active lifestyle are also notable: the risk of developing depression decreases, and symptoms of depression and anxiety are mitigated through regular exercise (Martinsen & Stephens, 1994; U.S. Department of Health and Human Services, 1996). In fact, exercise has been demonstrated to be as effective in reducing depressive symptoms as antidepressants and even more effective than antidepressants in preventing relapse (Babyak et al., 2000).

Considerable cross-sectional research, both at the national and state level, has been conducted over the last few decades through the US Department of Health and Human Services and related organizations such as NIH, to reach these conclusions and to determine the type and amount of exercise necessary to attain these salubrious outcomes. Recommendations issued in the Surgeon General’s Report of Physical Activity (1996) and subsequent publications advise the following levels of engagement to tap into these benefits: 30 minutes of moderate activity most days of the week or activities of a vigorous nature for 20 minutes at least three days a week. These recommendations are supported by the American College of Sports Medicine, a major sports medicine and exercise science organization, which similarly advises 30 minutes of moderate activity five days a week (Garber et al., 2011).

Physical activity of moderate intensity—sometimes also referred to as “regular, sustained activity” in public forums—is characterized by sustained rhythmic muscle activity and a rise of heart and respiratory rate where talking can still be done comfortably. Vigorous intensity is defined by sustained contractions of large muscle groups and reaching, at a minimum, 50% of one’s cardiorespiratory capacity; talking would be difficult at this intensity. Moderate intensity
activities include brisk walking, certain house/yard work, and bicycling, whereas running and swimming are characterized as exercise of vigorous intensity (Sallis & Owen, 1999; U.S. Department of Health and Human Services, 1996; World Health Organization, 2012). In general, it appears there is a dose-response relationship between the level of activity and degree of benefits conferred. People who engage frequently in longer bouts of exercise have better cardiovascular health and less risk of a multitude of conditions than those whose activity is of shorter duration and irregular basis (U.S. Department of Health and Human Services, 1996).

Despite evidence demonstrating the profound effects on physical and mental health described earlier and the lengths to which educators, healthcare providers, and government agencies have gone to share this information, more than 60% of adults fail to meet the recommendations put forth by the Surgeon General. Furthermore, a quarter of the American population does not engage in any physical activity during their leisure time (U.S. Department of Health and Human Services, 1996). Children and teenagers appear, however, to more closely approach optimal levels of physical activity; unfortunately, research has consistently shown that exercise rates decrease with age. In addition to age, low socioeconomic status, female sex, and ethnic minority status are all variables related to lower activity rates (Caspersen, Pereira, & Curran, 2000; Plotnikoff, Mayhew, Birkett, Loucaides, & Fodor, 2004; Sternfield, Ainsworth, & Quesenberry, 1999; U.S. Department of Health and Human Services, 1996).

The issue of inactivity extends beyond inadequate rates of exercise: it also encompasses the adoption of a sedentary versus active lifestyle. The milieu of modern society—with technological advances that have dramatically changed the ways Americans work, travel, and communicate—promotes inactivity as people spend more time sitting at computers, TVs, and cars, and less time walking, standing, and performing physical tasks. The typical adult spends 7-
10 hours a day engaged in sedentary behavior (Matthews et al., 2008) and it appears that this degree of sedentary behavior—even for those who otherwise meet the Surgeon General recommendations for physical activity—indeed contributes to variety of health problems (Owen, 2012; Patel et al., 2010; Thorp, Owen, Neuhaus, & Dunstan, 2011).

One longitudinal study of 123,216 Americans found that men who sit for at least six hours a day were 17% more likely to die during the course of the study than those with a more active daily lifestyle. For women, their heightened risk of mortality during this time was 34%. A testament to the robust effect of an active, engaged lifestyle, these results were determined after controlling for weight, smoking, and exercise rates (Patel et al., 2010). While the promotion of exercise has been the forefront of much research and health initiatives, it is important to recognize that an active lifestyle incorporates not just exercise but activities and behaviors involving movement—of some degree—throughout the day.

Factors Related to Engagement in Physical Activity

Low rates of engagement in physical activity may seem surprising considering the wealth of empirical support documenting the health-related benefits of exercise. However, several studies have shown that knowledge of these benefits in of itself is not associated with engaging in regular physical activity (Sallis & Owen, 1999). Instead other factors, including individual variables (e.g., sex, age) and specific characteristics of exercise (e.g., intensity, group-based versus individual), appear to better predict engagement in physical activity (Sallis & Owen, 1999).

Self-efficacy has been the variable most strongly linked to higher rates of physical activity and adherence. Generalizable as well, this factor has been found to have strong relations to exercise across age, sex, race, program types, exercise status (beginners versus experienced
exercisers), etc. (Trost, Owen, Bauman, Sallis, & Brown, 2002). It is, however, a highly specific construct in terms of its ability to predict engagement and skill in any domain, especially so with physical activity. People can vary greatly in self-efficacy across different physical tasks, for instance, rating their efficacy in walking during nice weather as high but running in rainy or cold weather as low. Therefore, researchers conclude that the best measures of self-efficacy are highly specific, directly focusing on certain tasks rather than exercise in general. Furthermore, self-efficacy appears to be particularly important at certain time points during the initiation and acquisition of an exercise program: the initial decision to start exercising and, if relevant, the transition from participation in a formal program to maintaining physical activity on one’s own (Sallis, Hovell, & Hofstetter, 1992).

Other modifiable variables—those, unlike sex, race, etc., that can potentially be influenced by interventions, the passage of time, or other factors—that are correlated with exercise include enjoyment of exercise, intention to exercise, and healthy dietary habits. Conversely, a few factors have repeatedly—and surprisingly—been found to be unrelated to exercise across a number of investigations: history of physical activity during childhood, knowledge of exercise and its benefits, and susceptibility to illness. While knowledge is not linked to participation in exercise, as previously mentioned, whether or not individuals believe that they themselves will be able to access its benefits is positively correlated to physical activity (Sallis, Hovell, & Hofstetter, 1992; U.S. Department of Health and Human Services, 1996). Social support also appears to be an invaluable factor in shaping people’s engagement in exercise, particularly so for women. This is a broad factor that encompasses many important aspects of social influence in exercise including number of friends who are physically active, modeling, having workout buddies, and having friends/family who encourage and support an
active lifestyle directly (e.g., giving positive verbal feedback and advice) and indirectly (e.g., providing childcare so a person has the opportunity to workout) (Sallis, Hovell, & Hofstetter, 1992; U.S. Department of Health and Human Services, 1996). Consideration of several variables related to exercise rates that are not amenable to modification (or at least, not so easily), such as sex and body mass index, will be presented later on.

Understanding variables that are associated with exercise engagement plays a critical role in helping individuals tap into the many health benefits of an active lifestyle. Especially important are understanding variables that predict and promote adherence to an exercise program, rather than just initiation. While many adults do initiate exercise programs at different points in their lives, adherence to regular activity is fairly low: 50% of people starting a new exercise program will have stopped by the 6 month mark (Dishman & Buckworth, 1997). Exercise intensity is one factor that has a well-established relationship to adherence: while approximately 50% of participants drop out of high intensity programs (defined as vigorous activities—such as running or swimming—that raise heart rate to 50-85% of the maximum heart rate), only 25-35% drop out of moderate intensity activities. This finding appears to have less to do with an increased risk of injury that may come with vigorous forms of activity (Sallis et al., 1986) and more due to greater negative emotional reactions to intense forms of exercise (Bixby, Spalding, & Hatfield, 2001; Ekkekakis, Hall, & Petruzzello, 2004; Lind, Welch, & Ekkekakis, 2009). Increasing intensity is often associated with rising levels of discomfort, and even pain, which may explain why fewer adhere to vigorous rather than moderate levels of exercise (Roth, 1974; Williams et al., 2008).
Pain Experiences in Physical Activity

Several different types of pain associated with exercise/sport settings have been identified, including injury-related pain, muscle soreness resulting from exertion, and pain associated with exertion itself (Dannecker & Koltyn, 2014). The latter two injury-free forms of pain result from a combination of factors including depletion of glycogen stores, a build-up of lactic acid, dehydration, and muscle exhaustion (Brooks, Fahey, & White, 1996; Fisher, 1990). While exertion pain occurs during the activity itself, muscle soreness can be a delayed reminder of the unpleasant sensations that can occur during exercise. One group of researchers found that this sort of delayed onset muscle pain significantly interfered with participants’ engagement in the activities of daily life (e.g., household chores) in addition to making future exercise sessions more uncomfortable (Dannecker, Price, O’Connor, & Robinson, 2008).

There is some question as to whether these physical sensations, ranging from muscle aches to fatigue to exertion, would be best described as pain or whether it would be more accurate to label them as physical discomfort, unpleasantness, etc. Most of the literature studying these physical activity experiences related to muscle soreness, exertion, and injury do use the term ‘pain’ to describe these sensations (Dannecker & Koltyn, 2014). Additionally, participants involved in sports/exercise have indicated that pain, specifically, is an expected—and even valued—component of their activity (Kress & Statler, 2007). For instance, colloquial expressions such as “no pain, no gain” suggest that people see an association between discomfort/exertion and reaching their physical activity goals. For the sake of conceptualization and continuity with other related lines of research, the term ‘pain’ will be used in this investigation to describe these physical sensations related to exercise.
Given that pain is a common experience in physical activity participation, a person’s cognitive and emotional reactions to this stress—including their ability to cope—is critical in our understanding of how pain may affect performance and adherence. As expressed by Whitmarch and Alderman, “the benefits of high pain tolerance, however, are not limited to the medical world alone, but are also desirable in the area of athletics. The athlete who has a high level of pain tolerance is expected to achieve a higher level of performance than the athlete with a low level of pain tolerance (1993, p. 388).” There is a substantial body of literature examining how athletes use cognitive strategies to cope with strenuous activity and therefore enhance their pain tolerance. For example, athletes commonly report using both association and dissociation, two coping tactics making use of focused attention and cognitive distraction respectively, to deal with the pain and exhaustion associated with their sports (Anshel, Jamieson, & Raviv, 2001; Deroche, Woodman, Stephan, Brewer, & Le Scanff, 2011; Masters & Lambert, 1989).

However, the literature looking at psychological factors associated with persistence in physical activity, such as coping strategies, has targeted athletes rather than individuals engaged in physical activity for the sake of fitness and wellness. Athletes likely differ from non-competitive exercisers in several key ways. Through athletes’ high level of commitment and involvement with their sport, they have had the opportunity to develop coping strategies that work for them in managing exertion pain and exhaustion. Additionally, they are more likely to report that pain is an expected and accepted part of their activities, thus they may tend to perceive pain accompanying workouts/training in more positive ways. For instance, they may see it as an indication that they are truly pushing themselves and view it as a challenge rather than a threat (Kress & Statler, 2007). People who exercise non-competitively may have different expectations and perceptions of physical activity and pain that is associated with their workouts.
Several factors may be related to higher ratings of pain during workouts, including exercise intensity. The intensity of a workout varies person to person, depending on their previous experience with exercise and their overall level of fitness (World Health Organization, 2012). Therefore, individuals who have previously been sedentary may initially find exercise more intense than active peers and, consequently, report more discomfort and fatigue. Additionally, experimentally induced pain procedures have demonstrated that healthy, sedentary individuals rate painful stimuli in general as more intense than athletes and have a lower pain tolerance (Sullivan et al., 2000). Expectations of pain, too, seem to play a role in whether physical activity proves to be uncomfortable. In one study of marathon runners, expectations of “hitting the wall,” an experience characterized by exhaustion and marked discomfort, proved to be the best predictor of whether runners actually did have that experience during the race (Burman, Brewer, & Cornelius, 2009; Burman, Brewer, Cornelius, Van Raalte, Petitpas, 2008).

**Pain Catastrophizing: A Conceptual Understanding**

Similar to these runners expecting—and ultimately begetting—“the worst” during a race, cognitive factors can play an important role in the perception of pain. Catastrophizing is well recognized as being one of the most influential and widely studied of these psychological factors. This construct describes the sense of helplessness, rumination, and magnification of the negative experience that may sometimes be activated in the face of a stressful event (Sullivan, Bishop, & Pivik, 1995). From a general perspective, catastrophizing is the tendency to focus on the “worst possible outcome,” imagining its likelihood, far greater, and magnitude of potential consequences, far worse, than reality dictates.

Within the context of pain, catastrophic thinking is connected to a number of adverse outcomes, including increased pain severity, greater functional impairment, and lower threshold
and tolerance of pain (Keefe et al., 2004; Sullivan et al., 2000). These findings appear to hold true across varied populations: experimental samples, patients with pain-related conditions, and individuals enduring procedural pain in medical settings (Sullivan et al., 1998; Sullivan & D’Eon, 1990; Sullivan & Neish, 1999). Although pain catastrophizing has strong positive correlations with related variables such as depression, state and trait anxiety, fear of pain, and neuroticism, it explains unique variance and is a significant mediator/predictor for pain responses (and other outcomes) when controlling for these factors (Martin et al., 1996; Sullivan et al., 2001; Sullivan et al., 1995; Walsh, Smith, & McGrath, 1998).

Despite the prominence of catastrophizing within the body of literature examining psychological factors involved in pain experiences, there is relatively little attention given to its theoretical underpinnings. Several conceptual frameworks that have been explored in the literature include a schema-activation model, a communal coping model, and the transactional model of stress. The schema-activation model purports that individuals develop “pain schemas”—cognitive sets specific to pain stimuli—based on previous experiences that guide people in how to think and feel about pain. According to this idea, people who tend to catastrophize may have developed a particularly negative cognitive script regarding pain, based on past encounters, and view any potential pain source as unfailingly aversive and threatening. This framework will shape future encounters, given that this pattern of ruminative, pessimistic thinking is activated whenever pain is experienced or imminent (Sullivan, Bishop, and Pivik, 1995; Sullivan et al., 2001; Turk and Rudy, 1992).

