The Efficacy of Affective Behavioral Strategies for Increasing Physical Activity: Implications for Harnessing the Dual-Mode Model

A Dissertation
SUBMITTED TO THE FACULTY OF
UNIVERSITY OF MINNESOTA
BY

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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

Adviser: Beth A. Lewis, PhD

June, 2017

Acknowledgements

My sincerest and deepest thanks to my advisor, Beth Lewis, PhD. She is the reason I am completing this work. After welcoming me onto her research team halfway through my master's degree, she gave me the opportunity to continue into my doctoral work. It has been an incredible honor and privilege being able to work with and learn from her. She is absolutely a model of research and service excellence, while maintaining a strong family life. Thanks for all you do!

I would also like to thank Diane Wiese-Bjornstal, PhD for her support and mentorship across my graduate career. She has shown me what it means to truly engage with students in and out of the classroom. She also went out of her way to help mentor me in becoming a certified consultant through the Association for Applied Sport Psychology (CC-AASP). Thank you Diane for the generous support of your time and knowledge.

I would like to thank David Williams, PhD and Daheia Barr-Anderson, PhD for serving on my committee. I would further like to thank Dr. Barr-Anderson for her gracious loan of ActiGraphs. I would not have been able to complete this project as timely as I did without the extra devices. Thank you!

My thanks to the Association for Applied Sport Psychology (AASP) for their generous funding of this project. Their financial support made this study possible through equipment, materials, and participant incentives. Thank you for your support. To my fellow graduate students and colleagues, especially Morgan Betker, Caroline Heffernan, Zach Pope, Hayley Russell, PhD, and Amanda Frayeh, PhD. Your support and encouragement has been amazing.

Finally, to my family, Mom, Dad, and Clay all that I have been able to accomplish comes from your never ending love and support. I cannot fully describe all that your encouragement has meant to me. And to Mitch, you are my rock. I could not have done it without you.

Dedication

This dissertation is dedicated to all those individuals who struggle with physical activity. It is my hope that everyone can find a way to be happy in movement and look forward to physical activity. There is no such thing as “no pain, no gain.” We are meant to move and it should bring us pleasure!

Abstract

Approximately 20.8% of U.S. adults participate in the recommended levels of physical activity (PA) despite the health benefits. Researchers have begun to examine the importance of affect for adopting and maintaining PA. However, few studies have examined how strategies aimed at facilitating positive PA-related affect can influence PA adherence. The current prospective, randomized controlled intervention trial examined the efficacy of a 12-week affective intervention focused on enhancing PA-related affect relative to a behavioral comparison. Participants included healthy low-active adults (n = 40). PA, PA-related affect, and several psychosocial variables were assessed at baseline, 12 weeks, and 16 weeks. Participants in the affective intervention demonstrated increases in objectively measured PA at 12 weeks relative to the behavioral comparison after controlling for baseline $f(1,28)=14.764$, $p < .005$. However, there were no between group differences on self-reported PA at 12 or 16 weeks. After controlling for baseline, participants in the affective intervention reported increases in positive Pre-PA affect $f(1,26)=5.485$, $p < .05$, and reported marginal increases in affect during PA $f(1,26)=3.037$, $p = .094$, relative to the behavioral comparison. Additionally, participants in the affective intervention reported marginal increases in PA enjoyment relative to the behavioral comparison at 16 weeks $f(1,32)=3.68$, $p = .064$. These findings provide initial evidence that teaching low-active individuals strategies to increase positive PA-related affect before and during PA is efficacious for increasing PA. Future studies with larger samples, and real-time assessment strategies are needed to further understand the efficacy of PA-related affect interventions.

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Introduction

Physical activity (PA) is related to a reduced risk of cardiovascular disease (CVD; Wilson, Ellison, & Cable, 2015), type 2 diabetes (Helmrich, Ragland, & Paffenbarger, 1994; Warburton, Gledhill, & Quinney, 2001), and breast cancer (Fournier et al., 2014; Pettapiece-Phillips, Narod, & Joanne, 2015). Additionally, PA improves energy, releases tension, promotes enthusiasm, enhances self-image, and improves general quality of life (AHA, 2015). Yet, according to the Centers for Disease Control and Prevention (2014), only 20.8% of U.S. adults ages 18 and over meet the PA guidelines for both aerobic and muscle-strengthening activities.

Research indicates that behavioral strategies are efficacious for increasing PA (Chase & Conn, 2013). These strategies include self-monitoring, goal setting, reminders, rewards, and social support. Interventions utilizing behavioral strategies are often informed by social-cognitive theory (Bandura, 1977). These interventions typically involve trained professionals who teach and reinforce these strategies with individuals or groups through multiple sessions. One problem is that these strategies do not work for some individuals (Higgins, Middleton, Winner, & Janelle, 2014) and long-term maintenance has not been widely examined (Gourlan, Trouilloud, & Sarrazin, 2011). There is a need for additional research that examines the efficacy of innovative and novel interventions for PA promotion.

There is evidence to suggest there is a relationship between PA and the associated affective response (defined as one's all-encompassing or "valenced" response to stimulus; Reed & Ones, 2006). Empirical evidence shows that significant increases in affect occur immediately following a bout of PA when compared to baseline (Welch,

Hulley, Ferguson, & Beauchamp, 2007). As little as four to 10-minutes of PA has resulted in significant increases in energy, activation, and positive affective valence, and decreases in tension (Ekkekakis, Hall, Van Landuyt, & Petruzzello, 2000; Saklofske, Blomme, & Kelly, 1992; Thayer, 1987). The dual-mode model suggests that in order for individuals to experience positive affect during PA the intensity should be more moderate in nature, as opposed to vigorous intensity (Ekkekasis, 2005; Ekkekakis, Hall, & Petruzello, 2008). In research investigating the long-term influence of affect on PA, Williams et al. (2008) showed that positive affect experienced during a single bout was related to greater PA six and 12-months later.

The purpose of this dissertation was to examine the efficacy of affectively-focused behavioral strategies on increasing PA among low-active adults. Though research indicates that those who experience greater positive affect during a single bout of PA report higher rates of PA in the future (Williams, 2007; Williams, Dunsiger, Jennings, & Marcus, 2012), few studies (Peterson et al., 2012) have examined how manipulating affect can influence PA promotion. Participants were given behavioral strategies and tools to self-manipulate their affect prior to and during PA in order to increase positive PA-related affect and improve adherence to overall PA.

Low-active participants were randomly assigned to either an affective intervention or a behavioral comparison both delivered over the telephone. During regular telephone session, participants in the affective intervention were encouraged to use behavioral strategies that specifically focused on manipulating and enhancing PA-related affect. The behavioral comparison consisted of telephone-based behavioral

strategies that addressed the benefits of PA, reminders to engage in PA, and social support for PA. As recommended by previous research, all participants self-selected the type of PA and self-paced their PA intensity (Williams, 2008; Williams et al., 2015). This study addressed previous methodological issues by randomizing participants, utilizing an objective measure of PA, following participants across 12 weeks, taking weekly measures of PA-related affect over 12 weeks, and including a follow-up at 16 weeks.

Aims and Hypotheses

For related logic model see Figure 1.1.

Primary Aim : To examine the efficacy of a 12-week affective intervention relative to a behavioral comparison on PA based on the ActiGraph and the 7-day Physical Activity Recall Interview (PAR) among low-active adults.

Related hypothesis. Participants in the affective intervention would exhibit greater increases in PA from baseline to 12 weeks and baseline to 16 weeks than participants in the behavioral comparison.

Secondary Aim : To examine the efficacy of a 12-week affective intervention relative to a behavioral comparison on affective valence experienced before PA (i.e. Pre-PA affect) and during PA as measured by the Feeling Scale (FS; Hardy & Rejeski, 1989) among low-active adults.

Related hypothesis. Participants in the affective intervention would report greater increases in feelings of Pre-PA affect from baseline to 12 weeks than participants in the behavioral comparison.

Related hypothesis. Participants in the affective intervention would report greater increases in feelings of affective valence during PA from baseline to 12 weeks than participants in the behavioral comparison.

Other Questions of Interest

Question of Interest 1: To examine the effect of a 12-week intervention on changes in self-efficacy for exercise, outcome expectations, PA social support, and enjoyment for exercise in both the affective intervention and the behavioral comparison.

Related hypothesis. Participants in both groups would report increases in self-efficacy for exercise, outcome expectations, and social support from baseline to 12 weeks and baseline to 16 weeks.

Related hypothesis. Participants in the affective intervention would report greater increases in PA enjoyment from baseline to 12 weeks and baseline to 16 weeks than the behavioral comparison.

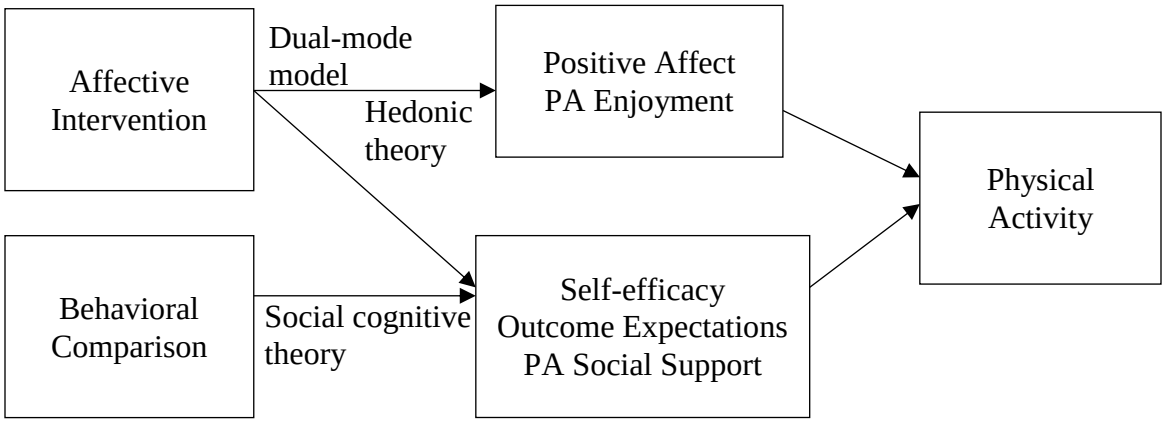

Figure 1-1. Logic model for hypotheses based on relevant theories.

2

Literature Review

Physical Activity and Health

Physical activity (PA) is related to numerous negative health consequences including several different noncommunicable diseases (NCDs; Fournier et al., 2014; Helmrich et al., 1994; Pettapiece-Phillips et al., 2015; Warburton et al., 2001; Wilson et al., 2015). Despite these health consequences, only 20.8% of adults meet the PA recommendations (CDC, 2014), which is to engage in 30 minutes of moderate intensity aerobic activity five days a week or 20 minutes of vigorous activity three days per week with two days of strength training as defined by Health and Human Services (HHS, 2008). This lack of PA has been linked to a rise in noncommunicable diseases (NCDs), such as cardiovascular disease, type 2 diabetes, and cancer. In the U.S. in 2012, there were more than 500 million primary care visits, many of which were for NCDs (CDC, 2012). Lee et al. (2012) estimated that physical inactivity is responsible for between 6-10% of the cases of cardiovascular disease, type 2 diabetes, and breast and colon cancer.

Conversely, the inclusion of PA is related to improvements in individuals with a variety of diseases, such as multiple sclerosis (DeBolt & McCubbin, 2004; Rampello et al., 2007), Alzheimer's (Intlekofer & Cotman, 2013; Steinberg, Sheppard Leoutsakos, Podewils, & Lyketsos, 2009), cystic fibrosis (Paranjape, 2012; Pianosi, 2008), and cerebral palsy (Balemans, Van Wely, Becher, & Dallmeijer, 2015). PA relates to increased muscle strength (Seguin & Nelson, 2003), bone density (Block, Genant, & Black, 1986; Heinonen, 1993), and fat loss (Ruotsalainen, Kyngäs, Tammelin, & Kääriäinen, 2015). PA is also related to several psychological and emotional benefits including improvements in sleep (Kredlow, Capozzoli, Hearon, Calkins, & Otto, 2015),

increased energy levels (Lox, Martin Ginis, & Petruzzello, 2010), and improved depression (Moreno et al., 2006; Rethort, Wipfli, & Landers, 2009; Stathopoulou, Powers, Berry, Smits, & Otto, 2006). Additionally, a small effect has been found for improvements in body image (Campbell & Hausenblas, 2009) and self-esteem (Aşçi, 2002). Research also links PA to reductions in the risk of global cognitive function decline and the progression of dementia (Aarsland et al., 2010; Frederiksen et al., 2015; Kivipelto et al., 2008; Roig, Nordbrant, Geertsen, & Nielsen, 2013).

The benefits of PA are well documented and varied (Lox et al., 2010). The day-to-day benefits improve general functioning (Campbell & Hausenblas, 2009; Kredlow et al., 2015; Roig et al., 2013) and the long-term benefits aid in disease prevention (Pettapiece-Phillips et al., 2015; Wilson et al., 2015). Despite these benefits of PA, most individuals in the U.S. do not participate regularly (HHS, 2011). Additionally, evidence suggests that 50% of individuals who begin a PA program quit within six months (Gill & Williams, 2009). Thus, PA promotion research has examined the efficacy of multifaceted theory-based intervention approaches designed to increase and maintain PA behavior.

Prominent Theories Applied to PA

Theoretical foundations are essential for describing and explaining why a behavior occurs, or perhaps fails to occur. A number of theories and models have been used in PA promotion research. The most common include: The transtheoretical model, self-determination theory, and social-cognitive theory. The following sections will describe these theories and their limitations.

Transtheoretical model. The transtheoretical model (TTM; Prochaska & DiClemente, 1983) is frequently used in PA research. This model describes five stages of change and recommends that the messages given to participants depend on the individual's stage of change. Several studies have applied this model to PA intervention research (Marcus, Eaton, Rossi, & Harlow, 1994; Marcus et al., 2000; Marcus, Rossi, Selby, Niaura, & Abrams, 1992), but support for the TTM is mixed. While the TTM may be useful for counselors, the major limitations are that it does not reliably predict what stage an individual will move to and when (Nigg, 2001), and ultimately does not provide an explanation of the mechanism that moves individuals through the stages of change (Lox et al., 2010).

Self-determination theory. Self-determination theory (SDT; Deci & Ryan, 1985) states that individuals have three primary needs including autonomy, competence, and relatedness (Lox et al., 2010). SDT asserts that PA can be both intrinsically (e.g., health benefits, sense of accomplishment) and extrinsically motivated (e.g., body image, staying in shape for other activities; Ryan, Williams, Patrick, & Deci, 2009). Intrinsic motivation will increase one's ability to meet these three primary needs, ultimately gaining greater self-determination. Utilizing SDT, Thørgersen-Ntoumani and Ntoumanis (2006) showed that among 375 active adults, those who reported higher levels of self-determined motivation also reported greater confidence in overcoming barriers, lower social physique anxiety, and stronger intentions to exercise.

Similarly, fitness program attendance has been linked to intrinsic motivation (Oman & McAuley, 1993) and greater support of the primary needs (Edmunds,

Ntoumanis, & Duba, 2008). Yet within PA contexts, a review by Ryan and colleagues (2009) shows that while extrinsic motivation is important for initial PA, unless these motivators are eventually internalized, SDT would suggest that those pursuing popularity or an attractive look will be less likely to adhere to PA long-term.

Social-cognitive theory. Social-cognitive theory, established by Bandura (1977), emphasizes that learning occurs in a social context and is gained through observation. In PA promotion research, the most prominently used construct related to social-cognitive theory is perceived self-efficacy (SE), which is described as situation-specific self-confidence (Lox, Martin Ginis, & Petruzzello, 2010) and is the extent to which an individual feels they can be successful at a particular behavior. SE has been shown to be a robust and stable psychological correlate of PA behavior (Cramp & Bray, 2011; Kaewthummanukul, Brown, Weaver, & Thomas, 2006; Sharma, Sargent, & Stacy, 2005), but it may not incorporate individual differences factors (i.e., living conditions, safety; Powell, Hutter, Seidel, & Piatt, 2010). Additionally, Williams and Rhodes (2014) suggest that the current measures used to assess SE are actually measuring a broader range of behavioral motives, which is potentially creating conceptual and operational discrepancies.

Social-cognitive theory is also related to outcome expectations, which is one's belief about the consequences of engaging in a behavior, such as PA. Though outcome expectancy has been studied much less than SE, findings have generally been mixed. For example, several studies found small or no associations between outcome expectations and actual PA behavior (Rovniak, Anderson, Winett, & Stephen, 2002), but small to

moderate associations between outcome expectations and behavioral intentions (Bryan & Rocheleau, 2002; Gao, Xiang, Lee, & Harrison, 2008).

Summary of prominent theories. There are several limitations to the previously discussed theories. First, some studies have found no effect of theory-based interventions and others have found that although the theory-based intervention is efficacious, it is only effective for a subsample of participants. Second, long-term PA maintenance is frequently not achieved or examined. Third, studies typically have not examined if the theory-based constructs are responsible for the behavior change. However, in a comprehensive meta-analysis, Conn, Hafdahl, and Mehr (2011) found that the most effective theory-based PA interventions emphasized behavioral components. These strategies are often utilized from the foundation of Bandura's social-cognitive theory (Knol et al., 2016; Rice, I., Rice, L., & Motl, 2015; Short, James, & Plotnikoff, 2013). Behaviorally-based strategies help individuals recognize exercise cues, learn to manage situations that have threatened PA in the past, and develop personalized strategies to maintain PA and prevent relapse. These strategies include tools such as PA contracts, goal setting, action plans, visual stimuli or reminders, and rewards (Gill & Williams, 2009; Marcus & Forsyth, 2009). Ruotsalainen, Kyngäs, Tammelin, and Kääriäinen (2015) found that the most effective interventions are ones that include behavioral management skills combined with supervised bouts of PA.

Despite the efficacy of behavioral interventions, there is significant room for improvement regarding their efficacy for increasing PA. Studies have begun to show that affect plays a role in both PA adoption and adherence (Kwan & Bryan, 2010; Williams et

al., 2008; Williams et al., 2012). Theories, such as the circumplex model, dual-mode model, and hedonic theory, have the potential to produce higher increases in PA and longer PA maintenance than interventions based on traditional theories. Utilizing behavioral strategies that focus on changing affect may improve the efficacy of existing PA behavioral interventions.

Affect and Affect-Related Theories

What is affect? Before exploring the relevant theories and models related to affect, it is necessary to have a clear understanding of affect. The constructs of affect, emotion, and mood have often been used interchangeably, which has muddled not only terminology, but measurement and findings. Affect, as defined by Gray and Watson (2007), is a broad, comprehensive construct that includes evaluative mental states in which a person is either pleased or displeased with what is happening. Affect at its most elementary state is referred to as core affect (Ekkekakis, 2013), which Russell and Feldman Barrett (2009) define as, "a neurophysiological state consciously accessible as a simple primitive non-reflective feeling most evident in mood and emotion but always available to consciousness" (p. 104). Core affect includes the negative and positive experiences of tension, calmness, pleasure, displeasure, energy, and tiredness (Ekkekakis, 2013). Importantly, core affect is thought to occur without cognition or reflection (Russell, 2003). According to Ekkekakis (2013), this non-cognitive and non-reflective character of core affect is its most vital defining trait. The primitive "hard-wired" nature of core affect results in immediate responses to things like distress or energy, which is evolutionarily advantageous (Lox, Martin Ginis, & Petruzzello, 2010). Batson, Shaw, and

Oleson (1992) argue that affect identifies preference, such that one seeks to move from a lesser valued state to a more valued one.

Additionally, core affect is distinct from and yet related to emotion and mood. It is distinct in that it can occur in isolation due to its non-cognitive nature. Yet core affect influences both emotions and moods. Core affect is the "experiential substrate" from which emotions and moods develop (Ekkekakis, 2013) and refers to an all-encompassing or "valenced" response to stimulus. Core affect also influences both emotions and moods (Ekkekakis & Petruzzello, 2000). Unlike core affect, emotion requires cognitive input from the individual (Lox et al., 2010). Moods refer to subjective states that may enhance or interfere with purposive behavior. Mood is distinct from emotion in that moods tends to last longer and may have unidentifiable causes (Lox et al., 2010). For the purposes of the current discussion, core affect will serve as the concept of interest. It is from this understanding of affect, that the theoretical foundations of affect, the circumplex model and dual-mode model, will be discussed.

Circumplex model. The circumplex model of affect was developed by Russell (1980). It consists of two bipolar dimensions including valence (pleasure vs. displeasure) and activation (activated vs. unactivated). These two dimensions are orthogonal to one another, which results in four different quadrants: pleasant-activated (enthusiasm, excitement, energy), pleasant-unactivated (calmness, relaxation), unpleasant-unactivated (depression, fatigue, boredom), and unpleasant-activated (distress, anxiety, tension).

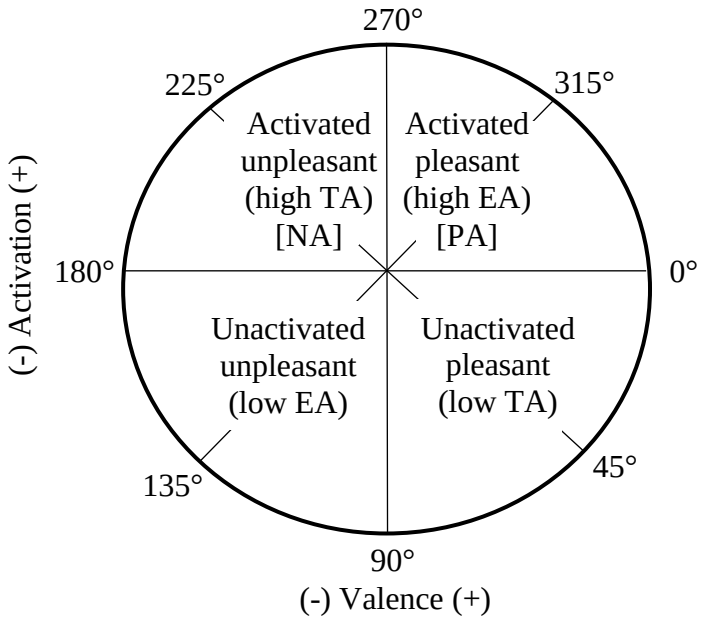

Figure 2-1. The circumplex model of affect. EA = energetic arousal; NA = negative affect; PA = positive affect; TA = tense arousal (Ekkekakis & Petruzzello, 1999).

The circumplex model takes a dimensional approach, which is the underlying belief that affective states are interrelated and broad in nature and can be measured through a small number of dimensions (Lox et al., 2010). This is particularly important for research on PA because models that encompass a wider range of affect have a greater ability to capture the true effects of PA-induced affect (Gauvin & Brawley, 1993). Ekkekakis and Petruzzello (1999) were among the first to advocate for the circumplex model's use in research on PA-related affect. They note several strengths of the model, such that it:

> Can provide a global representation of the affective space, it is balanced between positive and negative affectivity, it is based on the distinction between activation and affective valence and, because it targets elemental dimensions of affect, a

> circumplex-based operationalisation should maintain its psychometric integrity in the context of acute exercise (Ekkekakis & Petruzzello, 1999, p. 359).

From the foundation of the circumplex model, Ekkekakis (2003) developed the dual-mode model to investigate the dose-response of PA and its associated affective response. Dose-response is of particular interest for intervention research in that it provides a foundation for how best to study the optimum intensity of PA. Additionally, Williams (2008) recommends that the dual-mode model be integrated with hedonic theory to better study the dose-response between PA and affect and resulting PA adherence.

Dual-mode model and hedonic theory. Ekkekakis, Hall, and Petruzello (2008) note that a number of the theories used in both health and exercise psychology research are adapted from broader social and health psychology theories. These theories may overlook the unique challenges associated with PA adherence, such as the "revolving door" phenomenon (Gill & Williams, 2009). Ekkekakis and colleagues (Ekkekakis, 2003, 2005; Ekkekakis & Petruzzello, 2002) recommend applying the dual-mode model as one that meets these unique challenges. The dual-mode model describes the relationship between PA intensity and the associated affective response as experienced during a bout of PA (Ekkekakis, 2003; Ekkekakis et al., 2008). Specifically, this model states that as PA intensity increases, the associated affective valence (pleasure-displeasure) decreases. The tipping point in valence is specifically associated with an individual's ventilator threshold (VT). VT is defined as, "the exercise intensity at which the increase in ventilation becomes disproportional to the increase in power output or speed of

locomotion" (Svedahl & MacIntosh, 2003, p. 301). PA above the VT results in a consistently negative affective valence response, while PA at the VT produces a variable influence on affect. However, PA performed below the VT consistently produces positive affective valence (i.e., pleasure). The dual-mode model accounts for these changes in affect due to the differing influence of cognitive and interoceptive factors at varying intensities.

According to the dual-mode model, interoceptive factors (i.e., breathing, heart rate, body temperature) become increasingly important as PA intensity exceeds the VT. This is due to a threatening of homeostasis and results in a decline in affective valence (i.e., displeasure). Yet when PA intensity is approaching the VT, cognitive factors (i.e., goals, expectations, and perceived efficacy) are more important, which accounts for the variable findings at this range of intensity (Williams, 2008). However, research demonstrates that for PA below the VT, interoceptive and cognitive factors have little or no influence on affective balance because homeostasis is maintained and as a result, most individuals experience positive affective valence (i.e., pleasure; Ekkekakis, 2003, 2005; Ekkekakis & Acevedo, 2006).

Research examining the dual-mode model and the influence of the VT has found this inverse relationship between affect and intensity in laboratory-based studies including running (Acevedo, Rinehardt, & Kraemer, 1994) and cycling (Ekkekakis et al., 1997; Parfitt & Eston, 1995). Bixby, Spalding, and Hatfield (2001) demonstrated that after the exceeding the VT affect declines based on a visual analogue mood scale. Participants who worked below their VT showed gains in affect 20 minutes into a bout of

PA, but participants working at their VT reported increased negative affect 10 minutes into the bout. In a related study, Markowitz and Arent (2010) showed this same pattern with lactate threshold (i.e., PA results in excess lactate in the bloodstream and a shift into anaerobic energy systems), which is similar to VT.

There is further evidence suggesting that the relationship between PA intensity and affect is moderated by fitness level, current level of PA, and PA history. For example, when PA is higher in intensity, more fit individuals report greater affective benefits (Bulbulian & Darabos, 1986; Farrell, Gustafson, Morgan, & Pert, 1987; Tieman, Peacock, Cureton, & Dishman, 2002) and greater decreases in negative affect (Blanchard, Rodgers, Spence, & Courneya, 2001) than those who are unfit. Magnan, Kwan, and Bryan (2013) found that participants (n = 354) who were currently active over the past week, as measured by the 7-day Physical Activity Recall (PAR), experienced a greater degree of positive affect change than those who were less active.

The dual-mode model is also related to hedonic theory, which describes individuals' natural drive to find pleasure and avoid pain. This is known as the hedonic principle (Higgins, 1997). Williams (2008) combines the dual-mode model and hedonic theory in order to recommend an affect model that supports the need for self-paced PA. He argues that self-paced PA allows individuals to select the pace that best meets their innate hedonic tendencies, which is to experience pleasure. Research shows that when allowed to self-select pace, individuals tend to approach, but not exceed their VT (Ekkekakis, Lind, & Joens-Matre, 2006; Parfitt, Rose, & Burgess, 2006). This is ideal

according to the dual-mode model for experiencing the greatest positive affective valence. Self-paced PA will be discussed in more detail below.

Based on the hedonic theory, it is important to note that finding pleasure from PA may also be related to enjoyment of PA. The experience of positive affect is, by itself non-cognitive, but forms a base from which an individual may perceive enjoyment. This relationship between positive affect and enjoyment fits within hedonic theory given they both are experiences of pleasure. Findings regarding enjoyment and PA are similar to that of positive affect in that enjoyment is associated with improve attitudes towards PA (Martin Ginis et al., 2006) and increased PA intentions (Ruby, Dunn, Perrino, Gillis, & Viel, 2011) and adherence (Dunton & Vaughan, 2008; McArthur, & Raedeke, 2009; Williams, Papandonatos, Napolitano, Lewis, & Whiteley, 2006).

Similar to the circumplex model, the dual-mode model focuses on core affect. It is also dimensional in nature, but instead of looking at the orthogonal nature of valence and activation, it focuses primarily on the dimension of valence (pleasure vs. displeasure) as it is experienced during a bout of PA. Additionally, the dual-mode model and hedonic theory both consider core affect along a bipolar axel, such that pleasure and displeasure exist along a single dimension with two opposite poles. Thus, with a foundation in the circumplex model, the combination of the dual-mode model and hedonic theory are useful for investigating the relationship between PA-related affect and PA adoption and adherence (Ekkekakis, 2009; Williams, 2008; Williams et al., 2012).

Acute Affect-Related Findings

As discussed above, there is empirical evidence linking PA performed just below the VT to feelings of pleasure, as well as improved positive affect just after PA. The majority of research on PA and affect has been conducted in lab settings with a focus on acute effects. For example, among inactive women (n = 20), affective valence was shown to steadily decline once VT was reached and exceeded, but rebounded to show a significant increase 10 minutes after acute PA ceased compared to baseline (Welch, Hulley, Ferguson, & Beauchamp, 2007). In another study, self-selected aerobic step classes increased vigor and reduced tension, fatigue, and anger (Bartholomew & Miller, 2013; Kennedy & Newton, 1997; Lox & Rudolph, 1995). Research also indicates that bouts of PA do not have to be very long in duration to influence affect. Thayer (1987) showed that a 10-minute rapid walk resulted in significant increases in energy and decreases in tension, which was maintained up to two hours afterwards. Saklofske, Blomme, and Kelly (1992) found similar results in walks of just four minutes. Finally, increased activation and positive affective valence was demonstrated after walks of 10 to 15 minute in both laboratory and naturalistic settings (Ekkekakis, Hall, Van Landuyt, & Petruzzello, 2000).