Other theorists have taken more of a social/environmental approach in understanding pain catastrophizing, focusing on how interpersonal dynamics influence the pain experience. For instance, the communal coping model theorizes that catastrophizing serves a communicative
function, allowing individuals experiencing pain to solicit support from others by expressing their discomfort—either behaviorally or verbally—and, consequently, influencing their ability to cope with that particular situation. This model recognizes how learning theory contributes to the process; receiving comfort or special treatment from friends and family may reinforce expressions of pain and eventually lead to increased pain behaviors (Tsui et al., 2012; Sullivan et al., 2001; Sullivan, 2012).

The transaction model of stress, another conceptual framework, has become increasingly popular in terms of its application to this body of research. This model, first described by Lazarus and Folkman (1985), explains the process through which individuals respond to stress by delineating several key components: appraisals of the presenting situation, the individual’s coping resources and tendencies, and beliefs about one’s ability (to cope) and the context. In this model, primary appraisals are the initial evaluations made by an individual when s/he is first confronted by a stressor, be it pain-related or otherwise; it is the time when the possibility of danger or harm is assessed. The stressor may be interpreted as a threat (i.e., feeling unprepared and incapable of dealing with the situation), a harm/loss (i.e., perceiving negative or damaging outcomes associated with the situation), or a challenge (i.e., efficacy in being able to persevere and successfully deal with the situation). Secondary appraisals are evaluations that determine whether a person believes s/he possesses the coping abilities necessary to deal effectively with the stressor (Haythornthwaite & Heinberg, 1999; Thorn, Rich, & Boothby, 1999). The interplay between primary and secondary appraisals determines what actions a person will take in response to the stressor.

Catastrophizing can be viewed as both a primary and secondary appraisal: activation of these maladaptive thinking patterns both reflects an evaluative process and an individual’s fears
about being unable to handle the emergent situation. In consideration of this construct’s factors (i.e., magnification of the negative experience, rumination, and helplessness), magnification and rumination appear to function as primary appraisals, as they determine whether an individual will view a stressor as a threat, challenge, or source of harm. As the third factor shapes one’s efficacy in how they well they believe they can handle this stress, helplessness mirrors secondary appraisal processes (Hammerstein & Burton; Thompson, 2010).

To elucidate how catastrophizing fits into the transactional model of stress, consider the following example of an individual who is experiencing exertion pain during a workout. As this individual’s cardiorespiratory rate rises during exercise, she may begin to experience associated discomfort and, in turn, make an appraisal of these sensations. If she assesses this experience as an opportunity to improve her fitness and move closer towards her personal goals, this workout becomes viewed as a challenge. If catastrophic thinking is activated, and she sees the pain as an indication that she’s pushed herself too hard and may be too fatigued/sore later in the day to accomplish other tasks then the workout may be perceived as harm/loss or a threat. In accordance with secondary appraisal processes, if she sees herself as possessing the energy, strength, or fitness abilities to effectively handle the task, then she will use these personal resources to meet the challenge. Instead, if feeling helpless in the face of potentially impending stress, discomfort, or loss (of skills, energy, etc.) then she may balk, ending her workout early and perhaps being less inclined to exercise in the future.

**Pain Catastrophizing Within Sports and Exercise**

Although there is considerable research examining athletes’ experiences with pain in general (e.g., recovery from injury, coping strategies used during periods of heavy exertion), there appears to be little research looking specifically at pain catastrophizing. In one of these
few studies, it was observed that catastrophizing was a frequent response to pain during sporting events of college athletes from a variety of different sports (Meyers, Bourgeois, Stewart, and LeUnes, 1992). The student athletes involved in this investigation were asked to answer several open-ended questions, which ultimately informed the development of a sports-specific measure assessing coping responses to pain. The researchers labeled the common negative coping strategy that emerged in these answers as catastrophizing, which led to the inclusion of several similar items in their Sports Inventory of Pain. Similarly, in another qualitative investigation of elite skiers coping with physical setbacks, catastrophizing (defined in this study as emotional upheaval) and general negative thinking emerged as common reactions to injury-related events (Udry, Gould, Bridges and Beck, 1997).

While investigations such as these illustrate there may be a connection between negative thought patterns and pain experiences in sporting contexts, they did not empirically test this relationship. Sullivan et al. (2002) addressed this need by examining athletes’ and sedentary individuals’ pain responses and catastrophic thinking through use of the cold pressor task (i.e., an experimental pain manipulation where research participants place their hands in a basin of ice-cold water, typically for as long as they can). They determined that the 3-factor model of the Pain Catastrophizing Scale (PCS; Sullivan, Bishop, & Pivik, 1995), a measure that has been used extensively in clinical and experimental contexts, held up for both athletic and sedentary populations. The three factors of this model include helplessness, rumination, and magnification of the negative experience. Additionally, the results revealed that athletes report lower pain intensity during experimental pain manipulations than sedentary individuals. For both groups catastrophizing emerged as a significant predictor of pain ratings; however, contrary to expectations, catastrophizing did not explain the difference in pain ratings between the athletes.
and sedentary individuals. These researchers did not have data to suggest another factor that explained the differences in pain ratings, but did hypothesize that a more clear relation between catastrophizing and pain might emerge if sports related pain was studied (as opposed to using the cold pressor task).

Several groups of researchers have continued with this interest in the association between negative thinking patterns and pain perception in physical domains. Some have incorporated pain manipulations that may be more ecologically valid to exercise-related pain than methods like the cold pressor task. For instance, exercise protocols can be used to induce delayed onset muscle soreness (DOMS), which is characterized by aching and burning sensations; DOMS represents one type of pain that is encountered by people engaging in regular physical activity. Studies using this type of methodology have found that pain catastrophizing and pain-related fear, a similar construct, do not predict strength production in a weight lifting task prior to DOMS, but they do predict decreased physical output when the task is preformed while participants experienced muscle pain (Sullivan et al., 2002; Trost, France, & Thomas, 2011). In addition, catastrophizing and pain-related fear were both associated with poorer mood and higher ratings of pain intensity during the weight task with DOMS. Even controlling for mood and pain intensity, pain catastrophizing still predicted activity intolerance during the muscle soreness condition (Sullivan et al., 2002; Trost, France, & Thomas, 2011). The results of these studies suggest that when pain is present or produced during physical activity, those who engage in negative thinking patterns focused on the discomfort may decrease their physical output, be it by shortening the length of their workout or by lowering the intensity of their activity.

Similarly, Deroche et al. (2011) found in their sample of combat athletes (i.e., those participating in judo, wrestling, karate, etc.) that athletes who frequently engaged in pain
catastrophizing reduced their sport involvement. Conversely, athletes who were able to ignore pain were effectively able to work through particularly painful moments in their respective sport without a drop in exercise intensity or taking time off from the activity. In a sample of pain-free volunteers, people who engage in high levels of catastrophizing were less able to disengage their attention from a pain source when anticipating pain than those who scored lower in pain catastrophizing (Van Damme, Crombez, & Eccleston, 2004). By using a cross-lagged panel analysis, Campbell et al. (2010) were able to establish that changes in pain catastrophizing preceded and, therefore possibly contributed to, changes in pain ratings. Therefore, having a strong negative reaction to a painful stimulus, such as experimental pain manipulations or a fitness task, could ultimately lead to heightened pain perception and responses.

**Pain Catastrophizing: A Situational Versus Dispositional Construct**

The concept of pain catastrophizing has proven instrumental in helping researchers better understand how maladaptive thought patterns can contribute to higher pain ratings and other pain-related behavior (e.g., decreased physical output). There are two approaches to studying pain catastrophizing and its consequences and correlates—a trait perspective and situation-specific perspective. This area of inquiry requires not only consideration of conceptual/theoretical issues, but also poses methodological questions regarding how best to assess this variable.

Viewing pain catastrophizing as a dispositional variable suggests that people have stable cognitive/affective responses to pain-related stimuli regardless of the type of pain (e.g., chronic pain, pain related to medical procedures, exertion pain) or situation. There is evidence to support the notion that catastrophizing has some degree of stability across time and situations. For instance, test-retest correlations of .70-.80 have been reported in studies of both clinical and

The second approach is to view pain catastrophizing as situation-specific; individuals may respond to certain pain-inducing events by ruminating and feeling helpless, but may respond more adaptively to other scenarios. So, rather than making the assumption that catastrophizing is a trait and that people will always respond to different situations with the same degree of catastrophizing, this approach recognizes that people’s appraisals of painful experiences depend on the circumstances and their own beliefs about their ability to handle the stressor in question (Lazarus & Folkman, 1985). Indeed, a weak correlation has been reported between coping behaviors used during a stressful situation and one’s dispositional tendencies towards coping (Kaloupek, White, & Wong, 1984), suggesting that responses to stress may depend on characteristics of the stressor itself rather than some fixed internal coping style.

Support for the situation-specific perspective also comes from studies demonstrating the ease at which this cognitive-affective response can be modified. For instance, after participants in one investigation underwent a brief stress inoculation exercise, those who had previously been identified as high catastrophizers no longer engaged in high levels of catastrophic thinking during a cold pressor task (Vallis, 1984). Additionally, in clinical research, patients receiving cognitive behavioral therapy were similarly able to reduce their catastrophizing and subsequently reported improvements in their ability to cope with chronic pain (Keefe et al., 1991; Turner & Clancy, 1986). Formal therapeutic interventions such as stress inoculation and CBT may not even be necessary to lead to a reduction in catastrophic thinking in specific situations. When merely asked to not engage in catastrophizing, college students were able to significantly
decrease their negative thought patterns under these instructions alone (Spanos, Henderikus, & Brazil, 1981).

The Pain Catastrophizing Scale (PCS; Sullivan, Bishop, & Pivik, 1995) is the most widely used questionnaire in the assessment of pain catastrophizing, regardless of which approach is adopted. Traditionally, the PCS has been used from the dispositional standpoint, although this trend appears to be slowly changing as accumulating evidence suggests the situational version may be a better predictor of pain responsivity. Used as a dispositional measure, the PCS is given either prior to or without the presence of a pain manipulation. The standard instructions are used without modification (see Appendix B): participants are asked to reflect on the degree to which they have had certain thoughts, illustrated through the individual items, when they are experiencing pain. When the PCS is used as a situational measure, the directions are more specific and ask participants to reflect on a certain pain experience—rather than pain in general—as they complete the questionnaire. For example, Edwards et al. (2006) and Campbell et al. (2010) included the following instructions as a part of a modified situational catastrophizing measure they used: “We are interested in the types of thoughts and feelings that you had while you were participating in these pain procedures.” When used in this way, the PCS is given following a painful experience so participants can use that recent experience as a reference for completing the measure (Campbell et al., 2010).

A number of investigations have converged on the finding that the dispositional and situational versions of the PCS are not significantly correlated (Campbell et al., 2010a; Edwards et al., 2006). Furthermore, it appears that the situational version of the PCS better predicts pain ratings such as pain intensity and pain tolerance (Campbell et al., 2010a; Campbell et al., 2010b; Dixon, Thorn, Ward, 2004; Edwards, Campbell, Fillingim, 2005). These results suggest that the
manner in which individuals respond to particular stressors may vary based on the stressors’
characteristics and other situation-dependent factors rather than a predisposition toward negative,
ruminative thinking. In terms of understanding how an individual is affected by a particular
pain-related stimulus, it may be best to use the situational approach.

**Populations At Risk for Low Rates of Physical Activity**

Women and individuals with obesity are particularly vulnerable for several of the health
concerns previously addressed. Both women and obese individuals are more likely to report
lower pain tolerance and have more pain-related conditions (Janke, Collins, & Kozark, 2007;
Riley, Robinson, Wise, Myers, & Fillingim, 1998). In addition to higher pain responsivity, both
of these populations have lower rates of adherence to exercise programs and are more likely to
lead sedentary lives (Dishman & Gettman, 1980; King et al., 1997; Tryon, Goldberg, &
barriers to regular exercise and the mechanisms explaining higher pain responsivity for these two
groups—and, possibly, the interplay between these two trends—is an important avenue for
research and intervention.

Obesity is a prominent health concern in the United States: one third of American adults
are classified as obese, with another third classified as overweight and therefore at risk for
obesity (Wang & Beydoun, 2007). In addition to being more likely to develop life-threatening
conditions including heart disease, diabetes, and certain types of cancer, obese individuals are
less likely to engage in health behaviors that could serve as protective factors against these and
other health concerns. People who are overweight or obese lead more sedentary lives (Tryon,
Goldberg, & Morrison, 1992) and are less likely to adhere to physical activity (Dishman &
Gettman, 1980; King et al., 1997). It appears that the physical sensations associated with
exercise may vary according to body size, making exercise less comfortable to those with higher body mass indexes (BMI). For example, in one study where women of various sizes self-selected their pace on a treadmill, obese women had higher ratings of exertion, yet their ratings of exercise enjoyment were no different from the normal weight participants. However, these findings changed when the women participated in a trial where the pace was imposed by a researcher and was calculated, based on individual performance, to be at a moderately high intensity. Obese women now had not only higher perceived exertion ratings, but also diminishing ratings of pleasure in comparison to their peers (Ekkekakis & Lind, 2006).

Another possible explanation for lower rates of exercise—and greater indications of discomfort during workouts—may be connected with the higher rates of pain-related issues found in this population. Individuals who are overweight/obese are more likely to report skeletal and muscle aches and pains (Mattsson, Larsson, & Rossner, 1997). They also are more prone to develop certain pain conditions, including low back pain and osteoarthritis (Janke, Collins, & Kozark, 2007). Individuals with pain conditions are less likely to exercise, or engage in behaviors characterizing an active lifestyle, for fear of exacerbating their pain and worsening their condition (Roelofs et al., 2004).