Outside of more structured PA, there is also evidence linking daily activities to energetic arousal. Kanning, Ebner-Priemer, and Schlicht (2015) administered e-diaries to 74 older adults to assess the relationship between daily PA and affect. Participants wore accelerometers for three days and were notified via a study provided phone call to complete the Multidimensional Mood Questionnaire (MDMQ) when they exceeded or

fell below predefined PA thresholds. They found that older adults who were more active also felt more energized (awake vs. tired) and calm (relaxed vs. tense). However, there was no main effect for overall affective valence (unwell vs. well, discontent vs. content). Kanning et al. (2015) postulated that for older adults, there is generally less variability in affect because they have a greater ability to select contexts that maximize positive experiences and minimize negative ones. Interestingly, findings also indicated that BMI moderated the scores for contentedness, such that those with a lower BMI were more likely to be content after PA, but individuals with a higher BMI were not.

There has also been recent research linking PA-related affect to motivation. Among active female runners, Guerin and Fortier (2013) illustrated that motivation was positively related to levels of post-run affect. These findings lend support to previous findings that highlight the benefits of PA for females in particular (Butryn & Furts, 2003; Kelsey et al., 2006; Kull, 2002). With regard to males, Shin, Kim, and Kwon (2014) looked at the effect of intrinsic motivation on affective responses among 30 active college males. Participants completed two PA sessions, one on a cycle ergometer and one running on an indoor track (both were at vigorous intensities). Affect was measured using the Feeling Scale (FS; Hardy & Rejeski, 1989), while intrinsic motivation was measured by the Intrinsic Motivation Inventory (IMI; McAuley, Duncan, & Tammen, 1989). Both affect and intrinsic motivation were assessed every five minutes. Results confirmed previous findings in that positive changes in affect were attenuated by higher fitness level and intrinsic motivation. Furthermore, a meta-analysis by Reed and Ones (2006)

indicated that acute PA has a moderate, yet consistent effect on the experience of positive affect.

Initial evidence from Helfer, Elhai, and Geers (2015) suggests that purposeful manipulation of expectations about experiencing an elevation in positive affect post-PA can increase PA-related feelings and intentions. In this study, prior to 10 minutes of biking on a stationary bike, participants in the intervention group were exposed to an affective expectation manipulation, which involved telling the participants that PA often results in happiness, contentedness, and increases in self-efficacy. They found that feelings about PA were predictive of PA intentions and behavior (Helfer et al., 2015). The authors noted that their results can be used to develop interventions that increase PA by increasing positive feelings.

The studies presented above indicate that there is evidence establishing a link between acute PA and positive affect. It is important to understand that this link is contingent on a number of factors. When affect is assessed is crucial as the relationship between PA and affect fluctuates across a bout of PA. During the PA, the association between PA and affect depends upon the intensity of the PA itself. But after the completion of a bout, regardless of the intensity, there is a rebound towards positive affect. While it is important to understand the acute effect of PA on affect, the long-term effects may be more important for adherence. However, due to the difficulty of investigating these long-term effects, less empirical evidence is available. Much of the available research comes from Williams and colleagues (Williams et al., 2008; Williams, Dunsiger, Jennings, & Marcus, 2012).

Long-Term Affect-Related Findings

Williams et al. (2008) examined the effect of affective responses to PA on predicting future PA. They also examined ratings of perceived exertion (RPE) in order to determine if the relationship between affective responses and future PA is independent of RPE. This study showed that among 37 healthy, sedentary adults, those who reported more positive affect during a single bout of PA also reported more PA six and 12 months later (Williams et al., 2008). Specifically, they found that a one-unit increase in affect as measured by the FS was associated with 38 minutes of additional PA per week six months later and an extra 41 minutes 12 months later. However, these results became non-significant when RPE was included in the regression models (Williams et al., 2008). The authors note that this finding indicates that there may be common variance explained by affect and RPE. Expanding on these findings, Williams et al. (2012) showed a similar pattern in a larger sample (n = 146) of low active adults. Results demonstrated that affect experienced during PA was associated with weekly increases of 27-29 minutes six months later and 15 minutes 12 months later.

Similar research by Kwan and Bryan (2010) indicated that positive affect during a moderate-intensity bout of PA was positively associated with self-reported future PA, while concurrent negative affect showed an inverse association. Thus, while the body of evidence of the long-term effects of the PA-affect link is limited and more research is needed, it does suggest that sustained experience of positive affect during PA can promote continued participation. This is perhaps best described by Ekkekakis (2009) who states,

> Common sense and the so called 'hedonic' theory of motivation would suggest that, if people derive pleasure, a sense of energy or enjoyment, they would probably seek to repeat this activity. On the other hand, if they derive displeasure, discomfort, pain, or a sense of exhaustion, the chances of them repeating the activity or adhering to it over the long run would be diminished (p. 858).

Affect Manipulation Interventions

Based on the current understanding of affect experienced during PA and its relationship with adherence, it is crucial to consider how to manipulate affect. Studies seeking to influence general affect have provided candy (Isen, Daubman, Nowicki, & Sherman, 1987) or had participants write about either happy or sad events (Johnson, Ilies, Boles, & Kozlowski, 2012). However, as previously mentioned, few studies have examined how to specifically manipulate PA-related affect. Helfer and colleagues (2015) told participants prior to a 10-minute bout of PA "that exercise often results in good moods, happiness, contentedness, feelings of personal satisfaction, and increases in self-esteem" (p. 273). They found that such manipulation increased PA-related feelings and PA intentions. Peterson et al. (2012) conducted an affect PA intervention trial among adults who had just undergone percutaneous coronary intervention (PCI). Participants in the PA intervention group were instructed to "think about things that make you feel good," recall "proud moments," take time "each day to enjoy positive thoughts," and received small gifts in the mail (Peterson et al., 2012, p. 330) in order to induce positive affect and self-affirmation. After controlling for demographics and psychosocial

measures, they found that the PA intervention group was 1.7 times more likely to reach PA goals than the control.

There were several limitations related to the studies described above. For example, Helfer et al. (2015) were only interested in post-PA affect, not affect experienced during PA. Based on the work of Williams and colleagues (Williams et al., 2008; Williams et al., 2012), it is the positive affect experienced during PA that is most indicative of PA adherence and therefore should be prioritized. Additionally, Peterson et al. (2012) did not directly seek to influence PA-related affect, instead they targeted general, everyday affect. This lacks insight into how PA-related affect influences PA adherence. In order to address the current gap, future research needs to seek to manipulate affect experienced during PA and ensure that affect manipulation is directly related to PA.

Self-Paced Physical Activity

Researchers examining PA-related affect have examined the effect of self-paced PA on affect. Specifically, when individuals are instructed to self-pace their PA, they tend to approach, but not exceed their VT (Lind, Joens-Matre, & Ekkekakis, 2005; Parfitt et al., 2006). A meta-analysis by Williams (2008) indicated that self-paced PA is related to greater increases in positive affective responses when compared to prescribed intensity. In a pilot feasibility study, Williams (2007) found that among a small number of inactive to low-active adults, a self-paced walking program increased walking to a mean of 142.2 min/week (*SD* = 72.8) and received a satisfaction rating of 4.62 out of 5. Williams et al. (2015) further investigated the difference between prescriptions of self-

paced verses moderate-intensity PA in another study and found that those in a self-paced group walked significantly more minutes per week ($p < 0.05$) than a prescribed moderate-intensity group. Additionally, there were no significant differences on intensity level between the two groups, such that those who were instructed to self-select their pace chose a similar intensity as the moderate-intensity group (Williams et al., 2015). It is important to note, however, that regardless of group, participants, while increasing their overall PA, largely did not attain moderate-intensity during their PA minutes.

These studies provide evidence for further research on self-paced PA. Williams (2008) suggests that self-paced PA be combined with established programs of behavioral counseling in order to improve adherence. Additionally, recommendations for prescribing self-paced PA will be useful when incorporated with interventions in naturalistic settings (i.e., outside the laboratory), where participates will not be monitored.

Summary and Conclusions

PA has the potential to reduce disease risk for a number of non-communicable diseases (NCDs; Lee et al., 2011; Pettapiece-Phillips et al., 2015; Wilson et al., 2015) and provide a variety of physical and psychological benefits (Campbell & Hausenblas, 2009; Frederiksen et al., 2015; Ruotsalainen et al., 2015). However, overall PA adherence rates among adults remain low (Troiano et al., 2008). While there are a number of theoretical frameworks used in PA promotion interventions, social-cognitive theory-based interventions using behavioral strategies have shown the greatest efficacy in increasing PA levels. Yet even these interventions are only moderately effective (Conn et al., 2011).

Evidence supporting the relationship between affect and PA shows promise for better understanding how to increase PA (Kwan & Bryan, 2010; Williams et al., 2008).

Numerous studies have examined the relationship between affect and PA; however, few studies have attempted to manipulate PA-related affect in order to increase PA and PA adherence. Consequently, the purpose of the current study was to administer an affect intervention in which participants were taught how to use affectively focused behavioral strategies that specifically targeted positive affective prior to and during self-paced PA. The ultimate goal was to utilize those affective experiences as a motivational tool for adopting PA, with the eventual aim of long-term PA maintenance.

3

Methods

Study Design

This study was a prospective, randomized controlled intervention pilot study conducted in the upper Midwest. Forty low-active adults were randomly assigned to an affective intervention (n = 20) or a behavioral comparison (n = 20), each lasting 12 weeks. PA and psychosocial variables were assessed via an accelerometer (e.g. ActiGraph) at baseline and 12 weeks and questionnaires at baseline, 12 weeks (i.e., post-intervention), and 16 weeks (i.e., follow-up). Additionally, participants completed weekly affect assessments. This assessment schedule was consistent with previous intervention trials (Hartman et al., 2015; Pinto, Papandonatos, Goldstein, Marcus, & Farrell, 2013). This study was approved by the University of Minnesota's Institutional Review Board (IRB) under study number 1603P86082.

Participants and Inclusion/Exclusion Criteria

Participants were recruited through several online strategies (see Table 3-1).

Table 3-1

Methods of Recruitment

Recruitment Method	Screened (n = 56)	Randomized (n = 40)	Not Randomized [a] (n = 16)
Worksite Email	29 (51.8%)	22 (55.0%)	7 (43.8%)
Craig's List	16 (28.6%)	11 (27.5%)	5 (31.2%)
Other (i.e., Facebook posting, snowball sampling, flyers)	11 (19.6%)	7 (17.5%)	4 (25%)

[a] Participants were not randomized because they were either ineligible or after receiving more information about the study, were no longer interested in participating.

Fifty-six potential participants contacted the primary investigator (PI) and expressed interest in the study by calling or emailing the study line. Of those who expressed interest, forty participants were eligible, interested, and randomized. Inclusion

criteria included: (1) 18 years of age or older; (2) able to read and write in the English language; (3) low-active, which was defined as less than 90 minutes of moderate intensity PA per week within one month prior to screening as utilized in similar PA promotion interventions (Lewis, Williams, Frayeh, & Marcus, 2016; Mock et a., 2001; Thomas, Alvarez-Reeves, Lu, Yu, & Irwin, 2013); (4) had a history of low-activity (i.e., depending on the participant's age, at least 5+ years of low-activity as defined above); (5) able to commit to eight telephone-based coaching sessions across 12 weeks; and (6) willing to be randomly assigned to either of the two study arms, which were described as both focusing on PA, but doing so in different ways. Exclusion criteria included individuals who did not provide informed consent and/or those who reported any other health problems that would interfere with regular PA, as measured by the Physical Activity Readiness Questionnaire (PAR-Q; ACSM & AHA, 1998). Relying on the PAR-Q as an assessment of readiness to begin PA is considered appropriate according to recommendations from the American College of Sports Medicine (ACSM; Thompson, Arena, Riebe, & Pescatello, 2013).

Measures

Study measures utilized to assess the primary and secondary aims included an accelerometer to objectively assess PA for four days at both baseline and 12 weeks, the 7-day Physical Activity Recall to assess recent PA, and a weekly assessment of affective valence as measured by the Feeling Scale. These measures were selected because they align within the theoretical foundation of the dual-mode model in conjunction with hedonic theory. Additionally, several psychosocial questionnaires were administered

including self-efficacy for exercise, outcome expectations, social support for exercise, and PA enjoyment.

ActiGraph. The ActiGraph is currently the most accepted accelerometer for assessing PA in clinical and epidemiological studies (Plasqui, Bonomi, & Westerterp, 2013). It is an electronic device worn at the right hip that directly detects motion or acceleration of the trunk of the body. The ActiGraph provides an objective measure of PA that is less compromised by response bias, social desirability, differences in interpretation, and forgetfulness (Brownson et al., 1999; Harris et al., 2009; Shephard, 2003). The ActiGraph has been used on a wide range of populations and their use by researchers has increased exponentially in the past two decades (Bassett, Troiano, Mcclain, & Wolff, 2015; Harrison et al., 2011). ActiGraphs have strong validity when compared to doubly labeled water, the gold standard for measuring energy expenditure (Maddison et al., 2009), and have also demonstrated a high level of inter-instrument reliability (Santos-Lozano et al., 2012).

PA minutes per week were calculated at the moderate to vigorous physical activity (MVPA) level. Data was excluded for days where the device recorded less than 10 hours of wear time (Troiano et al., 2008). Participants were excluded from analysis if they had less than two days of recorded wear at either time point. Wear time validation was completed at baseline and 12 weeks and was checked for each participant based on their submitted ActiGraph wear logs. The cut-off for MVPA minutes was based on Freedson et al.'s (1998) predetermined cut-offs for adults. Average daily MVPA count

was multiplied by seven to calculate average PA minutes per week. This was done to allow for equitable timeframe comparison between the ActiGraph and the 7-day PAR.

7-Day Physical Activity Recall Interview (7-day PAR). The 7-Day PAR (Sallis et al., 1985) is considered the gold standard for assessing self-reported PA (see Appendix D). It measures all levels of PA that are in bouts of at least 10 minutes (Pereira et al., 1997). Research indicates that the 7-day PAR has fair to moderate validity compared to objective measures (e.g., doubly labeled water, accelerometers; Hayden-Wade et al., 2003; Sloane, Snyder, Mark-Wahnefried, Lobach, & Kraus, 2009). Reliability has generally been strong, with the interclass correlation coefficients ranging from .73 to .97 (Hayden-Wade, Coleman, Sallis, & Armastrong, 2003; Johnson-Kozlow, Sallis, Gilpin, Rock, & Pierce, 2006). PA was calculated as minutes of MVPA per week.