Researchers investigating the obesity-pain relation have sought to determine whether there is a causal pathway between the two conditions. For instance, researchers have hypothesized that chronic pain may restrict people’s activity levels contributing to a gradual weight gain over time, a speculation referred to as the disuse syndrome (Verbunt et al., 2003). Another possibility is that excess weight burdens and strains the musculoskeletal system, eventually leading to physical malfunctions and deterioration, which may translate into pain (Felson & Chaisson, 1997). The current literature fails to offer conclusive support for either
route and instead puts forward that a simple and direct causal relationship may not exist. Instead other variables may explain the connection; sex, physical activity, and other lifestyle factors have all been implicated as possible mediators (Janke, Collins, & Kozark, 2007).

Similar to individuals with obesity, women represent another group targeted for exercise interventions, as women have lower rates of exercise and adherence than men. Women are more likely to be inactive than men across a range of contexts, including sports, exercise of ranging intensities, and even in the workplace. For instance, according to the National Health Interview Survey, the prevalence of males engaging in regular, vigorous exercise is 18.1% compared to 14% of females; similarly, more males engage in regular, sustained activity (of any intensity) than females. These sex differences hold true across ethnicities, but are most pronounced for African Americans, with 28.9% and 18% of African American males and females, respectively, participating in regular, sustained activity (U.S. Department of Health and Human Services, 1996).

When physical activity is examined more closely—that is, as different types both inside and outside the domain of “exercise” are considered—striking findings emerge. In one study examining participation in various activities occurring within the prior two weeks, males were more likely to run for exercise than females (as well as engage in a variety of vigorous activities). However, in one case where the differences favor females, more women reported walking for exercise (48.3% of women versus 39.2% of men). And while men are more likely to participate in strengthening forms of exercise (i.e., weight lifting), more women make use of stretching exercises. In consideration of lifestyle associated with occupations, among those with sedentary jobs (e.g., office work), women were less likely to engage in physical activity outside the workplace than men (Plotnikoff, Mayhew, Birkett, Loucaides, & Fodor, 2004). Brownson
and colleagues (2001) note that when the definition of physical activity is expanded to include housework and occupational tasks (e.g., cleaning, active childcare), significantly more women are considered active and sex differences decline.

With regard to pain, women rate painful stimuli in experimental contexts as more intense and have lower pain tolerance than male participants (Riley, Robinson, Wise, Myers, & Fillingim, 1998; Thorn et al., 2004). Clinical research has documented that they also are more likely to have pain conditions, such as osteoarthritis, fibromyalgia, and back pain (Fillingim et al., 2009; Unruh, 1996). They, too, appear to be more expressive with regard to pain behaviors, engaging in a greater degree of facial expressions, body language, and speech that communicate feelings of discomfort (Fillingim et al., 2009; Keefe et al., 2000). Finally, women report higher levels of pain catastrophizing (Dixon, Thorn, & Ward, 2004; Osman et al., 2000; Thorn et al., 2004).

There are a number of mechanisms that may be contributing to this relationship between sex and pain. Research has been actively exploring various physiologically based factors, including gonadal hormones and endogenous pain modulation, which may lead women to be prone to greater pain sensitivity (Fillingim et al., 2009). Additionally, psychosocial influences, particularly those emphasizing gender roles and socialization, shape the ways men and women perceive and respond to pain stimuli. In a series of investigations examining gender role expectations of pain, participants—regardless of their sex—expected females to have higher pain sensitivity, lower tolerance, and a greater willingness to verbally express their discomfort (Robinson et al., 2001; Robinson, Wise, Gagnon, Fillingim, & Price, 2004). Furthermore, strong identification with gender roles is related to pain outcomes similar to these expectations. Women who endorse higher levels of femininity, encompassing traits such as warmth, emotional
expressiveness, helpfulness, etc., tend to have higher pain responsivity, whereas masculinity has been associated with higher pain thresholds and lower pain tolerance (Sanford, Kersh, Thorn, Rich, & Ward, 2002; Thorn et al., 2004). Finally, several studies have determined that sex differences in both pain responses and pain catastrophizing are partially mediated by emotional vulnerability, a measure of femininity (Dixon, Thorn, & Ward, 2004; Thorn et al., 2004).

Now, not only do each of these two populations—women and individuals with obesity—have greater risk of inactivity and pain concerns, but women are also more likely to be overweight or obese than men. Moreover, the association between obesity and health problems is substantially stronger for women than men. Mild obesity is associated with poorer outcomes for women, whereas for men adverse outcomes don’t typically become evident until moderate levels of obesity (Mond & Baune, 2009). Therefore for women, the negative consequences of excess weight start occurring lower on the obesity spectrum and, hence, affect more women than men.

In addition to this overlap between women and obesity, and perhaps related to it, both women and individuals with obesity appear more apt to engage in pain catastrophizing. As previously discussed, women are more prone to this maladaptive thinking pattern and studies have demonstrated that catastrophizing explains the sex differences that are present in pain responsivity (Keefe et al., 2004). Less research has been conducted that examines catastrophic thinking among individuals with obesity. However, Vincent et al. (2011) speculate—based on the results of three studies in this domain—that “the thought patterns more prevalent in obesity include dichotomous thinking, catastrophic ideation, lower cooperation, and somatization. These thought patterns likely lead to heightened hypervigilance to pain sensations and subsequent
development of depression and physical inactivity” (p. 160). These preliminary findings suggest that individuals with obesity may be more likely to engage in pain catastrophizing.

**Work-Place Based Exercise Promotion Programs**

Population-based programs designed to promote exercise are used to increase physical activity levels and other health behaviors within a specific organization or group. These organizations offer an avenue to reach a significant percentage of the adult population in a community and already have built-in channels of communication, administration, and organizational resources that can be utilized for these health initiatives. Additionally, workplaces frequently have staff in place who serve as resources related to health and wellness information. Furthermore, workplaces contain groups of individuals who will remain in that setting and in contact for long periods of time thus making easily accessible participants (Sallis & Owen, 1999). These factors make businesses and schools an attractive site to run programming that encourages the adoption of healthy lifestyles and, consequently, an increasing number of these institutions have offered health-related interventions over the last few decades.

Reviews of studies examining these types of programs have, however, identified issues that can detract from their success. Specifically, low recruitment, high dropout rates, and inadequate maintenance across both the programs themselves and among participants are common problems, which need to be addressed (Sallis & Owen, 1999; U.S. Department of Health and Human Services, 1996). With regard to recruitment, these programs frequently recruit just 20-30% of the employee population, with most of the recruited individuals being more fit, better educated, and more informed of health issues than those not participating in these programs/studies (Lovato & Green, 1990; Mattke et al., 2013). Despite these problems,
worksite-based health promotion programs have the potential to have considerable influence over individuals making lifestyle changes.

These health promotion programs vary significantly, particularly with regard to the extent or comprehensiveness of programming (i.e., do they focus on one specific behavior such as exercise or encompass other domains including diet, active lifestyle, etc.?), target of the intervention (e.g., increasing steps walked, minutes exercised per week, fitness classes attended), and incentives and resources employed. Some of the most common workplace interventions reported in the literature include those that target increased activity during the workday, for instance, encouraging stair use rather than elevators and recommending short walks and stretching intermittently during the workday for desk-bound employees. Other interventions encourage “active commuting”—walking, running, or biking to work—while other organizations offer fitness classes and/or gym facilities. Step counting, aided by the use of a pedometer, is a popular way of promoting an active lifestyle and can abet research efforts by making physical activity outcomes easily quantifiable. Health-based counseling can be influential in helping people identify goals, develop plans to meet these goals, and receive feedback and encouragement along the way (Dughill, Brettle, Hulme, McCluskey, & Long, 2008; Mattke et al., 2013; Proper et al., 2003).

It appears that the most successful of these interventions were comprehensive in nature—offering opportunities for physical activity (e.g., classes, gym facilities), health coaching, and the means to set goals and record progress. Programs that aimed to increase walking (or physical activity in general) assisted by pedometer use and those that offered individualized counseling/coaching appear to have more lasting outcomes—including increased rates of exercise—than interventions that focused solely on stair-walking (as opposed to elevator use) or
increasing “active commute” time. Based on a review of 26 relevant studies, Proper (2003) determined there is strong evidence that these types of organizational exercise programs (as a whole) increase physical activity among participants and alleviate pain associated with musculoskeletal disorders. There is moderate evidence to suggest these interventions reduce fatigue and mixed/inconclusive evidence for effectiveness of improved cardiovascular fitness, flexibility, weight, and general health measures.

Conn and colleagues (2009) performed a meta-analysis of 139 studies; they concluded that the effect size for physical activity behavior following workplace interventions is in the small to moderate range. The effect size for fitness of participants involved in these programs was .57, which suggests this type of programming had a large, positive effect on improving cardiovascular fitness of those involved. The effect size for work attendance was small (.19), suggesting these interventions have a small, but noticeable effect on the number of sick days taken by employees. It also appears that workplace physical activity programs have a moderate effect on job-related stress. Proper (2003) and others, however, acknowledge that this is a difficult area of literature in which to perform reviews or meta-analyses as the quality and methodology of related investigations vary greatly.
The Current Study

Although a small body of research has begun to focus on pain catastrophizing within the context of physical activity, several gaps within this domain have emerged. First, the majority of this work has emphasized the pain experiences of athletes, rather than people who engage in non-competitive physical activity. While these studies have looked at cognitive strategies and pain responses in groups including runners, triathletes, dancers, combat athletes, etc., we know very little about the pain experiences of those who are neither professional athletes nor concerned with competition. The pain experienced by people new to exercise—as well as their cognitions related to physical activity—are likely quite different than those of seasoned athletes and likely to play a role in people’s perceptions of and adherence to regular exercise.

Secondly, the literature examining pain catastrophizing within physical activity contexts is quite limited. What research exists has been primarily lab-based, using experimental analogues such as the cold pressor task, although some have gone a step beyond this, in terms of ecological validity, to actually replicate pain experiences associated with physical activity (e.g., DOMS). However, there is a lack of research focusing on pain catastrophizing as it applies to naturally occurring physical activity. Furthermore, those studies that have done this type of work have looked exclusively at muscle soreness as the source of pain. While muscle soreness is certainly one important component of the pain-related experience of physical activity, expanding the focus to incorporate all potential pain sources (i.e., exertion, injury-related, and muscle soreness) would allow for a more comprehensive exploration of exercise-related pain cognitions.
Therefore, the current study set out to explore the relation between exercise-related pain catastrophizing and exercise rates among individuals participating in a workplace wellness program. Over the course of a 9-week program, pain catastrophizing and self-reported weekly exercise rates were assessed at three points: at the beginning, at the midpoint, and immediately prior to its conclusion. In an attempt to explicate the relation between the two perspectives on pain catastrophizing described earlier, both dispositional and situation-specific catastrophizing were assessed and compared, in their association with each other and their unique predictive abilities. Demographic and biometric data was also incorporated so analyses could encompass the role of sex and BMI in exercise rates and exercise-related pain catastrophizing. The goals of this study and accompanying hypotheses are most clearly illustrated through the demarcation of two separate investigational aims.

**Aim One**

There is a paucity of research examining the role of cognitive factors in relation to the low exercise rates seen among the general population; therefore, the primary aim of this study was to look at the potential influence of one psychological factor, pain catastrophizing. Specifically, this investigation sought to determine whether pain catastrophizing could be used to predict exercise rates among participants in an organizational wellness program. This aim incorporated both situation-specific (exercise-related) and dispositional assessments of pain catastrophizing, using both a modified and standard version of the PCS, respectively, to measure this construct. In this way, the current study not only examined whether either dispositional or situation-specific pain catastrophizing predicted exercise rates in this population, but also sought to determine which might be the strongest predictor.
Finally, one additional factor was considered as a predictor variable for exercise rates. As the situation-specific version of the PCS was administered at two points during the study (i.e., at Time 2 and Time 3), the relationship between these two situation-specific scores was analyzed. This study examined whether or not there was a decrease in situation-specific pain catastrophizing from Time 2 to Time 3. This hypothesized decrease in PCS scores could reflect cognitive changes in the interpretation and experience of exercise-related discomfort and unpleasantness as participants continued through the course of the Couch to 5K program. Also, this study sought to determine whether this (potential) change in situational catastrophizing predicted higher rates of exercise at Time 3.

**Hypotheses.** It was hypothesized that high situation-specific pain catastrophizing would predict low exercise rates. It was also hypothesized that situation-specific pain catastrophizing would be a better predictor of exercise rates than dispositional catastrophizing. Finally, it was hypothesized that a change in situation-specific pain catastrophizing would predict exercise rates. Specifically, it was hypothesized that a decrease in pain catastrophizing from Time 2 to Time 3 would predict higher rates of exercise.

**Aim Two**

This investigation also served as an inquiry into better understanding participation rates among certain groups that have been identified as at greater risk for physical inactivity: women and individuals with obesity. Exercise rates and pain catastrophizing were examined for both groups. If group differences in exercise rates emerged (i.e., women engaged in lower rates of exercise than men, obese individuals engaged in lower rates of exercise than normal weight peers), then analyses would be incorporated to investigate the potential, meditational role of pain catastrophizing.
Hypotheses. With respect to exercise rates, it was expected that both women and individuals with obesity would engage in lower rates than their respective peers. Furthermore, it was hypothesized that both groups would also engage in higher rates of dispositional and situation-specific pain catastrophizing. Finally, it was hypothesized that exercise-related (situational) pain catastrophizing would partially mediate BMI and sex differences in exercise rates, if they were to emerge.
Method

Participants

Participants were employees, including both faculty and staff, of the University of Alabama who participated in one of the University’s Health Promotion and Wellness initiatives. Specifically, individuals who decided to participate in a program called Crimson Couch to 5K (CC25K) were recruited for the current study. This investigation was subsumed within a larger study being conducted by the Health Promotion and Wellness Office called “Crimson Couch to 5K: Evaluation of Improved Individual Health Goals, Health Measures, and Program Aspects.” Over the course of 9 weeks, participants, many of whom have previously been inactive or falling below recommended levels of physical activity, trained for a 5K (3.1 miles) event. Through both workplace-based exercise groups led by fitness coaches and workouts done on their own, participants gradually built up their walking/running ability and overall fitness. Participants also had the option of training alone for the event or forming a team. The 5K event is held annually on campus at the conclusion of the 9-week program.

Procedure

Individuals who were interested in participating in the Crimson Couch to 5K program could register online, by phone, through a coordinator located in their department/office, or by coming in to the Initial Check-In. All program participants were strongly encouraged to attend each of the three check-ins scheduled throughout the program, the first of which was held during the first week. At the Initial Check-In—also to be referred to as Time 1—participants completed
paperwork related to the training program and received information about what was offered throughout the 9 weeks. As a part of this process, participants visited several stations that were set up at each check-in: one station provided training tips and other information, another was allocated for research, and a third was responsible for biometric measurements. During this time participants completed a Crimson Couch to 5K Individual Tracking Card (see Appendix F), which assessed team status (individual versus team, and if the latter, team name) and their current frequency and duration of aerobic exercise. Additionally, nursing students and trained staff members at the biometric measurement station assessed physiological indicators of health, including body mass index and waist circumference; this information was recorded on the Tracking Cards by staff. When participants came across the research station at Time 1 they received basic information about the study and were asked if they would be willing to participate. Those willing were asked to read and sign the informed consent sheet. Following which, they completed the Couch to 5K Questionnaire (see Appendix D) and the Pain Catastrophizing Scale (PCS; see Appendix B) to assess their general psychological responses to pain.

When given in this context, the PCS was assumed to be a dispositional measure that captures a person’s general emotional reactions and thoughts related to pain. The PCS- Time 1 was administered with its standard set of instructions: “Everyone experiences painful situations at some point in their lives. Such experiences may include headaches, tooth pain, joint or muscle pain. People are often exposed to situations that may cause pain such as illness, injury, dental procedures or surgery.” Participants then responded to the questionnaire by indicating how likely they were to have experienced each of 13 “different thoughts and feelings that may be associated with pain.”
Approximately halfway through program, the Health Promotion and Wellness Office held a Midpoint Check-In—also to be referred to as Time 2—and, again, all participants were encouraged to attend so they could receive additional information. Similar to Time 1, several stations were set up, including one dedicated to research. Here, individuals who expressed a willingness to participate in this study during Time 1 were asked to complete a brief survey: the PCS-Time 2 (see Appendix C). Unlike at Time 1, participants were instructed to reflect specifically on a recent experience with exercise-related pain, defined as “sensations of physical discomfort and unpleasantness that may be induced through physical activity,” to guide their responses to the questionnaire. This version of the questionnaire was accompanied by three open-ended questions: “Was the discomfort/pain during or after the workout (or both)?”, “What were you thinking of when you completed this questionnaire?”, and “When was this workout?” In this context, the PCS-Time 2 served as a situation-specific measure of pain catastrophizing.

The Final Check-In (Time 3) was held shortly before the 5K event. At this time participants received their race packets and bibs for the event itself. As with the two prior check-ins, participants were asked to record their current aerobic exercise frequency and duration on their Participant Tracking Cards and were given the opportunity to have their biometric measurements taken by trained staff and nursing students. For those who had previously agreed to participate in research, participants were asked to complete the Couch to 5K Questionnaire-Time 3 (see Appendix E) and the PCS-Time 3 during this check-in period. With the PCS-Time 3, they were once more asked to reflect on their experiences with exercise-related pain; therefore, this use of the PCS served as another situation-specific measure of pain catastrophizing. Again, the PCS-Time 3 contained the three additional open-ended questions aimed at understanding
what kind of exercise-related pain/discomfort participants experienced and when this referent pain occurred.

Finally, there was also an option to complete certain measures online for both Time 2 (Midpoint Check-In) and Time 3 (Final Check-In). Shortly after the in-person Check-Ins for Time 2 and Time 3 an email invitation was sent to all individuals who agreed to participate in research during Time 1, but did not come in for subsequent program Check-Ins. The Time 2 email invitation contained a link to a page containing the PCS-Time 2. The Time 3 email invitation contained a link to a page containing the PCS-Time 3 and the Couch to 5K Questionnaire-Time 3. Each participant was given a unique link, connected to their participant identification number, a number that they were assigned during Time 1. In this way, participants’ questionnaire responses were kept confidential while still being connected to their data provided during the other time points. The electronic surveys were constructed through the website Survey Monkey and sent from an Office of Health Promotion and Wellness email account. The goal of including this electronic version of the Time 2 and 3 questionnaires was to increase response rate. As seen in previous years, a number of program participants come in for the Time 1 Check-In to register for Couch to 5K, but then may not attend later Check-Ins. Providing an electronic option afforded the possibility of retaining these individuals throughout the study.

Measures

The Pain Catastrophizing Scale. Developed by Sullivan, Bishop, and Pivik (1995), this 13-item instrument assesses catastrophic thinking in response to pain. For each item, participants indicate the frequency of which they have experienced a specific pain-related thought/ feeling through the use of a 5-point Likert scale, which ranges from 0 (“not at all”) to 4
In addition to a total score, the PCS also yields three subscale scores that represent three dimensions of catastrophizing: rumination, magnification of the negative experience, and helplessness. Analyses have determined that the PCS has high internal consistency (Cronbach’s alpha = 0.91) and high test-retest reliability ($r = 0.78$) (Sullivan et al., 1995; Van Damme, Crombez, Bijttebeir, Goubert, & Van Houdenhove, 2002). This questionnaire was given three times over the course of the study. The PCS-Time 1 was given during the recruitment/initial data collection phase of the program, serving as a dispositional measure.

The PCS-Time 2 and PCS-Time 3 served as situation-specific measures of pain catastrophizing; as previously described, participants were given modified instructions asking them to reflect specifically on their exercise-related pain. Length is an additional aspect of the situation-specific version that deviates from the traditional PCS. Several recent studies that have examined situation-specific pain catastrophizing have used an abbreviated 6-item version. This modification maintains the three-factor model of the original measure and possesses strong reliability with a Cronbach’s alpha of .87 (Campbell et al., 2010; Edwards, Smith, Stonerock, & Haythornthwaite, 2006). Several advantages come with use of this adaptation. First, it reduces participant burden, which was especially important in this study as participants were asked to complete measures at three time points without incentive. Second, based on the results from the feasibility study, several items on the PCS appear to be best suited for dispositional circumstances or with regard to chronic pain. Given the voluntary and time-limited nature of exercise engagement, certain items contained in the original PCS were not appropriate for the situation-specific context of this study.
Demographics. Demographic information was obtained from both the Participant Tracking Cards and the University of Alabama Office of Information Technology (OIT) database. In particular, sex, race, and age were included.

Biometric Measurements. These were optional measurements performed by trained staff and nursing students during the Time 1, 2, and 3 Check-Ins. These included height, weight, and waist circumference, and were recorded on the Participant Tracking Cards.

Exercise Rates. Exercise rates were calculated as a continuous variable, taking into account both frequency and duration. Participants’ rates of aerobic exercise were assessed at all three time points during the study through use of the Participant Tracking Cards. Participants were asked to record the number of days per week they currently engage in exercise and the number of minutes per day.

Couch to 5K Questionnaire. This is a 13-item questionnaire that was put together by a Health Promotion and Wellness Office staff member, drawing items from several measures to assess a number of health-related variables. The original purpose of this questionnaire was for its use immediately prior to the start of the Couch to 5K program and at its conclusion, therefore providing pre and post measures of various factors that might be influenced by engagement in a regular exercise program. In this way, changes that might have occurred over the course of the program (e.g., improved work productivity) could be detected.

This questionnaire assesses overall physical health (1 item), work productivity (1 item), depression (5 items), reasons for participation (1 item), and sleep difficulty (3 items). The depression items assess the frequency of five depressive symptoms (i.e., concentration difficulties, lack of energy, depressed mood, restlessness, and anhedonia) over the past two weeks using a 4-point Likert scale ranging from 0 (“not at all”) to 3 (“nearly every day”). These
items were drawn from the Patient Health Questionnaire (PHQ; Spitzer, Kroenke, & Williams, 1999), which is a well-validated instrument that is widely used for clinical and research purposes to detect five common mental disorders. The depression scale of the PHQ is comprised of 9 items. However, variations including a 2-item screener (containing the depressed mood and anhedonia items) have strong construct and criterion validity and are often used instead of the full version (Kroenke, Spitzer, & Williams, 2003). The sleep difficulty items are from the Sleep Scale of the Medical Outcomes Study (Hays & Stewart, 1992) and use a 6-point Likert scale to assess the frequency of difficulty in falling asleep, awakening during the night, and perceptions of how “quiet” one’s sleep is over the past 4 weeks. Validity and reliability have been established for both the 12-item and 6-item version of this scale.

Additionally, this investigator added two questions to the Couch to 5K questionnaire to address factors that have been identified as important to include in exercise and health research: motivation and sedentary behavior. Leon and colleagues (2007) discuss the use of an “intent to complete” item in randomized controlled trials to reduce attrition and assess motivation to continue with treatment. This type of item asks participants to rate the likelihood that they will complete (or attend) a certain objective using a 10-point Likert rating scale, ranging from 0 (“not at all likely”) to 9 (“extremely likely”). In the current study this question was changed to reflect participants’ intent to complete the 5K event at the conclusion of the program and served an indicator of motivation. This particular item was used at each of the three time points.

Finally, the item assessing sitting behavior was included to reflect the recent research that has illuminated the association between a sedentary lifestyle and adverse health outcomes, regardless of exercise engagement. Although a number of large-scale studies in this domain use hours of TV viewed as a proxy for sitting behavior, there are inherent flaws with this procedure
(i.e., many individuals who sit for long periods of time each day do not engage in copious amounts of TV viewing). Therefore, one item was created for the Couch to 5K Questionnaire to directly ask participants to estimate how many hours per day they sit, using the following response options: “0-3 hours,” “3-6 hours,” “6-9 hours,” “9-12 hours,” and “12+ hours.”

**Power Analyses**

Determination of the appropriate sample size needed to test this study’s hypotheses was done through power analyses using G*Power and in consideration of the sample sizes of similar types of investigations. No study has yet examined the relation between exercise-related pain catastrophizing and exercise rates and, consequently, related literature was reviewed to determine an approximate effect size. Based on studies that have examined physical activity-related outcomes (e.g., decreased strength production, dropout rates) in conjunction with pain catastrophizing, a moderate effect size was anticipated. Similar studies have used between 40 and 120 participants to reach significant findings. Based on G*Power analyses with power set at .80, a moderate effect size, and p=.05, a sample size of 40 was needed to run the regression analyses outlined in Aim One, determining whether the pain catastrophizing variables predict exercise rates. These same power analyses were run a second time with a more conservative approach, substituting in a small effect size, which concluded 81 participants would be needed. The sample size of the current investigation well exceeded what was needed to run the statistical analyses.

**Statistical Analyses**

**Descriptive Statistics.** Preliminary statistical analyses were first conducted, including frequencies and percentages for categorical variables and means and standard deviations for the continuous variables. Additionally, bivariate correlations were run.
Aim One. In Aim One, it was hypothesized that high situation-specific pain catastrophizing would predict low exercise rates and that situation-specific pain catastrophizing would be a better predictor of exercise rates than dispositional catastrophizing. Additionally, it was hypothesized that a change in situation-specific pain catastrophizing would predict exercise rates. To test these hypotheses, hierarchical linear regression was conducted with exercise rates, taken from Time 3 data collection, entered as the dependent variable. Demographic variables—in this case, sex and age—were entered in the first step. In the second step, the following predictor variables were entered: the PCS-Time 2 total score (a situational measure) and PCS-Time 1 total score (a dispositional measure). Prior to running the second regression model, a paired samples t test was performed to determine if there was a significant change in situational PCS scores from Time 2 to Time 3. If this were the case, this change could be entered in the second block of a regression model with Time 3 exercise rates as the dependent variable.

Aim Two. To address the hypothesized sex and BMI differences outlined in Aim Two, independent-samples t-tests and hierarchical multiple regression analyses were run with exercise rates and pain catastrophizing as dependent variables. Also, bivariate correlations were used to determine if significant correlations exist between: BMI and exercise rates, BMI and situational catastrophizing, and situational catastrophizing and exercise rates. If these relations were significant, then meditational analyses would be conducted to determine if differences in pain catastrophizing account for any observed BMI differences in exercise rates. Similarly, bivariate correlations were run for sex and exercise rates, sex and situational catastrophizing, and situational catastrophizing and exercise rates. If these variables were correlated then meditational analyses would be run to discern whether sex differences in exercise rates can be explained by catastrophizing.
Results

Participants

Participants were 373 faculty and staff members of the University of Alabama who participated in the research component of the 2013 Crimson Couch to 5K; this number represents the total of individuals who completed at least one of the three data collection time points for this study. For Time 1 (Initial Check-in), 281 completed the associated measures. Two hundred and fifty-six participants completed Time 2 measures; 44 of these participants completed the electronic version of the questionnaire. A total of 191 participants completed both Time 1 and Time 2 measures. There were 179 participants who completed the Time 3 measures, with 39 of this group completing the electronic version. Finally, 118 participants completed measures at all three time points.

Of the total number of participants, 71% were female. The mean age of participants was 41.43 years (SD=10.85). With regard to race, 75.3% were Caucasian, 19.6% were African-American, 4.3% were Asian or Pacific Islander and .9% were Hispanic.

Descriptive Statistics and Changes Across the Program

Descriptive statistics were calculated for all variables central to this study. Table 1 captures the means and standard deviations for the nine health-related variables that were assessed at both Time 1 and Time 3 (with the exception of sitting behavior which was only measured at Time 1). With regard to overall physical health, participants’ mean rating at Time 1 was 2.05 (SD = 0.70), which can be descriptively classified as “good” in comparison to their
same age peers. The mean Time 1 depression score, derived from the 5-item PHQ depression screener, was 2.38 (SD =2.60), suggesting minimal depression among the sample as a whole. The average number of waking hours that participants engaged in sitting behavior was in the range of 6 to 9 hours over a one-day period. Participants reported fairly strong intent to complete the 5K at both Time 1 (M=8.03, SD=1.55) and Time 3 (M=7.94, SD=2.20).