Feeling Scale (FS). The Feeling Scale (FS; Hardy & Rejeski, 1989) was selected to measure the dimensional bipolar nature of core affect. Using the FS, individuals indicate with a single-item how they felt on an 11-point scale that ranged from (-5) very bad, (0) neutral, to (+5) very good (see Appendix E). The FS focuses on affective valence (pleasure-displeasure) and can be utilized for assessment during a bout of PA (Williams, 2008; Williams et al., 2012). It has been shown to be a valid measure of the valence dimension of affect (Lang, 1980; Van Landuyt, Ekkekakis, Hall, & Petruzzello, 2000). Baseline FS scores were taken as an average of the first three recorded FS assessments and 12-week FS scores were taken as an average of the final three recorded FS assessments. These averages were taken at baseline and 12 weeks to account for individual variability in affective responses to single PA sessions (Unick et al., 2015).

Self-Efficacy for Exercise (SEE). The Self-Efficacy for Exercise (SEE) scale was revised from McAuley's (1990) self-efficacy barriers to exercise measure. This nine-item self-report instrument asks individuals to rate their self-efficacy expectations for continuing PA despite certain barriers in situations such as, "If the weather was bothering you" or "If you were tired" (see Appendix F). Individuals rate their self-efficacy on a scale from 0 (not confident) to 10 (very confident) on how confident they are that they could be active three times a week for 20 minutes each time in nine situations. The SEE has demonstrated both validity (Resnick, Luisi, Vogel, & Junaleepa, 2004) and high internal consistency ($\alpha = 0.92$; Resnick & Jenkins, 2000).

Outcome Expectations for Exercise (OEE). The Outcome Expectations for Exercise (OEE) scale was developed by Resnick, Zimmerman, Orwig, Furstenberg, and Magaziner (2000) and is based on Bandura's theory of self-efficacy (see Appendix G). Participants respond to statements such as, "Exercise helps me feel less tired" or "Exercise makes my muscles stronger," and is rated on a five-point likert scale ranging from strongly disagree to strongly agree. The OEE includes both positive and negative statements, which results in reverse scoring for positive items. Individual item scores are added together for the total outcome expectation score. The OEE has good reliability and validity (Resnick et al., 2000; Resnick, Zimmerman, Orwig, & Magaziner, 2001).

Physical Activity Social Support (PASS). The Physical Activity Social Support (PASS) scale is designed to assess different types of social support related to PA habits (Sallis et al., 1987; see Appendix H). Across 13 self-report items, it assesses the frequency in the past month that family and friends have independently supported an

individual's PA. For example, one item states, "Gave me encouragement to stick with my activity." Individuals respond on a five-point likert scale ranging from none to very often (there is also a does not apply option). Positive items are reverse scored. It has moderate to high test-retest reliability (r =.55-.86) and strong internal consistency (α = 0.61-0.91) and low to moderate criterion-related validity (Sallis et al., 1987; Sallis, Hovell, & Hofstetter, 1992; Sallis, Hovell, Hofstetter, & Barrington 1992).

Physical Activity Enjoyment Scale (PACES). The Physical Activity Enjoyment Scale (PACES) includes 18-items designed to assess PA enjoyment in adults across different modalities (Kendzierski & DeCarlo, 1991). Items include paired statements such as, "I enjoy it" against "I hate it" or "It's not at all stimulating" against "It's very stimulating" (see Appendix I). These statements are at opposite ends of a seven-point Likert scale and individuals are asked to respond based on which statement best represents their feelings. The PACES varies the positive and negative items on either side of the Likert scale, which results in reverse scoring for positive items. All items are added together for the total enjoyment score. This measure has good validity and reliability (Kendzierski & DeCarlo, 1991; Lewis et al., 2016).

Participant engagement. In order to assess participant engagement within the study, participants were asked to report their use of study recommended strategies and overall satisfaction with the study. To assess strategy use, participants were asked to report during one bout of PA per week if they had used any study recommend strategies, and, if yes, what study strategies they used. This included responding "yes" or "no" to the question, "Did you use an affective/behavioral strategy during your activity today?" If

they indicated “yes” they were then asked, “What strategy did you use?” and were able to select from a multiple choice list of potential strategies they may have used. These questions were included to ensure that participants were actively using the study recommended strategies.

To assess satisfaction, participants were asked to respond to a five-item satisfaction survey after completion of the 12-week assessments. The initial question asked, “How satisfied were you with the affective strategies/behavioral strategies program?” with responses given on a 10-point Likert scale. The remaining questions were open-ended and asked participants what they liked, did not like, or would change about the study (see Appendix J). This was utilized to assess participant responses to the different groups and ensure that one group did not significantly “like” or “enjoy” their experience more than the other.

Procedure

Participants were recruited primarily via online recruitment procedures such as Craig’s List, targeted emails, and posted study announcements. Interested individuals responded through both the study email address and phone line. Potential participants were screened by the PI using a standardized script to determine if they met inclusion and/or exclusion criteria (see Appendix B).

During the eligibility screening, participants were informed of the research topic, length of the study, the voluntary nature of the study, and confidentiality procedures. They were also asked about their willingness to be randomized into either study arm. Participants in both groups were specifically told that they would be encouraged to

increase their PA during the intervention. Once eligibility and interest were determined, those meeting the study criteria were emailed a link to the electronic informed consent and demographics form to be signed and completed through Qualtrics, an online survey software (see Appendices A and C). Participants were asked to complete the electronic consent and demographics forms within one week, in order to minimize the time between screening and randomization.

Once the consent and demographics forms were completed, participants were scheduled for their baseline ActiGraph assessment. As the initial step towards randomization, all participants received an ActiGraph with four-day wear instructions and a postage-paid envelope to return the ActiGraph via the US Postal Service. All participants were instructed to wear the ActiGraph over their right hip. The four-day wear period was selected based on evidence suggesting that three to four days of accelerometer wear will detect total PA with 80% reliability among young to middle-aged adults (Matthews, Ainsworth, Thompson, & Bassett, 2002), as well as older adults (Hart, Swartz, Cashin, & Strath, 2011). Once participants returned the ActiGraph, they were contacted via telephone by the PI to complete all questionnaires (e.g. 7-day PAR, SEE, OEE, PASS and PACES). During the same phone call, participants were randomly assigned to either the affective intervention or the behavioral comparison. The randomization allocation was 1:1 and was generated prior to beginning recruitment using an online randomization calculator. Participants were informed immediately over the phone of their group assignment and, regardless of assignment, were scheduled for their

first telephone session within seven days at a time that was convenient for them. They were then sent corresponding program materials via email.

Both groups completed eight telephone sessions across 12 weeks. The frequency of phone sessions decreased across the 12-week intervention including weekly calls for the first month and bi-weekly calls for months two and three. Calls lasted an average of 15.35 minutes (SD = 5.92). Sessions were scheduled in advance at a convenient time for participants. During the 12-weeks, all participants were instructed to maintain daily Physical Activity Logs (PALs) to track their PA. The PALs recorded total daily minutes of PA, the type of activity completed, and also allowed for participants to indicate whether they completed the weekly Feeling Scale (FS) assessment. Participants were informed that these PALs would be returned to the PI at the end of the 12 weeks. These were used as a behavioral strategy and were not utilized for analyzing PA.

Additionally, the one-item FS was completed electronically through Qualtrics three times during one bout of PA per week. Participants were instructed to complete it once right before beginning the bout, once 10 minutes into the bout, and a final time twenty minutes into the bout. Internal timers were built into the electronic survey so that if participants were more than five minutes late, their FS assessment was not recorded. Links to the FS were emailed directly to participants. In order to complete the FS during PA, participants were told they could set a timer on their smart phones to alert them when 10 minutes had passed. When the timer went off, they would pause their activity to re-enter the survey and complete the FS. This was repeated for the twenty-minute time point. Participants who had technology or access issues were also given the option to

record FS assessments on paper during their PA with the same time points and then later transfer them onto the electronic form. This was utilized to assess affective valence responses to PA throughout the 12-week intervention. The electronic survey assessing the FS also ended with two final questions regarding whether they used a study recommended strategy (i.e. reminders, rewards, visual/auditory stimuli), and, if yes, what strategy they used. Participants were continually reminded during the telephone sessions to continue to complete the PALs and the weekly FS.

Upon completion of the 12-week intervention period, participants again received an ActiGraph with four-day wear instructions and a postage paid return envelope. Participants were scheduled to wear the device on the same days of the week as their baseline assessment in order to account for day-to-day schedule differences (Hart et al., 2011). During the same timeframe, participants were contacted over the phone by a research assistant and completed the 12-week assessments. The research assistant was trained in administering questionnaires and blinded to the participant's group assignment. At this time, participants were also emailed short satisfaction surveys. Sixteen week assessments were again completed by the research assistant. Participants received a $25 e-gift card after both the 12 and 16 week assessments were completed.

Affective intervention. This 12-week affective intervention involved eight telephonic affective behavioral sessions delivered by the PI, who has several years of training in delivering phone-based PA interventions. The sessions consisted of educating participants about how to use affectively-focused behavioral strategies to increase and then sustain their level of PA. The affective intervention utilized behavioral strategies

such as visual and auditory stimuli, reminders and rewards, goal setting, utilization of social support, and self-monitoring via PALs (Conn et al., 2011; Gill & Williams, 2009; Marcus & Forsyth, 2009). The current study tailored these established strategies to specifically integrate and focus on PA- related affect. For example, PA reminders highlighted the positive affect felt while completing PA. This consisted of a mental or visual cue (e.g., repeating affective PA mantra, or thoughts/pictures of people or places that recalled pleasant experiences as representations of positive affect). Similarly, goal setting included setting a "feeling goal" with the intention of focusing on a specific pleasure-centered feeling they wanted to experience during PA (e.g., powerful, strong, calm, energized). In order to provide an individually tailored intervention, the PI worked with participants to determine which strategies best met their needs, which has been shown to increase PA adherence as measured by duration and frequency (Keele-Smith & Leon, 2003).

The introductory session described what to expect from the sessions, how materials would be used, information on becoming physically active, how to self-pace PA, and a brief summary of the types of strategies to be introduced in future sessions. Participants were not limited to individual, group-based, home or gym settings, but instead encouraged to seek out what PA type they liked best. The ability to choose PA type increases the study's ecological validity. Participants were instructed to self-pace their PA to an intensity that they found pleasant. Participants were then instructed on maintaining daily PALs throughout the study, to complete weekly FS assessments, and report recommended strategy use. The FS was presented to participants as a tool to gauge

how they were feeling prior to and during their PA. They were encouraged to use these assessments to note when they were straying away from "feeling good" and ensure that their PA type, intensity, and recommended strategy use were effective in producing positive affect during PA. See Table 3-2 for topics discussed at each affective telephone session (see Appendix I for the complete protocol).

Table 3-2

Timeline and Content of Affective Intervention Telephone Sessions

Session	Strategy	Content
1	Overview of the Intervention	Purpose of the calls, how to self-pace and self-select activity, instructions for PA logs and FS assessments, and discussion of finding the zone in which PA feels "good" for them and an initial list of some strategies that will help in focusing on "feeling good" and "enjoying" PA.
2	Visual and Auditory Stimuli	Descriptions of visual stimuli (i.e. pictures, quotes, etc.) or auditory stimuli (i.e. songs, playlists).
3	Reminders & Rewards	Directions on how to integrate reminders (i.e. post-it notes, alarms) with affective messages and/or rewards (i.e. watching a movie/show during PA, attending a group class, perceiving PA as reward itself).
4	Goal Setting & Action Plans	Instructions on how to modify goal setting to focus on setting a "feeling goal" for a particular PA bout. How to create an action plan for utilizing multiple affect strategies in a structured, consistent way around PA.
5	Social Support	Described how to seek out important others to do PA with or to assist in encouragement or related support for PA. Encouraged to engage in conversations about why such support is affectively meaningful.

6-7	Strategy Follow-up	Encouraged to utilize those strategies found to be most helpful and continue consist use of them.
8	Conclusion of Intervention	Discussed long-term use of strategies, developed final goals, and gave instructions for 12 and 16-week assessments.

Note. Each of the strategies utilized were tailored towards highlighting and enhancing affect experienced during PA.

Behavioral comparison. The behavioral comparison focused on traditional behavioral strategies used in previous trials to increase PA (Conn et al., 2011). See Table 3-3 for topics discussed at each behavioral telephone session (see Appendix J for the complete protocol). It followed the same schedule as the affective intervention across 12 weeks and included the same introductory session. Topics included the benefits of PA,

Table 3-3

Timeline and Content of Behavioral Comparison Telephone Sessions

Session	Strategy	Content
1	Overview of the Intervention	Purpose of the calls, how to self-pace and self-select activity, instructions for PA logs and FS assessments (described as "weekly assessments"), and discussion of getting started with PA.
2	Benefits of PA	Descriptions of physical (i.e. strength, reduced disease risk) and psychological (i.e. decreased stress, improved focus) benefits of regular PA.
3	Reminders & Rewards	Directions on how to integrate reminders (i.e. post-it notes, alarms) for scheduling PA and/or rewards (i.e. be able to watch a movie/show if PA is completed, purchasing new gear).
4	Goal Setting & Social Support	In-depth direction on how to set, assess, and evaluate PA goals. Recommended finding important others to do PA with or who provide PA support.
5	Staying Motivated	Questions about why PA is important to individual.
6-7	Strategy Follow-up	Encouraged to utilize those strategies found to be most helpful and continue consistent use of them.

8	Conclusion of Intervention	Discussed long-term use of strategies, developed final goals, and gave instructions for 12 and 16-week assessments.

reminders, rewards, goal setting, social support and maintaining motivation. Participants in this group also completed PALs to track daily PA in order to control for the influence of tracking on PA (Lewis et al., 2013) and completed the same weekly FS assessments with questions on study recommended strategy use. However, the FS assessments were described and presented to this group as "weekly assessments," and were not emphasized as a tool to assess how well they were "feeling good" during PA. Participants were not encouraged to focus on the feeling of PA nor did they discuss any pleasurable feelings felt during PA. Sessions were focused solely on behavioral strategies used to logistically aid PA. If participants offered comments about the feelings experienced during PA, the PI acknowledged the comment, but did not encourage further discussion.

Data Analysis

Independent t-tests and chi-square tests were conducted to examine the effect of group assignment on continuous and categorical demographic and dependent variables, respectively. Between groups analysis of co-variance (ANCOVA) was used to assess the effect of the intervention on PA (primary dependent variable) based on the ActiGraph at 12 weeks and the 7-day PAR at 12 and 16 weeks. Between groups ANCOVA was used to assess affect both before and during PA (secondary dependent variable) based on the FS at 12 weeks. Between groups ANCOVA was also used to assess the psychosocial variables of interest (i.e. self-efficacy, outcome expectations, physical activity social

support, and PA enjoyment) at 12 and 16 weeks. Baseline measures were included as covariates in order to control for baseline differences between groups.