With a mean Time 1 BMI of 28.46 (SD = 6.54), the average participant was overweight and there was a fairly widespread distribution with regard to body composition. Although BMI was treated as a continuous variable for most of the analyses conducted, BMI categories were also created based on the standard demarcation used by the World Health Organization and National Institute of Health, among others, to define obesity and identify those at elevated risk for health problems based on body composition. Thirty-six percent of the sample fell into the ‘healthy’ BMI range (under 25); as there were very few participants whose BMI fell below 18.5 (n=4), the underweight and healthy categories were collapsed into one group. Thirty-one percent of participants were classified as ‘overweight’ (BMIs ranging from 25 to 30) whereas 32.9% were ‘obese’ (BMIs of 30+).

Rates of aerobic exercise were also assessed at the beginning and conclusion of the study. At Time 1, the mean number of days that participants exercised was 2.90 days (SD = 1.83) over the past week. The mean total number of minutes that participants reported engaging in exercise over the course of one week at Time 1 was 116.33 (SD = 98.62). At Time 3, the mean number of days that participants exercised on over the course of a week was 3.96 days (SD = 1.41). The average weekly sum of minutes exercised for Time 3 was 169.29 minutes (SD = 98.40).

Paired sample t tests were conducted to determine if there were any significant changes that took place over the course of the 9-week program. Out of the eight variables measured at
both the beginning and conclusion of Crimson Couch to 5K, there were significant changes in four: work productivity, sleep difficulties, days of exercise, and minutes of exercise. Sleep difficulties decreased over the course of the 9 weeks, \( t(156) = 4.18, p < .001 \). Similarly, work productivity declined slightly during this timeframe, \( t(156) = 2.78, p < .01 \). As expected, both the number of days participants exercised, \( t(200) = -8.23, p < .001 \) as well as their weekly duration of exercise, \( t(200) = -9.20, p < .001 \), significantly increased from Time 1 to Time 3.

Table 1

*Participant Means and Standard Deviations (SD) for Health-Related Variables Measured at Time 1 and Time 3 of Crimson Couch to 5K*

<table>
<thead>
<tr>
<th></th>
<th>Time 1 (n=281)</th>
<th>Time 3 (n=179)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Productivity</td>
<td>8.00</td>
<td>1.32</td>
</tr>
<tr>
<td>Overall health</td>
<td>2.05</td>
<td>.70</td>
</tr>
<tr>
<td>Depression</td>
<td>2.38</td>
<td>2.60</td>
</tr>
<tr>
<td>Sleep difficulties</td>
<td>4.14</td>
<td>3.28</td>
</tr>
<tr>
<td>Sitting</td>
<td>3.04</td>
<td>.97</td>
</tr>
<tr>
<td>Intent</td>
<td>8.03</td>
<td>1.55</td>
</tr>
<tr>
<td>BMI</td>
<td>28.46</td>
<td>6.54</td>
</tr>
<tr>
<td>Exercise d/wk</td>
<td>2.90</td>
<td>1.83</td>
</tr>
<tr>
<td>Exercise min/wk</td>
<td>116.33</td>
<td>98.62</td>
</tr>
</tbody>
</table>
The Pain Catastrophizing Scale

The PCS was used in two different forms – as both a dispositional and situational measure – in this study and was administered at three time points. First, reliability analyses were run to compare the internal consistency of the two versions of the PCS used in the current sample with normative data. According to Sullivan et al. (1995), the PCS when used in its standard form as a dispositional measure has good internal consistency, with a Cronbach alpha coefficient of .91. In the current study, the Cronbach alpha coefficient for the PCS-Time 1 was .93. Campbell and colleagues (2010) reported a Cronbach alpha coefficient of .87 for the 6-item situational version of the PCS in a sample of healthy participants. With the current sample of Couch to 5K participants, the Cronbach alpha coefficient was .87 for the 6-item PCS at both Time 2 and Time 3. It appears the PCS, regardless of form or context (dispositional versus situational), serves as a reliable instrument in this current investigation.

The mean dispositional PCS score was 6.72 ($SD = 7.39$); the highest total score possible for this 13-item measure is 52, with higher scores reflecting higher pain catastrophizing. When given as a 6-item situational measure at Time 2, the mean PCS score was 3.47 ($SD = 3.75$). At Time 3, the mean situational PCS score was 3.18 ($SD = 3.65$). The situational measure, as an abbreviated 6-item version of the PCS, has a total of 24 possible points. A paired sample t test was conducted to determine whether there was the hypothesized decrease in exercise-specific catastrophizing from Time 2 to Time 3. Results revealed that there was no significant change in situational PCS scores, $t (166) = 1.34$, $p = .18$. 

42
Table 2

*Means and Standard Deviations (SD) for PCS Variables*

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCS – Time 1</td>
<td>6.72</td>
<td>7.39</td>
</tr>
<tr>
<td>PCS – Time 2</td>
<td>3.47</td>
<td>3.75</td>
</tr>
<tr>
<td>PCS – Time 3</td>
<td>3.18</td>
<td>3.65</td>
</tr>
</tbody>
</table>

Finally, the 13 items of the PCS, as given at Time 1, were subjected to principal components analysis (PCA) with the intention of comparing its factor structure with previous research. Prior to performing PCA, the suitability of data for factor analysis was assessed. Inspection of the correlation matrix revealed the presence of many coefficients of .3 and above. The Kaiser-Meyer-Olin value was .92, exceeding the recommended value of .6 (Kaiser, 1970, 1974) and Bartlett’s Test of Sphericity (Barlett, 1954) reached statistical significance, supporting the factorability of the correlation matrix.

Principal components analysis revealed the presence of two components with eigenvalues exceeding 1, explaining 54.6% and 7.8% of the variance respectively. However, an inspection of the scree plot revealed a clear break after the first component. The results of Parallel Analysis similarly demonstrated only one component with an eigenvalue exceeding the corresponding criterion values for a randomly generated matrix of the same size (13 variables X 267 respondents). The items with the highest loadings on this single factor were those four items that comprise the rumination subscale, one of the three subscales that formed following previous research that has repeatedly demonstrated a three-factor structure of the PCS.
Correlational Analyses

Bivariate correlations (see Table 3) were run to evaluate the strength of associations between key study variables, including PCS scores, exercise rates, and other health-related factors previously listed. Overall, the dispositional version of the PCS had more significant associations with other variables than the situational versions. Specifically, dispositional pain catastrophizing was positively correlated with poorer ratings of overall physical health (Time 1 only), depression (Time 1 and Time 3), sleep difficulties (Time 1 and Time 3), and BMI. Additionally, the PCS-1 was negatively correlated with both work productivity and intent to complete the 5K at Time 1 only. Both measures of situation-specific pain catastrophizing had positive correlations with three variables: PCS Time 1, depression (Time 1 and Time 3), and BMI.

There was a small, negative correlation between BMI and exercise rates at Time 1, \( r = -0.20 \), \( n = 278 \), \( p < .01 \), yet there was no significant relation between BMI and exercise rates at Time 3, \( r = -0.10 \), \( n = 188 \), \( p = .16 \). BMI is positively associated with pain catastrophizing, regardless of how or when it was measured during this study. Specifically, there was a small, positive correlation between BMI and dispositional catastrophizing, \( r = 0.27 \), \( n = 230 \), \( p < .001 \). With regard to situational catastrophizing, there was also a small, positive correlation at Time 2 (\( r = 0.17 \), \( n = 189 \), \( p < .05 \)) and Time 3 (\( r = 0.17 \), \( n = 169 \), \( p < .05 \)). It was also hypothesized that situational catastrophizing would be negatively correlated with exercise rates. However, inspection of these correlational analyses reveals that neither PCS–Time 2 nor PCS–Time 3 are significantly associated with exercise rates at either Time 1 or Time 3.
Table 3
Correlation Matrix for Crimson Couch to 5K Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. PCS 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. PCS 2 **0.35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. PCS 3 **0.40 **0.59</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Exercise T1</td>
<td>-0.04</td>
<td>0.01</td>
<td>0.02</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Exercise T3 **0.70</td>
<td>-0.03</td>
<td>0.01</td>
<td>0.04</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. BMI **0.27 *0.17 **0.17 **0.20 -0.10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Intent T1 *-.13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Intent T3 -0.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Sitting behavior 0.12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Overall Health T1 **0.20 0.06 0.02 **0.27 0.22 0.03 0.01 -0.01 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Depression T1 **0.42 **0.26 **0.27 **0.17 -.18 **0.21 **0.18 -0.02 0.07 **0.29 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Sleep T1 **0.35 0.14 **0.17 -0.09 -0.15 **0.28 **0.19 0.02 0.09 **0.28 **0.47 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Work productivity T1 **-.19 -0.03 -0.03 0.09 0.02 -0.09 0.10 0.09 -0.04 **-.16 **-.28 *.14 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: * Correlation is significant at the 0.05 level; ** Correlation is significant at the 0.01 level
**Aim One**

Hierarchical multiple regression was used to assess the ability of the situational and dispositional version of the PCS to predict Time 3 exercise rates, after controlling for the influence of sex and age. Preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity, multicollinearity, and homoscedasticity. Age and sex were entered at Step 1, explaining 0.2% of the variance in Time 3 exercise rates. After entry of the PCS-1 (dispositional) and PCS-2 (situational) at Step 2 the total variance explained by the model as a whole was 0.9%, $F (4, 148) = .329, p = .858$. Therefore, neither of these catastrophizing variables nor the model as a whole significantly explained any variance of Time 3 exercise rates.

The second hypothesis for Aim One was that a decrease in situational catastrophizing (Time 2 to Time 3) would predict Time 3 exercise rates. First, however, a paired samples t-test was conducted to determine if there was, indeed, a change in situational PCS scores from Time 2 to Time 3. As described previously, there was no significant change in situational PCS scores. Therefore, this second regression model to test this hypothesized change as a predictor for exercise rates was not completed.
Table 4

Summary of Hierarchical Multiple Regression Analyses for Catastrophizing Variables

Predicting Time 3 Exercise Rates

<table>
<thead>
<tr>
<th>T3 Exercise Rates</th>
<th>F</th>
<th>R²</th>
<th>p</th>
<th>β (SE)</th>
<th>beta</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall model</td>
<td>.33</td>
<td>.009</td>
<td>.86</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Situational PCS</td>
<td>6.58(24.23)</td>
<td>.02</td>
<td>.79</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dispositional PCS</td>
<td>19.17(23.03)</td>
<td>.07</td>
<td>.41</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Aim Two

Consideration of sex differences with respect to catastrophizing and exercise rates were addressed with a series of independent-samples t-tests. First, these analyses were run with both Time 1 and Time 3 exercise rates as the dependent variables. At Time 1, there was no significant difference in rates between men ($M = 116.70$, $SD = 89.88$) and women, $M = 116.48$, $SD = 100.74$, $t (294) = -.014$. There was also no significant difference for Time 3 exercise rates between men ($M = 179.44$, $SD = 120.27$) and women, $M = 167.13$, $SD = 93.37$, $t (203) = -.68$.

Next, t-tests were conducted to determine if sex differences exist with either form of pain catastrophizing. There was no significant difference in dispositional catastrophizing between men ($M = 7.60$, $SD = 7.59$) and women, $M = 6.64$, $SD = 7.36$, $t (242) = -.79$. Finally, no difference emerged in situational catastrophizing between men ($M = 3.63$, $SD = 3.90$) and women, $M = 3.48$, $SD = 3.74$, $t (221) = -.23$. 
Regression was chosen as the analytical approach through which to examine the impact of BMI on these outcomes in effort to preserve its integrity as a continuous variable. First, hierarchical multiple regression was used to assess the ability of BMI to predict Time 1 exercise rates, after controlling for the influence of age and sex. Preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity, multicollinearity and homoscedasticity. Age and sex were entered at Step 1, explaining none of the variance in Time 1 exercise rates. BMI was then entered at Step 2, explaining 4.1% of the variance, $F(3, 272) = 3.92$, $p = .009$. This represents the predictive ability of both the model as a whole and BMI individually, since age and sex did not add any contribution to the model. This same regression model was then run with Time 3 exercise rates as the outcome variable. Neither BMI nor the model as a whole significantly predicted exercise rates measured at the conclusion of Crimson Couch to 5K, $F(3, 184) = .80$, $p = .49$.

Similar regression models were also performed to determine if there is a relation between BMI and pain catastrophizing, in either form. With respect to dispositional pain catastrophizing, the total variance explained by the model as a whole is 7.8%, $F(3, 226) = 6.42$, $p < .001$. Neither sex nor age offered unique predictive ability or combined predictive power through their entry into the first block of the model. However, BMI uniquely explained 7% of the variance in dispositional pain catastrophizing, $R$ squared change = .07, $F$ change $(1, 226) = 17.11$, $p < .001$. An additional regression model was run with situational catastrophizing as the dependent variable. Here, sex and age explained 4% of the variance in situational catastrophizing when entered in the first step. After entry of BMI at Step 2, the total variance explained by this model as a whole was 6.8%, $F(3, 185) = 4.51$, $p < .001$. On its own, BMI explained just 2.8%, $R$ squared change = .028, $F(1, 185) = 5.54$, $p = .02$. In this model for the PCS-2, two of the three
included independent variables were statistically significant, with age recording a higher beta value (beta = -.19, p < .01) than BMI (beta = .17, p < .05). Age was a negative predictor for situational pain catastrophizing, indicating that older adults were engaging in lower levels of exercise-specific catastrophizing at Time 2.

Table 5

*Summary of Hierarchical Multiple Regression Analyses for BMI Predicting Exercise Rates*

<table>
<thead>
<tr>
<th>T1 Exercise Rates</th>
<th>F</th>
<th>R²</th>
<th>p</th>
<th>β (SE)</th>
<th>beta</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall model</td>
<td>3.92</td>
<td>.041</td>
<td>.009</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td></td>
<td></td>
<td></td>
<td>-3.07(.90)</td>
<td>-.20</td>
<td>.001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>T3 Exercise Rates</th>
<th>F</th>
<th>R²</th>
<th>p</th>
<th>β (SE)</th>
<th>beta</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall model</td>
<td>.80</td>
<td>.013</td>
<td>.49</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td></td>
<td></td>
<td></td>
<td>-1.55(1.10)</td>
<td>-.10</td>
<td>.16</td>
</tr>
</tbody>
</table>
Table 6

*Summary of Hierarchical Multiple Regression Analyses for BMI Predicting Catastrophizing Variables*

<table>
<thead>
<tr>
<th></th>
<th>Overall model</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dispositional</strong></td>
<td>6.42</td>
<td>.078</td>
<td>.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Catastrophizing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BMI</strong></td>
<td>.30(.07)</td>
<td>.26</td>
<td>.00</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Overall model</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Situational</strong></td>
<td>4.51</td>
<td>.068</td>
<td>.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Catastrophizing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BMI</strong></td>
<td>.10(.04)</td>
<td>.17</td>
<td>.02</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Discussion

This investigation studied participants involved in a short-term, workplace wellness program designed to increase physical activity with the goal of running or walking a 5K at the end of nine weeks. The primary purpose was explore the role that negative cognitions related to exercise-induced pain –specifically, pain catastrophizing –may play in exercise rates. There was an additional interest in examining exercise rates and catastrophizing among individuals with obesity and women, two groups that historically have had lower rates of physical activity than their healthy weight and male peers. Essentially, this investigation sought to better understand these disparities previously observed in exercise rates by examining cognitive factors related to sensations of discomfort and unpleasantness that may be provoked through physical activity.

Characteristics of Participants Enrolled in An Organizational Wellness Program

Characteristics of the participants, based on a number of variables assessed at both the beginning and conclusion of the program, create a portrait of the type of individual who may join an institutional wellness program such as Crimson Couch to 5K (CC25K). This study’s sample – as well as that of the corresponding feasibility study – was predominantly female, which is consistent with the literature suggesting this type of socially-oriented programming appears to attract more women than men (Dugdill et al., 2008; Sallis, Hovell, & Hofstetter, 1992; Sallis & Owen, 1999). At the very start of the program participants described their overall wellbeing in fairly positive terms. They identified their physical health as ‘good’ in comparison to others their age and generally expressed an absence of depressive symptoms. The typical participant
also reported mostly restorative and uninterrupted sleep and indicated their work productivity as being fairly high. An assessment of sitting behavior was also incorporated into the Time 1 Crimson Couch to 5K questionnaire, given the relatively recent and substantial wave of research that has demonstrated the association between hours of sitting per day and adverse health outcomes. Six to nine hours per day was endorsed as the mean and mode for this current sample’s sitting behavior, which is comparable to studies that have found the typical American adult spends 7 to 10 hours sitting each day (Matthews, 2008).

The mean BMI for this sample was in the overweight range, with 63.7% being overweight or obese. This parallels the nation-wide findings that 2/3 of American adults have BMIs of 25 or higher, therefore, falling above the “healthy” range of 18.5 to 25. Alabama, the state in which this investigation took place, has one of the highest prevalence rates of obesity in the country at 33% (Centers for Disease Control, 2012); correspondingly, 32.9% of this sample of Alabama adults fell into the obese category. What these findings communicate is that this institutional wellness program did not just draw in individuals with thin or healthy body types, but rather a representative sampling of adults of all shapes and sizes. There was no change in BMI over the course of the program, which is not surprising given the short time frame (nine weeks) and that this was designed to be an intervention to promote physical activity rather than to drive weight loss.

**Changes Occurring During the Program**

However, several notable changes were observed over the course of this nine-week period. First, sleep quality was found to improve from Time 1 to Time 3, although, most participants endorsed few problems in this domain from the start. Obtaining regular physical activity (albeit not immediately prior to bed time) has long been one standard recommendation to
achieve more restorative and plentiful sleep. It appears that a perceptible impact on sleep patterns can be seen within just two months of increasing exercise rates through a workplace program such as CC25K.

Another significant and unpredicted change was seen with work productivity. The literature on workplace wellness programs has not demonstrated any overwhelming outcomes regarding work productivity, although one meta-analysis determined a small effect for improving attendance at work (Conn et al., 2009), a related variable that was not assessed in the current investigation. Furthermore, the feasibility study for this current project, conducted with the 2012 CC25K data, failed to yield any change for work productivity. Therefore, it was not expected that any changes in self-reported productivity would occur over the span of the most recent CC25K. However, a slight decline in work productivity was observed between Time 1 to Time 3, with the change from 8/10 to 7.62/10 still representing moderately high productivity at both time points.

If this finding is accepted at face value, what rationale can there be to explain this trend in decreasing job performance? Although engagement in exercise tends to promote energy (U.S. Department of Health and Human Services, 1996), it may be plausible that fatigue was a contributing factor for those individuals new to regular workouts. Perhaps, job performance could suffer, temporarily, as a result of participants being tired and sore after beginning a new exercise regimen. Another possible (although unlikely) explanation is that participants were so invested in practicing new health habits, fitting in workouts, etc. that these activities slightly distracted them from applying their standard level of focus and effort at work.

However, it is more likely that this observed “change” in job performance was an artifact of the inherently imperfect process of research and assessment. For instance, regression to the
mean – a statistical phenomenon – describes how an extreme score measured at one point in time will likely fall closer to the mean or more typical score at another time point. After all, these participants rated their work productivity as an 8 out of 10 at Time 1, suggesting they perceived their ability in this domain to be well above average or what is expected.

There was one major change that occurred over the course of the 9-week program that was anticipated. Exercise rates, encompassing both the frequency of weekly workouts and total duration of physical activity in a one-week period, increased from the start to finish of CC25K. Specifically, at Time 3 participants were exercising one additional day and fifty-four additional minutes over the course of a week than at Time 1. While workplace wellness programs can target a multitude of health outcomes including smoking cessation, stress management, and fitness, this program’s primary goal – as the name “Couch to 5K” aspires – is the promotion of physical activity. To this end, group workouts and weekly training guides, which suggested workouts that increase in time/difficulty as the program progresses, are offered to encourage rising levels of exercise participation. Finally, one of the most salient findings from the literature on organizational wellness programs is that these interventions do improve rates of physical activity (Conn et al., 2009; Proper, 2003).

The Problem With Pain Catastrophizing: Psychometric and Conceptual Concerns

While formal programming may be successful in helping people lead more active lives, there remain numerous barriers, including psychological factors, which impede engagement in regular exercise. To briefly reiterate the previously described literature on this subject, it is clear that cognitive responses to sport and exercise related pain can affect performance, exercise rates, and future engagement in these activities. Paramount to this current investigation, of course, is studying the role of maladaptive pain-related cognitions within a population of non-athletes.
As there is no existing questionnaire that directly assesses maladaptive cognitive patterns specific to exercise-related pain and discomfort, a widely used measure in the field of pain cognitions, the Pain Catastrophizing Scale, was selected for this purpose. The PCS was used, first, in its standard form as a dispositional measure to better understand how participants respond in a general, trait-like way to pain stimuli. Then, the PCS was altered by both changing the instructions to specifically reflect pain sensations associated with exercise and by adopting the 6-item version, previously used by several groups of researchers in different situational contexts (Campbell et al., 2010; Edwards et al., 2006). These adaptations for the situational PCS used in the current study were guided by insights gained during the feasibility study (see Appendix A): a floor effect limited the usefulness of this measure when the original, 13-item PCS was used in exercise contexts. It appeared that many of the original items reflected a sense of urgency or severity that were inconsistent with the time-limited, largely controllable experience of encountering discomfort/unpleasant sensations when exercising. It was hoped that use of the 6-item PCS, which eliminated a number of the more extreme statements better suited to more intense pain stimuli (e.g., experimental pain induction, acute pain conditions), would improve the ability to capture the true construct of interest: general, maladaptive thoughts emerging in response to exercise-related pain. This, however, would prove to not be the case.

Before delving into further questions of validity and conceptualization, the related results, including a review of the two primary aims of this investigation, will be summarized. First, it appears that the typical participant in CC25K endorsed minimal dispositional catastrophic thinking when reflecting on their general reactions to pain stimuli; the mean PCS score at Time 1 was just 6.72 out of 52 possible points. It seems CC25K participants may report less pain catastrophizing – in this dispositional sense – than other samples of healthy participants. For
example, the mean PCS scores across several other studies range from 9.58 to 19.22 (Campbell et al., 2010a; Dixon, Thorn & Ward, 2004; Sullivan et al., 2002). With the PCS Time 2 and Time 3, the mean scores were 3.47 and 3.18, respectively, out of 24. As this modified, situational questionnaire has never been implemented in exercise-related contexts, there are no similar studies or samples with which to compare these scores.

The primary aim of this investigation was to assess the predictive power of dispositional versus situational catastrophizing on exercise rates: would engagement in these forms of maladaptive thinking lead to lower physical activity later in the program? The results of hierarchical multiple regression analyses found that neither the PCS -1 (dispositional) nor the PCS – 2 (situational) predicted exercise rates at Time 3. One additional hypothesis was that there would be a reduction in exercise-specific catastrophizing from Time 2 to Time 3; however, no change was observed in these PCS scores. It is not necessarily surprising that the dispositional PCS did not predict exercise rates as research in this domain suggests situational measures typically are stronger predictors of relevant outcomes than corresponding dispositional measures (Campbell et al., 2010a; Campbell et al., 2010b; Dixon, Thorn, & Ward, 2004; Edwards, Campbell, Fillingim, 2005). However, the situational PCS also did not have predictive power in this case.

These findings were likely influenced – and limited – by the instrument used in this study. The abbreviated 6-item version of the PCS was ultimately selected to assess this construct. While, as previously discussed, there were advantages to using this modification, the brevity of this scale is a shortcoming in and of itself. It is not only typically harder to establish reliability for scales of less than 10 items, but there will also be less variability among the scores
themselves. The restricted range of PCS-2 scores may have interfered with its predictive ability, potentially making it harder to detect a related change in exercise rates, if one were to exist.

Regardless of these specific psychometric concerns, the PCS may not have been the best choice for this investigation for a completely separate, conceptual reason. This research project was espoused to explore cognitive factors that may shape exercise behavior, yet the literature in this field is too new and limited to provide specific, widely confirmed hypotheses about which particular cognitive processes are involved or most important. For example, a number of different types of cognitions have been explored in this exercise-pain domain, including coping strategies such association and dissociation, acceptance, and pain ignoring, all of which have been examined in different contexts and with different populations (i.e., athletes versus non-athletes). State and trait anxiety have also been studied with respect to exercise-related pain and represent more inclusive, non-specific forms of maladaptive cognitions when compared with catastrophizing, which is rather narrowly defined. Expectations of future pain or injury as well as various cognitive appraisal processes, including the interpretations made of pain stimuli (i.e., challenge, threat, harm), have all been considered in this burgeoning area of research as well. All of these various cognitive variables, not just catastrophizing, have demonstrated significant associations with exercise or sports-related behavior in previous research.

Catastrophizing originally appeared to be a reasonable choice for the lens through which to explore the construct of interest: that is, negative thoughts held about exercise-related pain. After all, in the vast body of literature on the subject, pain catastrophizing has proven to be one of the most robust predictors of pain-related outcomes and is widely acknowledged to play an important role in the perception of experimental, procedural, and chronic pain. Additionally, the emerging field of research that specifically examines pain experienced during physical
activity does suggest catastrophizing may be one key determinant in these outcomes as well. However, these studies were almost exclusively concerned with athlete populations, often including those coping with injury. For those whose career—their livelihood and identity—may be determined by the extent of an injury, catastrophic thinking including rumination and contemplation of the worst possible outcome may be a warranted and understandable response. Therefore, the very meaning and interpretation of discomfort or unpleasantness encountered during a workout may be quite different for athletes versus non-athletes. Furthermore, athletes likely exert themselves with greater frequency and duration in physical contexts than individuals who exercise for the sake of health or recreation. Differing levels of effort and intensity likely translate into different degrees of pain and subsequent responses, including thoughts and behaviors. Because much of this research has focused on sports, it is important to direct attention to understanding pain-related cognitions in non-competitive forms of physical activity. And, it is crucial to recognize that psychological processes may vary because of differences in commitment, interpretations, prior experience, and training of the individuals being studied.

So while catastrophizing may be one factor influencing physical activity behavior, there are likely others that are equally, if not more, important. The very reasons that the original 13-item PCS was discarded in favor of the abbreviated situational version apply to the measure as a whole. Catastrophizing describes a specific and intense affective state where one fixates on the “worst possible” outcome. This may be too narrow a concept to measure the extent of maladaptive cognitions that could influence exercise behavior. Furthermore, catastrophizing implies the perception of a threat and sense of lack of control, neither of which is necessarily applicable to physical activity circumstances. After all, a person presumably may start and stop a workout at any time. Furthermore, most pain encountered during physical activity whether it is
from exertion or sore muscles, while unpleasant, is generally benign and dissipates with time. Although the 6-item version of the PCS did remove certain items that were particularly ill suited for the context of physical activity due to their emotionality and severity, the remaining statements remain highly emotive and urgent. In light of these considerations, the current researcher is in the process of constructing a new measure to assess a more broad and relevant range of cognitions that may influence exercise behavior.

**Examining Group Differences in Exercise Rates and Catastrophizing**

The second purpose of this investigation was to analyze exercise rates and catastrophizing amongst two groups typically seen as being at risk for physical inactivity: women and individuals with obesity. First, it was anticipated that overweight/obese individuals would have lower baseline rates of exercise, yet there were no striking findings to this effect. BMI predicted a very small percentage (4.1%) of the variance in Time 1 exercise rates. The small, negative correlation between these two variables suggests that overweight/obese individuals tended to engage in lower levels of physical activity at the onset of CC25K. However, given the strength of these associations, it is a mild trend accounting for minimal variability. Therefore, obese individuals were exercising at fairly comparable rates as their healthy weight counterparts in the week prior to starting this program. This finding is not consistent with the consensus in the literature that individuals with obesity typically engage in less physical activity than those of a healthier BMI. What might explain this discrepancy?