Given the study's small sample size (n = 40), when there were no differences between groups at either 12 or 16 weeks, we explored within subject changes overall and within each group. Repeated measures analyses of variance (ANOVA) was used to determine if there were changes over time in any of the necessary study variables. Additionally, given the small sample size "marginal significance" was discussed for findings where $p < .10$. Data were analyzed using SPSS (v24.0) for Windows and Microsoft Excel (Windows 2010). The ActiGraph data was analyzed using ActiLife (v6.12.1).

4

Results

Recruitment and Retention

A flowchart of participant recruitment, screening, randomization, and completion is shown in Figure 4-1. During the intervention, one participant was excluded due to pregnancy and four dropped out due to lack of time. There were no differences between

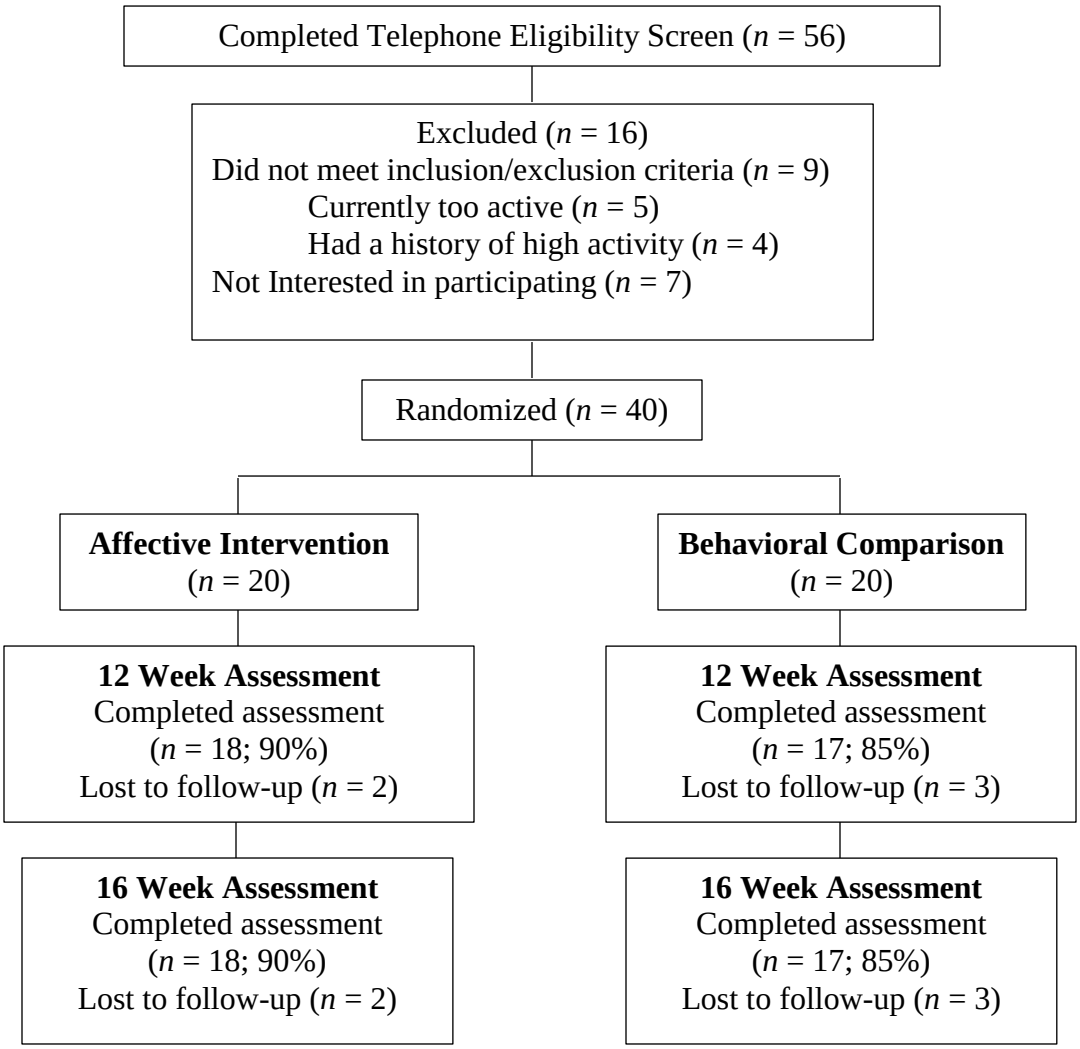

Figure 4-1. Sampling and flow of participants from September 2016 to April 2017.

groups on average number of telephone sessions completed or length of telephone sessions (see Table 4-1). There was no differential drop-out between groups at either time

point. There were no differences on the demographic variables between those who dropped out (n = 5) and those who completed the study (n = 35).

Table 4-1

Telephone Counseling Session by Group

Group	Telephone Sessions	
	Mean Number of Sessions Completed	Mean Minutes per Session
Affective Intervention	6.70 (1.95)	15.93 (5.88)
Behavioral Comparison	5.70 (2.98)	14.74 (5.92)
All Participants	6.20 (2.54)	15.35 (5.92)

Note. Standard deviations are in parentheses.

Participant Engagement

There were no between group differences on self-reported use of the tailored intervention strategies (i.e., rewards, reminders, visual/auditory stimuli). The affective intervention reported strategy use on average 87% of the time and the behavioral comparison reported strategy use on average 80% of the time. Additionally, there were no between group differences for participant satisfaction score. The affective intervention reported an average of 7.70 out of 10 (n = 13) and the behavioral comparison reported an average of 7.92 out of 10 (n = 12) on the satisfaction questionnaire. Several participants provided comments related to accountability such as, “Getting the calls from the program kept me accountable” as a reason they liked the study. Many participants noted the difficulty of completing the digital FS during PA because it was, “difficult to remember” or “annoying to do while working out.” A majority of participants also noted that using wearable technology (i.e. Fitbit) or using a PA app would be beneficial additions.

Baseline Demographic and Psychosocial Data

Participant demographic data is summarized in Table 4-2. There were no between group differences for any demographic variables; however, there were between group differences for a few of the other baseline variables. At baseline, the affective intervention reported significantly fewer minutes of moderate to vigorous PA (MVPA) based on the ActiGraph $f(1,30)=2.60$, $p < .05$, than the behavioral comparison.

Table 4-2

Participant Demographics by Group

Characteristic	Total Sample (n = 40)	Affective Intervention (n = 20)	Behavioral Comparison (n = 20)	P-Value for Group Differences
Age (average in years)	39 (12)	42 (10)	37 (14)	.281
Sex (% female)	90%	85%	95%	.605
Race (%)				.359
Caucasian	75%	75%	75%	
American-Indian	2.5%	0%	5%	
Asian	12.5%	10%	15%	
African-American	5%	10%	0%	
Other	5%	5%	5%	
Ethnicity (%)				1.00
Non-Hispanic	97.5%	100%	95%	
Hispanic	2.5%	0%	5%	
Marital Status (% Married)	45%	60%	30%	.142
Education				.566
Some College	22.5%	15%	30%	
College Graduate	27.5%	30%	25%	
Post-graduate Work	47.5%	50%	45%	
Income				.104
Under $10,000	7.5%	0%	15%	
Between $10,000-39,9999	15%	10%	20%	
Between $40,000-59,9999	15%	15%	15%	
Between $60,000-89,9999	22.5%	25%	20%	
Over $90,000	40%	50%	30%	
Currently Employed (%)	90%	90%	90%	1.00
Current Smokers (%)	0%	0%	0%	

Additionally, there were between group differences at baseline on both Self-Efficacy for Exercise (SEE) and Physical Activity Enjoyment Scale (PACES). Specifically, the affective intervention group scored significantly higher on both the SEE ($p < .05$) and the PACES ($p < .05$) at baseline when compared to the behavioral comparison.

Primary Dependent Variable

The primary dependent variable of PA was measured by both the ActiGraph and the 7-day PAR in order to assess PA using both objective and subjective measures. The hypothesis stated that participants in the affective intervention would exhibit greater increases in PA than participants in the behavioral comparison.

ActiGraph. At baseline, participants wore the ActiGraph for an average of 3.51 days (SD = 0.64) out of the requested four. There were no differences for average wear time between groups. At 12 weeks, participants wore the ActiGraph for an average of 3.91 days (SD = 1.09) out of the requested four. There were no differences for average wear time between the groups. Participants who wore the ActiGraph for at least two days at both baseline and 12 weeks were included in the analyses (among the participants who completed the study, three participants did not meet the wear requirements).

There were significant between group differences for participants' MVPA at 12 weeks based on the ActiGraph after controlling for baseline MVPA, with the affective intervention recording significantly higher minutes of MVPA than the behavioral comparison condition, $f(1,28)=14.764$, $p < .005$ (see Table 4-3).

Table 4-3

Mean and Standard Deviations for MVPA based on ActiGraph by Group

Group	ActiGraph	
	Baseline	12 weeks
Affective Intervention (*n* = 16)	193.11 (83.43)	281.12 (135.93)
Behavioral Comparison (*n* = 15)	272.91 (108.57)	183.49 (98.71)
All (*n* = 31)	234.82 (104.05)	230.73 (126.31)

Note. Means reflect average MVPA minutes adjusted to reflect 7 days. Standard deviations are in parentheses.

7-Day Physical Activity Recall (PAR). There were no significant between group differences for participants' MVPA at 12 weeks based on the PAR after controlling for baseline MVPA (see Table 4-4). In examining change in PA over time, participants significantly increased their MVPA from baseline to 12 weeks $f(1,34)= 37.383$, $p < .001$, and baseline to 16 weeks $f(1,34)=48.20$, $p < .001$. By group, participants in the affective intervention significantly increased their MVPA from baseline to 12 weeks $f(1,17)=21.18$, $p < .001$, and baseline to 16 weeks $f(1,17)=42.65$, $p < .001$. Participants in the behavioral comparison also significantly increased their MVPA from baseline to 12 weeks $f(1,16)=15.44$, $p < .005$, and baseline to 16 weeks $f(1,16)=15.05$, $p < .01$.

Table 4-4

Means and Standard Deviations for MVPA based on 7-day PAR by Group

Group	PAR		
	Baseline	12 weeks	16 weeks
Affective Intervention (n = 18)	45.56 (45.89)	275.00 (201.20)	290.00 (165.81)
Behavioral Comparison (*n* = 17)	62.76 (59.24)	259.41 (219.28)	295.00 (259.71)
All (*n* = 35)	53.91 (52.73)	267.43 (207.20)	292.43 (213.30)

Note. PAR= 7-day Physical Activity Recall. Standard deviations are in parentheses.

Secondary Dependent Variable

The secondary dependent variable was affect as assessed by the FS in order to examine the efficacy of a 12-week affective intervention relative to a behavioral comparison on affective valence experienced before PA (i.e. Pre-PA affect) and during PA among low-active adults. It was hypothesized that participants in the affective intervention would report greater increases in feelings of both Pre-PA affect and affect during PA from baseline to 12 weeks than participants in the behavioral comparison.

Feeling Scale (FS). Participants recorded an average of 7.45 FS assessments (SD = 4.80) out of the requested 12. There were no between group differences for either the average number of FS assessments recorded or for baseline FS. Baseline FS scores were calculated as an average of the first three recorded FS assessments after randomization (e.g., weeks 1-3). Baseline FS scores were collected on average at week 2.6 (SD = 1.01). This collection point was established by averaging the weeks when participants completed their first three FS assessments. There were no differences for average week of FS assessments utilized for baseline scores between groups. Similarly, 12-week FS scores were taken as an average of the final three recorded FS assessments and were collected on average at week 10.25 (SD = 1.77). There were no differences between groups for average week of 12-week FS assessments. Analyses included only those participants who completed at least six FS assessments. Of the participants who completed the study, eight participants did not have at least six recorded FS assessments.

There were significant between group differences on FS assessments completed immediately prior to PA (i.e., Pre-PA affect) at 12 weeks after controlling for baseline

Pre-PA affect $f(1,26)=5.485$, $p < .05$. Specifically, the affective intervention demonstrated a greater increase in positive Pre-PA affect compared to the behavioral comparison (see table 4-5).

Table 4-5

Means and Standard Deviations for Pre-PA Affect based on the FS by Group

Group	Assessment	
	Baseline	12 weeks
Affective Intervention (n = 13)	.74 (1.34)	2.08 (1.91)
Behavioral Comparison (n = 14)	1.02 (1.75)	1.07 (1.36)
All (n = 27)	0.88 (1.54)	2.18 (1.09)

Note. FS= Feeling Scale. The FS is a one item measure with responses on an 11-point Likert scale. Scores range from -5 to +5. Standard deviations are in parentheses.

There were marginally significant between group differences on FS assessments during PA (i.e., PA affect) at 12 weeks after controlling for baseline PA affect $f(1,26)=3.037$, $p = .094$. Specifically, the affective intervention reported marginally higher positive PA affect than the behavioral comparison (see Table 4-6).

Table 4-6

Mean and Standard Deviation for FS PA affect by Group

Group	Assessment	
	Baseline	12 weeks
Affective Intervention (n = 13)	2.36 (.70)	3.11 (1.08)
Behavioral Comparison (n = 14)	2.00 (1.38)	2.11 (1.51)
All (n = 27)	2.18 (1.09)	2.59 (1.40)

Note. FS= Feeling Scale. The FS is a one item measure with responses on an 11-point Likert scale. Scores range from -5 to +5. Standard deviations are in parentheses.

Psychosocial Variables.

Bivariate correlations between PA and psychosocial variables are summarized in Table 4-7. To follow is a summary of the between group differences and changes across time on the psychosocial measures. The aim for this question of interest was to examine the effect of a 12-week intervention on changes in self-efficacy for exercise, outcome expectations, PA social support, and enjoyment for PA in both the affective intervention and the behavioral comparison. The related hypotheses anticipated that while both groups would experience increases in self-efficacy for exercise, outcome expectations, and social support, participants in the affective intervention would report greater increases in PA enjoyment than the behavioral comparison.

Self-Efficacy for Exercise (SEE). There were no significant between group differences on self-efficacy for exercise at 12 weeks after controlling for baseline self-efficacy (SEE) or at 16 weeks (see Table 4-8). In examining change over time, participants significantly increased their SEE from baseline to 12 weeks $f(1,34)= 13.752$, $p < .005$, and baseline to 16 weeks $f(1,34)= 22.629$, $p < .001$. By group, participants in the affective intervention showed a marginally significant increase in their SEE from baseline to 12 weeks $f(1,17)=3.427$, $p = .082$, and significantly increased from baseline to 16 weeks $f(1,17)=6.203$, $p < .05$; while participants in the behavioral comparison significantly increased their SEE from baseline to 12 weeks $f(1,16)=12.422$, $p < .005$, and baseline to 16 weeks $f(1,16)=21.842$, $p < .001$.

Table 4-7

Correlation matrix for PA and psychosocial variables at baseline, 12 and 16 weeks

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1.	Baseline ActiGraph		.28	-.31	-.44*	.07	-.39*	.31*	.21	-.06	-.16	.19	-.13	.24	-.18	-.14	.14	-.13
2.	Baseline PAR			.33	-.06	.09	-.30	.14	.14	.01	.05	.10	-.20	.31	.02	.10	.01	-.09
3.	Baseline SEE				.43*	.09	.29*	.18	-.11	.26	.15	.06	.13	.06	.41*	.31	.17	.22
4.	Baseline OEE					.03	.60**	.20	.01	.30	.48**	-.03	.49**	-.21	.46*	.54**	.10	.33
5.	Baseline PASS						.26	.05	.21	.12	-.05	.64**	.13	.50**	.09	-.02	.50**	.16
6.	Baseline PACES							.16	.12	.15	.19	.16	.50**	.03	.30	.31	.19	.50**
7.	12-week ActiGraph								.17	.21	.22	.22	.21	.16	.19	.32	.27	.35
8.	12-week PAR									.01	-.08	.44**	.12	.37*	.12	.15	.51**	.23
9.	12-week SEE										.52**	.26	.51**	-.03	.82**	.64**	.39*	.44*
10.	12-week OEE											-.05	.65**	-.03	.46*	.79**	.03	.43*
11.	12-week PASS												.14	.56**	.23	.10	.81**	.28
12.	12-week PACES													-.05	.52**	.66**	.33	.81**
13.	16-week PAR														-.05	.07	.44*	.10
14.	16-week SEE															.68**	.40*	.60**
15.	16-week OEE																.33	.65**
16.	16-week PASS																	.47**
17.	16-week PACES																	

Note. * Correlation is significant $p < .05$; ** Correlation is significant at $p < .005$. PAR= 7-day Physical Activity Recall; SEE= Self=Efficacy for Exercise Scale; OEE= Outcome Expectations for Exercise; PASS= Physical Activity Social Support; PACES= Physical Activity Enjoyment Scale.

Table 4-8

Means and Standard Deviations for SEE by Group

Group	Assessment		
	Baseline	12 weeks	16 weeks
Affective Intervention (*n* = 18)	56.20 (21.07)	63.44 (11.00)	66.11 (11.88)
Behavioral Comparison (*n* = 17)	44.60 (12.27)	59.18 (17.28)	59.76 (15.12)
All (*n* = 35)	50.40 (18.01)	61.37 (14.35)	63.03 (13.72)

Note. SEE= Self-Efficacy for Exercise Scale. The SEE is a nine-item measure with responses on a Likert scale from 0-10. Scores range from 0-90. Standard deviations are in parentheses.

Outcome Expectations for Exercise (OEE). There were no significant between group differences for participants' outcome expectations at 12 weeks or 16 weeks after controlling for baseline OEE (see table 4-9). In examining change in outcome expectations over time, participants significantly increased their OEE from baseline to 12 weeks $f(1,34)=12.784$, $p < .005$, and baseline to 16 weeks $f(1,34)=15.261$, $p < .001$. By group, participants in the affective intervention did not significantly increase their OEE from baseline to 12 weeks, but did show a significant increase from baseline to 16 weeks $f(1,17)=13.729$, $p < .005$; while participants in the behavioral comparison did significantly increase their OEE from baseline to 12 weeks $f(1,16)=15.486$, $p < .005$, and baseline to 16 weeks $f(1,16)=5.588$, $p < .05$.

Table 4-9

Means and Standard Deviations for OEE by Group

Group	Assessment		
	Baseline	12 weeks	16 weeks
Affective Intervention (*n* = 18)	35.95 (5.72)	38.00 (5.09)	40.00 (3.84)
Behavioral Comparison (*n* = 17)	32.70 (6.59)	38.12 (4.82)	36.47 (6.24)
All (*n* = 35)	34.33 (6.31)	38.06 (4.89)	38.29 (5.37)

Note. OEE= Outcome Expectations for Exercise. The OEE is a nine-item measure with responses on a Likert scale from 1-5. Standard deviations are in parentheses.

Physical Activity Social Support (PASS). There were no significant between group differences for participants' PA social support at 12 weeks after controlling for baseline PASS. There were, however, significant between group differences for participants' PASS at 16 weeks, $f(1,32)=5.03$, $p < .05$; with the affective intervention reporting greater PA social support than the behavioral comparison (see Table 4-10). In examining change in PA social support over time, participants did not significantly increase their PASS from baseline to 12 weeks. By group, participants in the affective intervention did not significantly increase their PASS from baseline to 12 weeks; while participants in the behavioral comparison also did not significantly increase their PASS from baseline to 12 weeks.

Table 4-10

Mean and Standard Deviation for PASS by Group

Group	Assessment		
	Baseline	12 weeks	16 weeks
Affective Intervention (*n* = 18)	65.80 (13.38)	66.72 (9.34)	69.78 (15.05)
Behavioral Comparison (*n* = 17)	66.95 (18.32)	64.76 (17.10)	59.76 (17.35)
All (*n* = 35)	66.38(15.84)	65.77 (13.50)	64.91 (16.75)

Note. PASS= Physical Activity Social Support. The PASS is a 13-item measure with responses on a five-point Likert scale. Standard deviations are in parentheses.

Physical Activity Enjoyment Scale (PACES). There were no significant between group differences for participants' enjoyment at 12 weeks after controlling for baseline PACES; however, there were marginally significant differences at 16 weeks with the affective intervention reporting greater PACES than the behavioral comparison $f(1,32)=3.68$, $p = .064$ (see Table 4-11). In examining change in PA enjoyment over time, participants significantly increased their PACES from baseline to 12 weeks $f(1,34)= 25.852$, $p < .001$. By group, participants in the affective intervention significantly increased their PACES from baseline to 12 weeks $f(1,17)=20.615$, $p < .001$; while participants in the behavioral comparison also significantly increased their PACES from baseline to 12 weeks $f(1,16)=12.183$, $p < .005$.

Table 4-11

Means and Standard Deviations for PACES by Group

Group	Assessment		
	Baseline	12 weeks	16 weeks
Affective Intervention (n = 18)	87.30 (13.68)	98.39 (13.05)	101.72 (13.43) [a]
Behavioral Comparison (n = 17)	73.30 (19.10)	90.18 (14.63)	87.82 (14.07)
All (n = 35)	80.30 (17.87)	94.40 (14.26)	94.97 (15.27)

Note. PACES= Physical Activity Enjoyment Scale. PACES is an 18 item measure with responses on a seven-point Likert scale. Standard deviations in parentheses.
[a] Marginally significant at the 0.10 level.

5

Discussion

PA and PA-related Affect

This randomized, controlled study examined the efficacy of a 12-week affective intervention on PA relative to a behavioral comparison among low active adults. The affective intervention increased PA at 12 weeks compared to the behavioral comparison based on the ActiGraph, however, there were no between group differences on PA based on the 7-day PAR at 12 or 16 weeks. The affective intervention in this study taught participants to focus on and enhance their positive affect during PA through eight telephone-based sessions. The sessions were based on previous PA intervention studies utilizing behavioral strategies for increasing PA, which have demonstrated effectiveness (Conn et al., 2011). However, for the affective intervention participants, these strategies were further tailored to focus on positive affect and "feeling good" during PA. Low-active adults with a history of low-activity were targeted given that low levels of PA are associated with numerous negative health outcomes (Fournier et al., 2014; Helmrich et al., 1994; Pettapiece-Phillips et al., 2015; Warburton et al., 2001; Wilson et al., 2015). Those with a history of low-activity are also not likely to have experienced a development of fitness or have previous experiences with PA, which can influence one's affect during PA (Bulbulian & Darabos, 1986; Farrell et al., 1987; Frazão et al., 2016; Tieman et al., 2002).

Participants were asked to self-select their pace of PA due to previous findings that show individuals tend to near the VT, but not exceed it when allowed to self-pace (Ekkekakis et al., 2006; Lind et al., 2005; Parfitt et al., 2006). This is consistent with the dual-mode model, which states that as PA intensity increases, the associated affective

valence (pleasure-displeasure) decreases (Ekkekakis, 2003; Ekkekakis et al., 2008). Participants were also instructed to self-select type of PA to allow for the influence of hedonic theory, which asserts that it is an individual's natural drive to seek out pleasure and avoid pain (Higgins, 1997).

Further, before discussing the meaning of the current findings, it is important to note that the statistical procedures utilized in this study included multiple analyses by using individual ANCOVAs to assess the intervention effect on the dependent variables. This increases the chance of a Type I error and should be acknowledged when interpreting the current findings. Additionally, it is also important to note that effect sizes were calculated for this study and were relatively low.

The finding that the affective intervention demonstrated more PA minutes per week than the behavior comparison based on the ActiGraph, though consistent with the hypothesis based on the dual-mode model and hedonic theory, was likely impacted by the elevated baseline levels of PA recorded by both groups. Even though participants were screened for current level of PA (e.g. < 90 minutes a week), the average weekly minutes at baseline for both the behavioral comparison and the affective intervention were much greater than 90 minutes based on the ActiGraph. Based on the 7-day PAR, the finding that there were no between group differences on PA at 12 or 16 weeks was contrary to what was hypothesized. However, participants in both groups reported comparable increases in PA from baseline to 12 weeks and baseline to 16 weeks. Results between the two assessments of PA showed that participants self-reported far fewer weekly MVPA minutes at baseline than was objectively recorded. However, at 12 weeks, self-reported

weekly MVPA minutes were more consistent with objectively recorded minutes. The discrepant findings between the two assessments of PA provide only partial confirmation of the related hypothesis since greater PA was demonstrated in the objective measure of PA (e.g. ActiGraph), but was not found in the subjective measure of PA (e.g. 7-day PAR).

Additionally, based on the dual-mode model and the structure of this study, the intensity of the PA performed was of particular interest. The participants' PA intensity was not followed during the 12-week intervention due to previous findings that indicated self-paced PA tends to remain below the VT (Lind et al., 2005; Parfitt et al., 2006; Williams, 2008). It was therefore expected that the current participants would not engage in vigorous intensity PA. The data from the ActiGraph collected at both baseline and 12 weeks was used to assess this assumption. The PA intensity recorded from the ActiGraph demonstrates that at baseline, participants engaged in an average of 3.6 minutes of vigorous to very vigorous PA and at 12 weeks they engaged in an average of eight minutes of vigorous to very vigorous PA (minutes represent the four days of wear).

Despite the discrepant results, the current findings demonstrate that instructing individuals to focus on the feeling of positive PA-related affect can increase their overall level of PA. This ability to attend to positive affect may also have the potential to increase future PA adherence, which is critical for increasing positive health outcomes, such as improved energy, self-image, and general quality of life (AHA, 2015), as well as, decreasing negative outcomes, such as type 2 diabetes (Warburton et al., 2001) and cardiovascular disease (Wilson et al., 2015).

The affective intervention also reported increases in positive Pre-PA affect from baseline to 12 weeks as hypothesized compared to the behavioral comparison. The affective intervention also showed marginally significant differences in affect experienced during PA relative to the behavioral comparison from baseline to 12 weeks as hypothesized. The findings on increased positive Pre-PA affect show that participants in the affective intervention may have developed a heightened expectation of positive affect during their PA, which resulted in a pre-emptive elevation in positive affect as they got ready to begin a bout of PA. The participants' increase in Pre-PA affect is consistent with hedonic theory, which states that individuals seek out pleasure (Higgins, 1997). If an activity has given individuals pleasure in the past, individuals will likely continue to seek it out and expect it to continue to give them pleasure.

This is also consistent with findings from Helfer et al. (2015), which showed simply telling participants before a short bout of PA that PA often results in feelings such as contentedness and happiness resulted in higher positive affect post-PA and higher intentions to engage in PA in the future. However, the current study differed from Helfer et al. (2015) in that this study did not tell participants they could expect to "feel better" once they were finished with their PA, but that they should seek to find pleasure (i.e. positive affect) during PA itself. This study adds to the literature by demonstrating that increasing positive affect during PA can also result in increasing positive Pre-PA affect and perhaps can play a role in PA adherence.

With regard to affect experienced during PA, the current findings provide preliminary evidence that the affective intervention may have successfully manipulated

positive affect during PA; however, a larger sample size is needed to confirm this finding. This finding is important given previous research indicates that positive affect during PA is related to greater PA adherence (Kwan & Bryan, 2010; Williams et al., 2008; Williams et al., 2012). Peterson et al. (2012) also found that individuals were more likely to reach PA goals when positive affect was activated via bimonthly motivational telephone calls and small gifts. Similar to Peterson et al. (2012), this study utilized weekly and bimonthly calls to help activate positive affect in order to influence PA adherence. This study improved upon the work of Peterson and colleagues because while they sought to increase general affect, the current intervention specifically encouraged participants to associate positive affect or "feeling good" with PA itself. Future adequately powered studies are needed to examine if positive affect mediates the effect of affective interventions on PA behavior change.

Regarding affect measurement, it is necessary to indicate several important considerations. First, this study analyzed pre-PA affect as its own dependent variable. It is often used as a baseline measure in order to look at affective responses to PA (i.e. change from baseline to during PA), but this study considered it separately due to interest in potential shifts in anticipatory affect. Specifically, it was anticipated that after having pleasurable experiences during PA at the beginning of the intervention, participants would begin to report a shift in affect Pre-PA in anticipation of again experiencing pleasure in PA later in the intervention. In order to examine this potential shift, it was necessary to independently analyze Pre-PA affect and during PA affect. Second, the vast majority of responses on the FS were positive, regardless of time point or group

assignment. All participants recorded a 1.2 for Pre-PA affect and a 2.3 for during PA affect on the FS, which ranged from -5 to +5. Finally, the current study focused primarily on PA-related affect experienced just prior to and during PA, but did not assess affect after PA was completed. This was done for several reasons. First, the dual-mode model is concerned with affect during PA as the crucial time point for the intensity-affect relationship to occur. Second, based on the previously mentioned findings that affect experienced during PA is related to future PA adherence (Kwan & Bryan, 2010; Williams et al., 2008; Williams et al., 2012), it was important that this study maintain that particular time point for assessment. Third, due to the novel nature of the current design, it was important for the FS assessments to stay central to the theoretical foundation, especially with no previous literature on feasibility or participant adherence.

Theoretically, the findings on PA and PA-related affect demonstrate that it is possible for individuals to be taught how to harness the dual-mode model and hedonic theory in order to improve PA adherence. This suggests that when low active individuals self-select the type and pace of their PA and are instructed to maintain a pleasant feeling throughout PA, they may be more likely to engage in PA. This is important because it demonstrates that positive PA-related affect can be taught. Previous findings have shown that higher positive PA-related affect is moderated by fitness and current level of PA (Blanchard et al., 2001; Bulbulian & Darabos, 1986; Farrell et al., 1987; Magnan et al., 2013; Tieman et al., 2002); however, that necessitates a history of PA. Given the current low levels of PA among adults (CDC, 2014), these findings show it is possible to increase positive PA-related affect among individual who do not meet current PA

recommendations and have a history of low PA. The current findings demonstrate that similarly affectively-based PA intervention have the potential to increase PA adherence among the large population of low active adults; thus harnessing the dual-mode model and hedonic theory to increase PA adherence.