Participants who signed up for this particular program may have already been involved in one of the many other wellness initiatives being offered through their workplace in the recent past. Therefore, they may have already been working towards enhancing their fitness prior to enrolling in CC25K. As expected, BMI no longer possessed *any* predictive power for exercise
rates at Time 3. Perhaps a testament to this type of health promotional intervention and participants’ high level of motivation, these participants – regardless of body composition – were exercising at similar levels by the end of CC25K.

While BMI may not have held much influence in the domain of exercise rates, a more noticeable impact was observed within catastrophizing. BMI emerged as a significant and unique predictor for both dispositional and exercise-specific pain catastrophizing, although it accounted for more variance in the trait measure (7%) than the situational version (2.8%). Therefore, higher BMIs are associated with a greater degree of pain catastrophizing, particularly on the dispositional level.

It was also speculated that sex differences – namely, that women would engage in higher catastrophizing and have lower exercise rates at Time 1 – would emerge in this sample. However, there were no significant differences found between males and females for exercise rates at either Time 1 or Time 3 nor were women more likely to engage in either dispositional or exercise-specific pain catastrophizing. These results are inconsistent with previous, well-documented findings in both the exercise and pain catastrophizing literature.

As no research has yet compared exercise-specific pain catastrophizing between men and women, the hypothesis that a difference would be observed was based on general research with the PCS in other applications. It appears that both males and females in this study engaged in a similarly minimal degree of pain catastrophizing in the context of exercise. Building off earlier reflections concerning assessment and conceptualization of psychological factors, there are concerns with both the 6-item, situational PCS as well as the relevance of catastrophizing to this setting that may have influenced results. Sex differences might surface if a different measure—one that assessed more general, maladaptive cognitions regarding exercise-related pain—was
used in the place of the PCS.

The original PCS, however, has been widely used as a dispositional measure of pain catastrophizing, yet results in the current investigation deviated from previous findings with comparable samples. One possible reason for the lack of significant differences between men and women and their relatively low dispositional PCS scores is that the context in which participants completed this measure was somewhat unique. In earlier studies, participants often completed the PCS as part of a formal experimental protocol, typically filling out the measure before engaging in an experimental pain manipulation such as a cold pressor task. In this case, participants completed this questionnaire while attending the check-in for an organizational wellness program and without a subsequent pain task. More traditional, experimental formats, particularly those that are explicitly introduced as being an investigation into pain processes, may facilitate participants’ reflections on previous pain experiences as they respond to the PCS. Despite being a general, dispositional measure, a lack of pain cues/ context may hinder the ability to recall relevant experiences in one’s past, making it more difficult to accurately complete.

A disparity in exercise rates between the sexes was also predicted, based on previous research, although this hypothesis went unsupported. Men and women engaged in the same level of exercise at both Time 1 and Time 3 of the program. There are several striking factors, however, that may explain why no significant differences were observed across study hypotheses.

First and perhaps most significantly, this was not a random sampling of American adults. Earlier studies have typically surveyed a national sample of adults or, often, college students – samples without any connection to wellness programming. In stark contrast, the current sample
was directly pulled from participants who signed up for a physical activity intervention. This level of initiative suggests they likely possessed strong motivation and interest in being physically fit, illustrated through their Time 1 ratings reflecting strong intention to train for and complete the associated 5K. Given these intentions, they were likely engaging in higher baseline (Time 1) rates of exercise than typical adults. Finally, the notion of training to complete a 5K may be a daunting or improbable feat for many individuals leading a largely sedentary lifestyle, consequently deterring from participation that would be more representative of the population as a whole.

Another related consideration, first addressed with respect to BMI, is that CC25K represents one of many health promotional programs that are organized for University of Alabama employees by the Office of Health Promotion and Wellness. As stated, it seems likely that many of this study’s participants—regardless of body size or sex—have been involved with previous programming and have consequently become more physically active through these functions. In addition to joining these earlier programs for the sake of improving health and fitness, there are other motivational sources that encourage participation among University employees. For instance, one draw to engagement in these workplace wellness offerings may be the financial incentives. While not an element of CC25K, there are certain monetary rewards that participants can earn by being involved in these various programs.

Another appealing—and influential—factor is the strong social component of these types of programs, whether that takes the form of options for team-based participation, co-workers who encourage one another to get involved, or simply that these activities take place within a social climate. For example, these offerings can include educational classes, informational check-ins, events, group training sessions, and family oriented activities. Social support is
known to play a pivotal role in women’s engagement in physical activity; therefore, initiatives such as these that have social involvement woven in the very fabric of their design would likely be especially attractive to women. This particular feature of CC25K may be a key reason as to why so many more women than men joined this program and perhaps offers insight into why there were no significant sex differences with this sample. The Office of Health Promotion and Wellness works to build a culture of engagement in health behaviors, taking advantage of these natural motivational factors. This organization’s initiatives and forms of outreach have almost certainly influenced the exercise rates of those individuals who continue to engage in their programming.

The process and nature of physical activity measurement itself also likely played a role in reaching these specific findings. In an effort to reduce participant burden and to maintain consistency with methods previously used by the CC25K program in former years, the well-validated and lengthy questionnaires often used to quantify physical activity in the literature were passed over for a simpler process. Participants were asked to provide an estimate of their engagement in exercise over the past week by recording the number of days they exercised and the average duration (in minutes) of each workout. Additionally, this single, two-part question (i.e., days per week, minutes per workout) targeted aerobic exercise, which is simultaneously specific and open-ended. Therefore, this measure focuses on one type of physical activity: the form with the greatest activation of the cardiorespiratory system and well-acknowledged health benefits, but excludes strengthening and stretching activities. Had these additional exercise forms been included, a sex difference would have likely appeared with a higher prevalence of women engaging in stretching activities and more men involved with strengthening activities, as has previously been observed in related studies.
Furthermore, because no objective definition of aerobic exercise was offered on this brief physical activity measure, it remains unclear how participants conceptualized this question. Perhaps many of participant responses conformed to the traditional (and unspoken) definition, yet others may have mistakenly included stretching or strengthening activities in their answer. For example, it is expected that most respondents exclusively recorded “workouts,” those activities done specifically for the sake of fitness, such as running, using cardio machines at the gym, or taking an aerobics class. Consider, however, what is known about the advantages of an active lifestyle versus time-limited bouts of exercise while leading an otherwise sedentary lifestyle. The literature has begun to reflect these findings – that regular movement throughout the day, not just discrete workouts, promotes health – by widening definitions used to categorize physical activity. For instance, certain lively behaviors of daily life, including engagement in active play with children, performing household chores, and doing yard work certainly generates a rise in cardiovascular rate, meeting the criterion for aerobic exercise. Perhaps some participants included these activities in their calculation of weekly exercise rates while others did not, contributing to problems with reliability and validity. Also, considering that the goal of CC25K is completing a 5K event at its conclusion, participants may have been primed to consider walking and running when reflecting on their exercise behavior over the previous week, discounting or simply not recalling other forms of physical activity.

Although the simple measure used to assess physical activity at Time 1 and Time 3 has its flaws, selecting a valid and feasible form of measurement is a challenge in this line of research. Self-report measures, including questionnaires, diaries/logs, and interviews, are commonly used in research contexts given benefits such as ease of use, cost-effectiveness, and low participant burden. These advantages come with a trade-off, however; the flaws in using
these subjective measures include response bias, problems with recall, and a lack of convergence with more accurate means of physical activity measurement.

Prince and colleagues (2008) conducted a review to examine 187 articles that compared self-report versus direct measures of physical activity (e.g., pedometers, accelerometers, and monitoring physiological markers). They determined that the correlations between subjective and objective measures were in the low to moderate range, suggesting self-report tools are inherently unable “to capture the absolute level of physical activity.” This review also revealed that there appears to be no general trend for whether respondents tend to over-or-under-report their general level of activity. However, several specific patterns were noted. First, people are more likely to over-estimate involvement in high intensity forms of exercise such as running or swimming. Secondly, individuals with obesity tend to over-report vigorous physical activity and are less accurate overall. This may be due, in part, to these individuals possessing a lower level of fitness, resulting in low intensity exercise producing a heightening of their respiration rate (Warner et al., 2012). Future research in this domain would be improved through the addition of an objective measure, such as pedometer use, to augment self-report measures, allowing for comparison of these methods within this particular context and enhancing accuracy.

Conclusions and Future Directions

There are several significant limitations and barriers that limited this investigation’s ability to fully explore and explain the initial research questions. Psychometric concerns regarding the measures, particularly the PCS and measurement of physical activity, have been discussed. From these challenges came renewed ideas of how to improve upon measurement of these constructs, particularly so with cognitive factors related to exercise, and what future directions this line of research should take. There were methodological problems, including
retention of participants and confounding variables that accompany any investigation that is examining a “real world” program, one that by its very nature can not be carefully constructed and run with laboratory precision. However, there are substantial benefits from studying existing health promotional interventions and analyzing what factors do or do not contribute to outcomes. The ability to establish tight control over variables and outside influences may have been compromised by this type of research, but, conversely, external validity was improved. This type of research reflects genuine trends in organizational wellness programs, enhancing generalizability and prompting realistic, educated hypotheses about how and what to study within this particular niche.

One finding, regarding participation, was that workplace wellness programs draw a selective sample from the overall employee population. The participants of this investigation reported generally good health, mostly restorative sleep, minimal symptoms of depression, and fairly high job performance. It appears that rather high functioning employees with reasonably good mental and physical health, albeit across a broad range of BMIs, participated in CC25K. These results are consistent with previous studies that have found participants in workplace wellness programs tend to possess greater physical fitness, more education, and greater health literacy than the average adult (Mattke et al., 2013; Sallis & Owen, 1999). According to a thorough review on the subject, only 21% of employees participate in fitness oriented workplace programs such as this one (Mattke et al., 2013). Given these findings, future research within organizational wellness programs would do well to examine what barriers prevent the majority of employees from joining this type of intervention and how these barriers can be overcome.

Previously raised psychometric concerns began with questioning the validity and usefulness of incorporated measures and eventually delved into deeper considerations of the
constructs themselves. It appears that pain catastrophizing may hold little predictive power within this type of setting and these particular outcomes. This does not mean that cognitive factors regarding exercise-related pain do not influence behavior, but rather that a novel approach and different measures may be needed to better understand this particular empirical pursuit. The literature certainly implies that exercise rates, as well as other related outcomes, are shaped by various psychological variables. However, pain catastrophizing, at least within the realm of non-competitive physical activity, may not be the most powerful psychosocial determinant of behavior.

Therefore, the nature of these findings suggests that future investigations focus on other cognitive variables that have been largely unexamined within non-competitive physical activity. Based on various aspects of the current investigation, including the literature review, results related to the PCS, and anecdotal evidence provided by participants during data collection, a follow-up study has already been formulated to address these conceptual issues. In this successive project, a new questionnaire has been developed with the aim of assessing a more broad range of negative cognitions that may be evoked by exercise related pain and discomfort. Care was taken to construct items that accurately reflect the full spectrum of anxious and negative thoughts that could be prompted through discomfort associated with exercise, be it exertion, muscle soreness, or injury. Specifically, the type of negative cognitions incorporated in this new measure include: rumination; expectations of experiencing pain-related outcomes; lack of self-efficacy regarding one’s ability to cope effectively; specific worries related to exercise-related pain, etc. While there are some elements of pain catastrophizing represented in certain items, they are more appropriately gauged to this particular context. Also unlike the PCS, this questionnaire is specifically tailored to physical activity, both with respect to the instructions and
content of the items themselves. Currently a validation study is being conducted to examine the validity, reliability, and predictive power of this newly developed measure.

Physical inactivity remains a pressing problem in American society, with tremendous health consequences. Research focusing on factors that influence exercise behavior, whether that is defined as adherence, exercise rates, or other forms of participation, is crucial to better understanding what variables both restrict and facilitate the adoption of an active lifestyle. Consideration of cognitive factors, particularly maladaptive thought patterns that may be prompted by exercise-related pain, is an important piece of this puzzle. Exploring what specific cognitive processes are at work in determining future exercise participation can ultimately help shape future organizational wellness programming and other interventions that work to eliminate health disparities and promote physical activity within all subsets of the population.
References


Appendix A: Feasibility Study

The Feasibility Study

During the 2012 Crimson Couch to 5K program, the feasibility study was run, implementing procedures very similar to those previously outlined in this proposal. The purpose of the feasibility study was two-fold. First, one aim was to determine if an adequate number of program participants would be willing to participate in the research component and to identify how many of these participants would complete measures across all three time points. Second, this study served as a trial run to identify any potential problems that could interfere with data collection or the validity of measures used.

Method

Participants

Participants included 289 faculty and staff members of the University of Alabama who participated in the research component of the 2012 Crimson Couch to 5K program. The majority of participants were female (79%). With regard to race, 76% were Caucasian, 15% were African American, and 4% were Asian or Pacific Islander. The mean age for participants was 41.6 years. The majority of participants were staff members (74%), while 17% were faculty and 7% were graduate students.

Procedure

The procedures for this feasibility study were very similar to what is outlined in the current proposal, with some differences in terms of the timing of electronic surveys and the
composition of the surveys themselves. Individuals attending the in-person Initial Check-In (Time 1) for the Couch to 5K program were asked if they would be willing to participate in this study. Those who indicated their consent, completed the PCS-Time 1 (dispositional version) and the Couch to 5K Questionnaire (identical to the measure presented in Appendix D excluding items 11, 12, and 13, which assess motivation and sedentary behavior).