Psychosocial Variables

There were a number of noteworthy correlations between the two measures of PA and the psychosocial variables. At baseline, the ActiGraph showed significant negative correlations with outcome expectations (OEE) and PA enjoyment (PACES). There were no other significant correlations between the ActiGraph and the psychosocial variables at either time point. At 12 weeks, the PAR showed a significant positive correlation with PA social support (PASS) at 12 and 16 weeks. Finally, at 16 weeks the PAR again showed significant positive correlation with PASS at all time points. Based, on these findings, it appears that social support is an important factor for PA adherence.

There were no between group differences on self-efficacy for exercise (SEE) or outcome expectations for exercise (OEE), but there were significant increases in SEE and OEE across time for all participants. This confirmed the hypothesis that the study's intervention would result in similar increases in all participants, regardless of group, on these psychosocial variables as both groups were structured around behavioral strategies. Previous research has demonstrated that behaviorally-based PA promotion interventions increase these variables (Cramp & Bray, 2011; Higgins et al., 2014). However, contrary to the hypothesis, the affective intervention reported significantly greater PA social support (PASS) at 16 weeks compared to the behavioral comparison, though neither

group showed increases in PASS across time. This finding was unexpected and additional studies are needed to further explore the role of social support in relation to PA-related affect.

Additionally, the affective intervention showed marginally significant increases on PA enjoyment (PACES) relative to the behavioral comparison from baseline to 16 weeks as hypothesized. The trend towards significance may indicate that those in the affective intervention, while increasing their PA-related affect, were also experiencing increasing enjoyment from PA. These findings are meaningful because they provide support that affect and the emotion of enjoyment may be related through hedonic theory.

It is important to note that affect and the emotion of enjoyment are distinct from one another, though affect is the foundation from which emotions develop (Ekkekakis, 2013; Ekkekakis & Petruzzello, 2000). Thus, with specific cognitive input, positive affect can move from its non-cognitive nature into the related perception of enjoyment. This foundational relationship demonstrates that as affect changes, there will likely be a corresponding change in the resulting emotions. Furthermore, PA enjoyment has been described as a positive affective response to PA (Wankel, 1993) and an important affective factor that effects PA behavior change by means of hedonic motivation (Lewis et al., 2016). This close and interrelated nature of positive affect and enjoyment as it relates to PA can potentially be explained by hedonic theory. Individuals naturally seek to maintain a pleasant state, which can be innately felt in positive affect, but can further be cognitively processed as enjoyment. Both positive affect and enjoyment are consistent with the hedonic principle of seeking out pleasure and avoiding pain (Higgins, 1997).

Similar to affect, PA enjoyment has been shown to increase PA intentions (Ruby, Dunn, Perrino, Gillis, & Viel, 2011), improve attitudes towards PA (Martin Ginis et al., 2006), and predicts PA and PA adherence (Dunton & Vaughan, 2008). PA enjoyment has also been shown to be both a predictor and an outcome of PA (McArthur, & Raedeke, 2009; Williams, Papandonatos, Napolitano, Lewis, & Whiteley, 2006). Future studies with larger sample sizes are needed to examine the importance of PA enjoyment.

Strengths

The present study had several strengths. Specifically, this was the first intervention study to influence positive affect experienced during PA. A majority of the PA-related affect literature is observational or nonexperimental and therefore, is unclear how enhancing positive affect can influence PA adherence. This study also added to the current literature by addressing several of the limitations of previous studies. First, it utilized a strong theoretical foundation of the dual-mode model and hedonic theory. Many studies on PA-related affect have not integrated these theories directly into the design of the intervention. Second, this study followed participants across 12 weeks of PA sessions, which is important for accurately assessing PA-related affect. Third, this study allowed for participants to self-select type and pace of PA, which has been shown to reach similar intensity as when a moderate-intensity level is prescribed (Lind et al., 2005; Parfitt et al., 2006), but has the added strength of greater improvements in affective responses compared to prescribed intensity (Williams, 2008). Finally, unlike several of the previous studies reviewed, this study used an objective measurement of PA.

Limitations

There were several limitations related to this study. First, participants in this study were volunteers and were mostly female, Caucasian, non-Hispanic, educated, employed, and had relatively high incomes (majority above $60k), which may have influenced the generalizability of the findings. Future studies should examine other demographic groups, especially given the low rates of PA among minorities (August & Sorkin, 2011) and those with low socioeconomic status (Pampel, Kruger, & Denney, 2010). Second, the current study had a small sample size (n = 40), which lowered the statistical power to detect significant between group differences. Specifically, mediation analyses were not feasible given the small sample size. Third, the length of the intervention was relatively short and it is unclear if the PA increases would have continued in the long-term. Fourth, there were between group differences at baseline in PA based on the ActiGraph, as well as self-efficacy for PA (SEE) and PA enjoyment (PACES). These baseline differences may have affected the findings at 12 and 16 weeks. Fifth, there were limitations with regard to measurement. The majority of the measures used in this study, while reliable and valid, were self-report and therefore open to self-report bias. Additionally, the ActiGraph was only worn by participants for four days and then scaled to reflect seven days. Sixth, the telephone coaching was administered to both groups by the PI. This was done to ensure that all participants received the same non-specific factors such as engagement and empathy; however, this did introduce investigator bias into the delivery of the intervention. Recordings were made of a random 10% of telephone calls to check for consistency regardless of group assignment. Finally, there were limitations as to how

affect was assessed through the FS. For example, there were no time stamps on the electronically submitted FS assessments, which means that it cannot be confirmed that participants completed the assessment at the requested time points. Participant burden may also have played a role in the low completion rate of the FS assessments. Participants completed on average 62% of the weekly FS assessments.

Future Directions

Few PA interventions trials have examined interventions that target affect. Consequently, future research on PA-related affect and PA adherence needs to consider the following important factors: Study setting and target population, effectively influencing affect, and the timing of affect assessment.

Setting and target population. The majority of studies examining PA and affect have been conducted in laboratory settings (Ekkekakis et al., 2000; Kanning et al., 2015). Therefore, previous studies lack ecological validity. Additionally, much of the early affect and PA research included healthy, active participants. Even though more recent studies have included obese and overweight (Ekkekakis, Lind, & Vazou, 2010), sedentary or low-active (Williams et al., 2008, Williams et al., 2012), and older adults (Kanning et al., 2015), more research is needed with these high risk populations.

Effectively influencing affect. Given what little research has been done on the relationship between affect and PA in regards to interventions and the manipulation of affect, it is critical that future research aim to bolster our understanding of how to influence and enhance positive affect experienced during PA. Current evidence demonstrates that affect is tied to the intensity of the PA itself (Ekkekakis, 2003;

Ekkekakis et al., 2008; Frazão et al., 2016), but beyond that, little is known about how to create positive affect during PA. Future studies may benefit from utilizing mixed-methods approaches to first qualitatively interview participants about their feelings toward PA and what makes them feel good or bad during PA; and then to develop a tailored quantitative intervention to influence affect during PA.

Timing of affect assessment. Future studies should assess PA-related affect before, during, and after PA over multiple sessions. Early research assessed affect before and after a bout of PA (Blanchard, Rodgers, Spence, & Courneya, 2001; Bixby, Spalding, & Hatfield, 2001; Ekkekakis & Petruzzello, 1999), but this failed to demonstrate how affect during PA fluctuates depending on PA intensity (Ekkekakis et al., 2008) and how affect changes day-to-day (Unick et al., 2015). By assessing affect at each of these time points across multiple bouts of PA, future studies will have a better understanding of the fluctuations of PA-related affect and how that effects day-to-day PA. Additionally, findings from Williams and colleagues (Williams, 2008; Williams et al., 2012) provide evidence that affect experienced during PA is most predictive of future PA adherence, but more longitudinal research is needed to understand how affect relates to PA adherence and how that relationship changes over time.

In order to meet these timing needs and day-to-day variations in affect, future studies should utilize ecological momentary assessment (EMA). EMA involves repeated sampling of individuals' behaviors and associated experiences in real time as they occur in the natural environment (Shiffman, Stone, & Hufford, 2008). This is often accomplished through assessments at periodic or random intervals using technologies

such as diaries, telephones, and physiological sensors. This means of assessment is crucial to having real time measures to better understand the influence of positive affect on PA and PA adherence. EMA also helps to increase ecological validity and minimize recall bias.

It is particularly important that EMA technology be used to assess PA-related affect to ensure that measurements are being recorded at critical time points around PA (i.e. prior to PA, below the VT, at the VT, above the VT, and post-PA) and to better examine the relationship between PA intensity, affect, and adherence. This requires that there be a combination of assessments recording both intensity and affect simultaneously. Being able to demonstrate through technology that an individual was being physically active at a certain intensity and recorded a particular level of affect at the same exact time is crucial to extending the collective knowledge. While there has been some initial use of this data collection methodology (Kanning et al., 2015), future research needs to continue to incorporate innovative designs using EMA technology, such as wearable devices, smart phone apps, and individually-tailored websites.

Implications and Conclusions

The study findings provide preliminary evidence that PA interventions targeting affect may be efficacious for increasing PA. However, support for the affective intervention is complicated by inconsistent results between the PA assessment measures (ActiGraph supported the findings, whereas the PAR did not). The dual-mode model and hedonic theory postulate that positive affect is at its highest when individuals are working below their ventilator threshold (Ekkekakis, 2003, 2005; Ekkekakis & Acevedo, 2006)

and individuals who experience positive affect during PA tend to have better PA adherence (Kwan & Bryan, 2010; Williams, 2008; Williams et al., 2012). From this theoretical framework and the initial findings in this study, it is important for researchers to consider that affectively-based PA interventions may have the potential to increase PA adherence among the large population of low-active adults. In general, participants in both interventions reported increases on the psychosocial variables, which is consistent with findings from previous behaviorally-based interventions. The affective intervention did; however, report greater increases on PA social support and enjoyment relative to the behavioral comparison. The enjoyment finding is consistent with hedonic theory such that the experience of greater positive PA-related affect, resulted in increased enjoyment, both of which bring a sense of pleasure.

This study has possible implications for practitioners targeting PA behavior change. Specifically, practitioners should seek to eliminate the popular adage of "no pain, no gain." Instead, they should describe PA as an activity that can be pleasurable. To do this, practitioners can create PA environments that allow individuals to self-select the type and pace of their PA. They should focus on how PA can make them "feel good." Additionally, practitioners should encourage individuals to associate that pleasurable feeling as a direct and immediate response to PA. This places the emphasis on finding pleasure from PA instead of the negative experiences of exhaustion, exertion, and discomfort, which may lead to an increase in PA adherence. The ability to impact PA and PA adherence is crucial in improving health and wellness and limiting non-communicable disease factors. Future studies should seek to address the present

limitations by conducting longer interventions, seeking out larger and more diverse samples, and utilizing objective measures and innovative technologies that allow for ecological momentary assessment (EMA). Additionally, it is important to more fully explore how best to instruct participants to focus on positive affect both before and during PA.

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APPENDICES

Appendix A

CONSENT FORM

Positive Mood for Physical Activity & Wellness Program

You are invited to be in a research study examining the effect of affective behavioral strategies on increasing physical activity. You were selected as a possible participant because you called our study telephone line and completed the eligibility screen. We ask that you read this form and ask any questions you may have before agreeing to be in the study.
This study is being conducted by Lauren Billing, M.S., a Ph.D. student in the School of Kinesiology at the University of Minnesota. This study is being sponsored and funded by the Association for Applied Sport Psychology (AASP).

Background Information:
The purpose of this study is to examine if exercise interventions help increase physical activity.

Procedures:
If you agree to be in this study, we would ask you to do the following things:

First, you will complete the forms included in this link. Specifically, this includes electronically signing this consent form and answering the questionnaire assessing demographic variables. Once we obtain your consent and demographics, you will be mailed an ActiGraph, a device that tracks your physical activity, for 4-days of wear. The activity monitor is an objective way to assess how much exercise you are doing during a short period of time. It is the size of a beeper and is worn on your waistband. We will send this monitor to you through the mail and you will return it to us in a postage paid padded envelope. Once you wear the ActiGraph for 4 days, you will mail it back to us in pre-paid envelope. Next, we will take you through a telephone interview assessing physical activity, affect, self-efficacy for exercise, outcome expectations, exercise attitudes, physical activity enjoyment, physical activity social support, stress, and sleep. We will periodically tape your responses to the interviews. This is done for quality control and strict confidentiality will be maintained. Next you will be randomly assigned to one of two conditions: (1) telephone-based affective behavioral strategies group focused on physical activity; or (2) telephone-based behavioral strategies group also focused on physical activity. The assignment to each group is completely random. Both groups will participate in telephone-based sessions with a health educator for 12-weeks, weekly during the first month, then every other week during months 2 and 3.

At the end of the three months, you will repeat the 4-day ActiGraph wear and telephone-based interview assessment with one more telephone-based assessment to be completed one month later. Again, the interviews will periodically be taped. Throughout this process, there will be no expenses as we will provide all of the materials and postage paid envelopes for the return of the questionnaires and activity monitor.

Risks and Benefits of being in the Study:
The study has several risks. First, physical activity can lead to orthopedic injuries. Second, physical activity can lead to an exacerbation of a pre-existing medical condition. The likelihood of these risks occurring is generally low. If an injury occurs or if physical activity becomes unsafe, you will be asked to discontinue physical activity until your healthcare provider provides written permission for you to continue physical activity again.

Should you at any time have a question or concern about your activity's impact on your health status please contact your physician or healthcare provider.

Participants are not responsible for loss, theft, or damage to the ActiGraph.

There are no direct benefits to participation in the study.

Compensation:
You will receive $25 for completing the post-intervention ActiGraph wear and assessment and another $25 for completing the one-month assessment. You must complete the ActiGraph wear and assessments to receive the incentive.

Confidentiality:
The records of this study will be kept private. In any sort of report we might publish, we will not include any information that will make it possible to identify an individual participant. Research records will be stored securely and only researchers will have access to the records. Study data will be encrypted according to current University policy for protection of confidentiality. Lauren Billing, the primary investigator on the study, will listen to the audiotapes to ensure the interviews are done properly. She will erase the tapes after listening to them and nobody else will have access to these audiotapes.

Voluntary Nature of the Study:
Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University of Minnesota. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

Contacts and Questions:
The researcher conducting this study is Lauren Billing, M.S. You may ask any questions you have by calling Lauren at 612-345-0324 or contacting her via email at

billi183@umn.edu. You can also contact my advisor Dr. Beth Lewis at 612-625-0756 or blewis@umn.edu.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, you are encouraged to contact the Research Subjects' Advocate Line, D528 Mayo, 420 Delaware St. Southeast, Minneapolis, Minnesota 55455; (612) 625-1650.