At the Midpoint Check-In, individuals were asked to complete the corresponding Time 2 measure, which was the situation-specific PCS; at this time, the full 13-item PCS was used with modified (situation-specific) instructions. Participants who had agreed to be a part of the study during Time 1 yet did not show up for the in-person Midpoint Check-In were sent an email with a link to the electronic version of the Time 2 measure. These procedures were repeated for Time 3. Individuals presenting at the Final Check-In were asked to completed the Time 3 measures: the PCS—again, the full 13-item situation-specific version and the Crimson Couch to 5K questionnaire. Those who had previously agreed to participate in the study, but did not attend the Final Check-In were emailed a link to the electronic version of the Time 3 materials. Additionally, at each time point participants were given the opportunity for biometric measurements (weight, waist circumference, etc.) as a part of the program check-in process.

Measures

The Pain Catastrophizing Scale. Developed by Sullivan, Bishop, and Pivik (1995), this 13-item instrument assesses catastrophic thinking in response to pain. This questionnaire was given three times over the course of the feasibility study. The PCS-Time 1, given during the recruitment/initial data collection phase of the program served as a dispositional measure. The PCS-Time 2 and PCS-Time 3 served as situation-specific measures of pain catastrophizing, as
participants were given modified instructions asking them to reflect specifically on their exercise-related pain catastrophizing.

**Demographics.** The Crimson Couch to 5K Participant Tracking Cards and the Office of Information Technology (OIT) database were used to obtain demographic information, including age, race, employee status (i.e., staff, faculty, graduate student, retired), and sex.

**Biometric measurements.** Trained staff took biometric measurements for program participants, including waist circumference, hip circumference, weight, and blood pressure, during each of the three Check-Ins. These measurements are an optional, but popular part of the Check-In process. Staff recorded this information on the Participant Tracking Cards used for each Check-In.

**Exercise rates.** Participants’ frequency and duration of aerobic exercise was recorded on the Participant Tracking Cards for each of the three time points.

**Results**

A total of 688 people participated in the 2012 Crimson Couch to 5K training program. Two hundred and eighty-nine individuals consented and participated in some aspect of this study. It should be noted that although 688 people participated in the program, only approximately half of these individuals were solicited for research participation given that many did not come in for the Couch to 5K Check-Ins (where research recruitment was conducted). Given that there were three different time points in which participants could submit a survey related to the study (i.e., Initial Check-in, Midpoint Check-In, Final Check-In), frequencies for each time point were calculated. For Time 1, 196 participants completed the associated measures. For Time 2 and Time 3, respectively, 150 and 133 individuals participated.
These numbers represent the total participating for each time point; it is also useful to break down these numbers further to understand the format used (in-person versus electronic) and the total number that completed measures for all three time points. For Time 1, the only option during the 2012 round of data collection for this feasibility study was to do so in person at the Initial Check-In. However, Times 2 and 3 had electronic survey alternatives, emailed following the in-person Check-In. Thirty participants completed the electronic measure for Time 2 and 20 did so for Time 3. Finally, the total number of participants—including both electronic and in-person formats—who completed both Time 1 and Time 2 was 90. The total number of participants who completed measures across all three time points was 56.

Figure 1

*Frequency of Participants Per Time Point, In Person Versus Electronic Format*
The preceding information summarizes the frequencies of participation across the 2012 Couch to 5K feasibility study. However, helpful feedback was given directly and indirectly throughout this process. While qualitative in nature, this information shaped the procedure described earlier in this proposal document. For example, a number of participants indicated during Time 2 and Time 3 that they had difficulty completing the PCS-2 and 3. They pointed out certain items of the original PCS that do not lend themselves well to the context of physical activity, which by its nature is voluntary and time-limited. Because these items reflected a degree of severity and sense of urgency that respondents did not associate with physical activity, their presence contributed to a floor effect for the PCS-2 and 3. Participants’ comments were one factor that led to replacing the 13-item PCS with the modified situational version of the PCS, adapted and first used by Edwards et al. (2006). This six-item alternative eliminates many of the statements that, while appropriate for the dispositional measure, do not fit the current context.
Appendix B: Pain Catastrophizing Scale -- Time 1

Everyone experiences painful situations at some point in their lives. Such experiences may include headaches, toothaches, joint pain or muscle pain. People are often exposed to situations that may cause pain such as illness, injury, dental procedures or surgery.

We are interested in the types of thoughts and feelings that you have when you are in pain. Listed below are thirteen statements describing different thoughts and feelings that may be associated with pain. Using the following scale, please reflect back on time in which you experienced pain and indicate the degree to which you had these thoughts and feelings when you experience pain.

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>not at all</td>
<td>to a slight degree</td>
<td>to a moderate degree</td>
<td>to a great degree</td>
<td>all the time</td>
</tr>
</tbody>
</table>

When I’m in pain ...

_____ 1. I worry all the time about whether the pain will end.
_____ 2. I feel I can’t go on.
_____ 3. It’s terrible and I think it’s never going to get any better.
_____ 4. It’s awful and I feel that it overwhelms me.
_____ 5. I feel I can't stand it anymore.
_____ 6. I become afraid that the pain will get worse.
_____ 7. I keep thinking of other painful events.
_____ 8. I anxiously want the pain to go away.
_____ 9. I can’t seem to keep it out of my mind.
_____ 10. I keep thinking about how much it hurts.
_____ 11. I keep thinking about how badly I want the pain to stop.
_____ 12. There’s nothing I can do to reduce the intensity of the pain.
_____ 13. I wonder whether something serious may happen.
Appendix C: Pain Catastrophizing Scale – Time 2 and 3

We are interested in the types of thoughts and feelings that you have when you are experiencing **exercise-related pain**. *Exercise-related pain includes sensations of physical discomfort and unpleasantness that may be induced through physical activity.* Listed below are six statements describing different thoughts and feelings that may be associated with pain. Using the following scale, please reflect back on a time within the past two weeks in which you experienced **pain/discomfort during a workout** and indicate the degree to which you had these thoughts and feelings during that time. If you did not experience exercise-related pain during the past two weeks, think back to the most recent workout when you did experience some discomfort or unpleasantness to address these items.

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>not at all</td>
<td>to a slight degree</td>
<td>to a moderate degree</td>
<td>to a great degree</td>
<td>all the time</td>
</tr>
</tbody>
</table>

**When I’m experiencing exercise-related pain...**

_____ 1. I worry about when it would end.

_____ 2. I thought that the pain might overwhelm me.

_____ 3. I felt that I couldn’t stand it.

_____ 4. I couldn’t stop thinking about how much it hurt.

_____ 5. I kept wishing that it would be over.

_____ 6. I felt that the experience was awful.

7. Was the discomfort/pain during or after the workout (or both)?

8. What kind of discomfort/pain were you thinking of when you completed this questionnaire?

9. When was this workout?

**Part B**

10. How likely are you to complete the Couch to 5K event? (Please circle one.)

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>Likely</td>
<td>Extremely Likely</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix D: Couch to 5K Questionnaire – Time 1

1) Considering your age, how would you describe your overall physical health?
   ___Excellent   ___Good   ___Fair   ___Poor

2) On a scale from 0 to 10 where 0 is the worst job performance and 10 is the performance of a top worker, how would you rate your overall job performance during the past 4 weeks? Please circle a number.

<table>
<thead>
<tr>
<th>Worst Performance</th>
<th>Top Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

   Over the last 2 weeks, how often have you:

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>Several days</th>
<th>More than half the days</th>
<th>Nearly every day</th>
</tr>
</thead>
<tbody>
<tr>
<td>3) had little interest or pleasure in doing things?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4) felt down, depressed, or hopeless?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5) felt nervous, restless, keyed up, or on edge?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6) felt weak or easily fatigued?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7) had difficulty concentrating?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### How often during the past 4 weeks did you:

<table>
<thead>
<tr>
<th></th>
<th>None of the time</th>
<th>A little of the time</th>
<th>Some of the time</th>
<th>A good bit of the time</th>
<th>Most of the time</th>
<th>All of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>8) feel that your sleep was not quiet (moving restlessly, feeling tense, speaking, etc., while sleeping)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9) have trouble falling asleep?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10) awaken during your sleep time and have trouble falling asleep again?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

11) Approximately how many hours a day do you sit (i.e. at a desk, in front of the TV, in your car)?

- [ ] 0-3 hours
- [ ] 3-6 hours
- [ ] 6-9 hours
- [ ] 9-12 hours
- [ ] 12+ hours

12) Why did you decide to participate in Crimson Couch to 5K (please check all that apply):

- [ ] Improve health
- [ ] Manage/ lose weight
- [ ] Social: to spend time with friends or meet new people
- [ ] For fun
- [ ] Improve fitness
- [ ] For the challenge
- [ ] To look more attractive
- [ ] To manage stress
- [ ] For a competitive outlet
- [ ] To increase strength and/or endurance
- [ ] To feel better about yourself

Other: _____________________________________________

13) How likely are you to complete the Couch to 5K event? (Please circle one.)

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all Likely</td>
<td>Extremely Likely</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix E: Couch to 5K Questionnaire – Time 3

1) Considering your age, how would you describe your overall physical health?
   ____Excellent  ____Good  ____Fair  ____Poor

2) On a scale from 0 to 10 where 0 is the worst job performance and 10 is the performance of a top worker, how would you rate your overall job performance during the past 4 weeks? Please circle a number.

<table>
<thead>
<tr>
<th>Worst Performance</th>
<th></th>
<th>Top Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
</tbody>
</table>

Over the last 2 weeks, how often have you:

<table>
<thead>
<tr>
<th>3) had little interest or pleasure in doing things?</th>
<th>Not at all</th>
<th>Several days</th>
<th>More than half the days</th>
<th>Nearly every day</th>
</tr>
</thead>
<tbody>
<tr>
<td>4) felt down, depressed, or hopeless?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5) felt nervous, restless, keyed up, or on edge?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6) felt weak or easily fatigued?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7) had difficulty concentrating?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
How often during the **past 4 weeks** did you:

<table>
<thead>
<tr>
<th></th>
<th>None of the time</th>
<th>A little of the time</th>
<th>Some of the time</th>
<th>A good bit of the time</th>
<th>Most of the time</th>
<th>All of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>8) feel that your sleep was not quiet (moving restlessly, feeling tense, speaking, etc., while sleeping)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9) have trouble falling asleep?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10) awaken during your sleep time and have trouble falling asleep again?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix F: Participant Tracking Card

Crimson Couch to 5K
Individual Tracking Card

Name: ________________________ Phone: ________________

Department: ____________________ Email: ________________

Team Name: ____________________ T-Shirt size (circle): S M L XL 2X 3X

Training Program (circle): 5K Walk 5K Beginner Running 5K Intermediate Running 5K Advanced Running 10K

<table>
<thead>
<tr>
<th>9-Week Training Program Check-Ins</th>
<th>*Height (inches)</th>
<th>*Weight (pounds)</th>
<th>*Body Mass Index</th>
<th>*Blood Pressure (mercury Hg)</th>
<th>Aerobic Exercise: (Days a Week)</th>
<th>Aerobic Exercise: (Minutes a Day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kickoff: September</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mid-Point: October</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final: November</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Optional Measures

Office of Health Promotion and Wellness | 321 Russell Hall | 348-0077
Appendix G: IRB Approval

August 21, 2012

Rebecca Kelly, Ph.D., R.D.
Director of Health Promotion and Wellness
Academic Affairs
The University of Alabama

Re: IRB # 10-OR-283-R2 “Crimson Couch to 5K: Evaluation of Improved Individual Health Goals, Health Measures, and Program Aspects”

Dear Dr. Kelly:

The University of Alabama Institutional Review Board has granted approval for your renewal application.

Your renewal application has been given expedited approval according to 45 CFR part 46. Approval has been given under expedited review category 7 as outlined below:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Your application will expire on August 20, 2013. If your research will continue beyond this date, complete the relevant portions of the IRB Renewal Application. If you wish to modify the application, complete the Modification of an Approved Protocol Form. Changes in this study cannot be initiated without IRB approval, except when necessary to eliminate apparent immediate hazards to participants. When the study closes, complete the appropriate portions of the IRB Study Closure Form.

Please use reproductions of the IRB approved informed consent form to obtain consent from your participants.

Should you need to submit any further correspondence regarding this proposal, please include the above application number.

Good luck with your research.

Sincerely,

Carpnano T. Myles, MSM, CIR
Director & Research Compliance Officer
Office for Research Compliance
The University of Alabama
UNIVERSITY OF ALABAMA
INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF HUMAN SUBJECTS
REQUEST FOR APPROVAL OF RESEARCH INVOLVING HUMAN SUBJECTS

I. Identifying information

Principal Investigator
Names: Rebecca K. Kelly
Department: Office of Health Promotion and Wellness
College: Office for Academic Affairs
University: Box 870367
Address: Box 870367
Telephone: 348-0077
FAX: 348-0083
E-mail: rkeally@ua.edu

Second Investigator
Names: Melondie Carter
Department: Office of Health Promotion and Wellness
College: Nursing
University: Box 870367
Address: Box 870367
Telephone: 348-0077
FAX: 348-0083
E-mail: mcarter@ua.edu

Third Investigator

Title of Research Project: Crimson Couch to 5K: Evaluation of Improved Individual Health Goals, Health Measures, and Program Aspects

Date Submitted: 8/16/2012
Funding Source: Office of Health Promotion and Wellness

Type of Proposal
- [ ] New
- [ ] Revision
- [x] Renewal
- [ ] Completed
- [ ] Exempt

Please attach a renewal application
Please attach a continuing review of studies form

UA faculty or staff member signature:

II. NOTIFICATION OF IRB ACTION (to be completed by IRB):

Type of Review: [ ] Full board [x] Expedited

IRB Action:
- [ ] Rejected
- [ ] Tabled Pending Revisions
- [ ] Approved Pending Revisions
- [x] Approved—this proposal complies with University and federal regulations for the protection of human subjects.

Approval is effective until the following date: 8/20/13

Items approved:
- [ ] Research protocol (dated __________)
- [ ] Informed consent (dated __________)
- [ ] Recruitment materials (dated __________)
- [ ] Other (dated __________)

Approval signature

Date: 8/21/2012