You will be sent a digital copy of this information to keep for your records.

Statement of Consent:

I have read the above information. I have asked questions and have received answers. I consent to participate in the study.

- I, _____, consent to participate in this study. Date: _____
- I,_____, do not consent to participate in this study.

Appendix B

Eligibility Screen

Hello, my name is Lauren Billing. I am with the University of Minnesota and the Positive Mood for Activity Program. Thanks so much for your interest. I'm calling you to tell you a little more about the study to see if you're interested and also ask you a few questions to see if you're eligible. Do you have a few minutes to go through that right now?

First, I just need to ask if I have permission to keep the information I ask you during this interview? It will remain confidential and will be kept without your name attached.

YES NO

1. How did you hear about the study?_____
2. What is your DOB? _____
3. Are you able to read and write in the English language?_____
4. Over the past month, did you participate in any moderate intensity physical activity? What I mean by that is any activity that feels as hard or harder than a brisk walk. It gets your heart rate going faster and feels like you're running late for an appointment. For the activity to be counted, it needs to be for at least 10 continuous minutes without stopping.

YES NO

If greater than 90 minutes per week of moderate intensity physical activity, then go to paragraph B.

5. In the past 5-10+ years (varies depending on age of individual), did you participate in any moderate intensity physical activity at a rate of more than 150 minutes or 2.5 hours per week for a period of 6-months or longer?

YES NO

If yes, then go to paragraph B.

6. I have a few more questions to ask you, but before I do I'd like to tell you a little bit more about the study so you can tell if you really are interested.

The study occurs over the phone for 12-weeks with a one-month follow-up call and is designed to improve physical activity. The study would begin for you right away. The first step is for you is to complete an online consent and demographics form, which I will email or text directly to you, whichever you prefer. Once I have received both of those back from you, I will mail you an ActiGraph and ask you to wear it for 4 days. It's a small device, similar to a pedometer, that you wear at your hip and it tracks your exercise. I will send this monitor to you through the mail and you will return it to me in a pre-paid postage padded envelope. Once I have received the ActiGraph back from you, I will give you a call and take you through an initial telephone interview and then

randomly assign you to one of two different groups: affective behavioral strategies or behavioral strategies, both focus on physical activity. Assignment to either group is completely random. Regardless of which group you are placed in, you will participate in telephone-based sessions. The sessions will decrease in regularity. The first month we will talk once a week and then months 2 and 3, it will be every other week. Initial calls will be a little longer, between 30 and 45 mins, while later calls will be between 10-20 mins. At the end of the 3 months you will be mailed an ActiGraph again to wear for another 4 days along with return postage. You will also complete another telephone interview after returning the ActiGraph and one final telephone assessment one-month later.

You will receive $25 for completing the post-intervention ActiGraph wear and assessment and another $25 for completing the one-month assessment. You must complete the ActiGraph wear and assessments to receive the incentive. Lastly, I want to stress that everything will occur through the mail, over the phone, or online. There are no in-person interviews or appointments. Your participation is totally voluntary and your information will remain confidential. I will also be sending you a full copy of this, so don't worry about remembering it all.

Does this sound like something you'd be interested in? **YES NO**

If YES… Great! I have just a few more questions to see if you're eligible.
If NO… Okay. I thank you for your time and consideration. Could you tell me what makes you disinterested in the study?

7. The next questions are general physical activity questions assessing your readiness to begin activity. (**If they answer yes to any one of the following, go to paragraph B**)

Physical Activity Readiness Questionnaire (PAR-Q)

Questions	Yes	No
1. Has your doctor ever said that you have a heart condition and that you should only perform physical activity recommended by a doctor?		
2. Do you feel pain in your chest when you perform physical activity?		
3. In the past month, have you had chest pain when you were not performing any physical activity?		
4. Do you lose your balance because of dizziness or do you ever lose consciousness?		
5. Do you have a bone or joint problem that could be made worse by a change in your physical activity?		
6. Is your doctor currently prescribing any medication for your blood pressure or for a heart condition?		
7. Do you know of any other reason why you should not engage in physical activity?		

If you have answered "Yes" to one or more of the above questions, consult your physician before engaging in physical activity. Tell your physician which questions you answered "Yes" to. After a medical evaluation, seek advice from your physician on what type of activity is suitable for your current condition.

A. **Eligible.** Based on all of that… you are eligible to participate. I will need to get some contact information from you to get things moving.
    a. Full name _____
    b. Mailing address _____
    c. Contact Information
        i. Number _____
        ii. Email _____
        iii. How would you like to receive links for the consent and demographics form?
    d. Is it okay for me to reference the study when I call or leave a message?

        Yes No

        i. If no, is there another name you'd like me to use?
    e. The next step is for you to read and sign the consent and fill out the demographics form, which I will send right after we get off the phone. I would like for you to fill those out as soon as possible so that I can get the ActiGraph mailed out to you and we can get things going. Once the consent and demographics are complete, I will automatically send the ActiGraph. You don't need to do anything other than keep an eye on the mail. Once, you have returned the ActiGraph I will get back in touch with you to go through the initial telephone interview and then randomly assign you to one of the groups. Please let me know if you have any issues or questions. Lastly, I'm really excited to get to work with you. Thanks for your interest in the study. And I will talk to you soon.

B. **Ineligible.** I'm sorry, but you are not eligible for this study based on _____. Thank you for your time and interest.

Appendix C

Demographics Questionnaire

1. What is your name? _____
2. What is your date of birth? _____ (MM/DD/YYYY)
3. Which of the following do you consider to be your racial group?
    a. White
    b. Black or African American
    c. American Indian or Alaska Native
    d. Asian
    e. Native Hawaiian or Pacific Islander
    f. Other
    g. Don't know/refuse to answer
4. What is the highest grade you have completed in school?
    a. Less than high school graduate (write in year 7-12)____
    b. High school graduate
    c. Some college
    d. College graduate
    e. Post-graduate work
5. What is your present total household income?
    a. Under $10,000
    b. Between $10,000 and $19,000
    c. Between $20,000 and $29,999
    d. Between $30,000 and $39,999
    e. Between $40,000 and $49,999
    f. Over $50,000
6. Are you employed?
    a. Yes
    b. No

If no, continue to Question 8

7. Which of the following best describes your job?
    a. Professional, administrative, or executive (i.e. government official, manager, purchasing agent, marketing rep, doctor, nurse, lawyer, teacher)
    b. Clerical work, administrative support, sales, or technician (i.e. office staff, data processing, sales clerk or supervisor, lab tech, LPN, legal asst.)
    c. Crafts, trade, factory work, service, or labor (i.e. carpenter, electrician, machine operator, machinist, foreman, police officer, restaurant worker, barber).
    d. Other (please describe) _____
8. How many hours per week (on average) do you spend at your job?
    a. 1-15 hours

b. 16-30 hours
c. 31-45 hours
d. 46-60 hours
e. 61+ hours

9. What is your current marital status?
    a. Single (never married)
    b. Married
    c. Divorced
    d. Widowed
    e. Separated
    f. Don't know
10. How many children under the age of 18 are currently living with you?
    a. None
    b. One
    c. Two
    d. Three
    e. Four or more
11. How many children under the age of 5 are currently living with you?
    a. None
    b. One
    c. Two
    d. Three
    e. Four or more
12. Do you currently smoke cigarettes?
    a. No
    b. Yes
        i. If yes, during the past 7 days, how many cigarettes did you smoke on a typical day?_____
13. How many days over the past week did you eat any servings of fruits and vegetables?_____
14. Approximately how many servings of fruits and vegetables did you eat on each of those days? _____

Appendix D

7-Day Physical Activity Recall (7-day PAR)

		Yesterday					One Week Ago	
	Days of the week	HRS MIN	HRS MIN	HRS MIN	HRS MIN	HRS MIN	HRS MIN	HRS MIN
SLEEP	Night							
		:	:	:	:	:	:	:
	Naps							
		:	:	:	:	:	:	:
	Total	:	:	:	:	:	:	:
MORNING								
	Sitting							
		:	:	:	:	:	:	:
	Moderate							
		:	:	:	:	:	:	:
	Hard							
		:	:	:	:	:	:	:
	Very Hard							
		:	:	:	:	:	:	:
AFTERNOON								
	Sitting							
		:	:	:	:	:	:	:
	Moderate							
		:	:	:	:	:	:	:
	Hard							
		:	:	:	:	:	:	:
	Very Hard							
		:	:	:	:	:	:	:
EVENING								
	Sitting							
		:	:	:	:	:	:	:
	Moderate							
		:	:	:	:	:	:	:
	Hard							
		:	:	:	:	:	:	:
	Very Hard							
		:	:	:	:	:	:	:

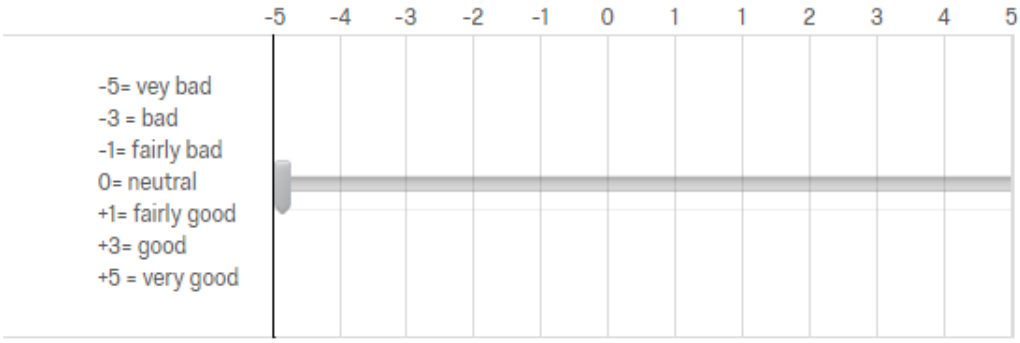
Appendix E

Feeling Scale (FS)

This assessment is to be filled out during physical activity. Be sure you select one day a week to you fill this out on a phone, tablet, or computer depending on where you are doing your activity.

First, as you prepare for your activity set a timer for 10 mins, hit start. Then complete the first Feeling Scale response just before beginning your activity, hit the next button. Once the timer goes off complete another Feeling Scale response, hit the next button and begin the 10 min timer one more time. Once the timer does off, complete the final Feeling Scale response and strategy use questions.

Please note, this survey is designed to auto-advance after 10 mins on a particular page. This is done to ensure that responses are recorded within the two 10 min periods. If you miss one, simply complete the next one within the remaining time allotment.



Appendix F

Self-Efficacy for Exercise Scale (SEE)

Now I am going to give nine situations that might affect your participation in exercise. For each one, use this scale where 0 is Not Confident and 10 is Very Confident, to tell me how confident you are right now that you could exercise 3 times a week for 20 minutes each time, in each of these situations:

	Not Confident										Very Confident
1. If the weather was bothering you	0	1	2	3	4	5	6	7	8	9	10
2. If you were bored by the program or activity	0	1	2	3	4	5	6	7	8	9	10
3. If you felt pain when exercising	0	1	2	3	4	5	6	7	8	9	10
4. If you had to exercise alone	0	1	2	3	4	5	6	7	8	9	10
5. If you did not enjoy it	0	1	2	3	4	5	6	7	8	9	10
6. If you were too busy with other activities	0	1	2	3	4	5	6	7	8	9	10
7. If you felt tired	0	1	2	3	4	5	6	7	8	9	10
8. If you felt stressed	0	1	2	3	4	5	6	7	8	9	10
9. If you felt depressed	0	1	2	3	4	5	6	7	8	9	10

Appendix G

Outcome Expectations for Exercise (OEE)

Now I'm going to read you nine different statements about the benefits of exercising, like walking, jogging, swimming, biking, stretching, or lifting weights. On this scale from 1 to 5, where 1 means you Strongly Disagree, and 5 means you Strongly Agree, please state how much you agree or disagree with each statement.

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
1. Exercise makes me feel better physically	1	2	3	4	5
2. Exercise makes my mood better in general	1	2	3	4	5
3. Exercise helps me feel less tired	1	2	3	4	5
4. Exercise makes my muscles stronger	1	2	3	4	5
5. Exercise is an activity I enjoy doing	1	2	3	4	5
6. Exercise gives me a sense of personal accomplishment	1	2	3	4	5
7. Exercise makes me more alert mentally	1	2	3	4	5
8. Exercise improves my endurance in performing my daily activities (personal care, cooking, shopping, light cleaning, taking out the garbage)	1	2	3	4	5
9. Exercise helps to strengthen my bones	1	2	3	4	5

Appendix H

Physical Activity Social Support (PASS)

The following questions refer to social support for your physical activity. Below is a list of things people might do or say to someone who is trying to do physical activity regularly. Please read and answer every question. If you are not physically active, then some of the questions may not apply to you. Please rate each question. Please rate how often any family member or friend has said or done what is described during the last month.

During the last month, my family (or members of my household) OR friends:	**None**	**Rarely**	**A few times**	**Often**	**Very often**	**Does not apply**
1. Did physical activities with me						
Family	0	1	2	3	4	N/A
Friends	0	1	2	3	4	N/A
2. Offered to do physical activities with me						
Family	0	1	2	3	4	N/A
Friends	0	1	2	3	4	N/A
3. Gave me helpful reminders to be physically active (i.e., "Are you going to do your activity tonight?)						
Family	0	1	2	3	4	N/A
Friends	0	1	2	3	4	N/A
4. Gave me encouragement to stick with my activity program						
Family	0	1	2	3	4	N/A
Friends	0	1	2	3	4	N/A
5. Changed their schedule so we could do physical activities together						
Family	0	1	2	3	4	N/A
Friends	0	1	2	3	4	N/A
6. Discussed physical activity with me						
Family	0	1	2	3	4	N/A
Friends	0	1	2	3	4	N/A
7. Complained about the time I spend doing physical activity						
Family	0	1	2	3	4	N/A
Friends	0	1	2	3	4	N/A
8. Criticized me or made fun of me for doing physical activities						
Family	0	1	2	3	4	N/A

Friends	0	1	2	3	4	N/A
9. Gave me rewards for being physically active such as bought or gave me something I like						
Family	0	1	2	3	4	N/A
Friends	0	1	2	3	4	N/A
10. Planned for physical activities on recreational outings						
Family	0	1	2	3	4	N/A
Friends	0	1	2	3	4	N/A
11. Helped plan events around my physical activities						
Family	0	1	2	3	4	N/A
Friends	0	1	2	3	4	N/A
12. Asked me for ideas on how they can be more physically active						
Family	0	1	2	3	4	N/A
Friends	0	1	2	3	4	N/A
13. Talked about how much they like to do physical activity						
Family	0	1	2	3	4	N/A
Friends	0	1	2	3	4	N/A

Appendix I

Physical Activity Enjoyment Scale (PACES)

Please rate how you feel at the moment about physical activity. Below is a list of feelings with respect to physical activity. For each feeling, please mark the number that best describes you.

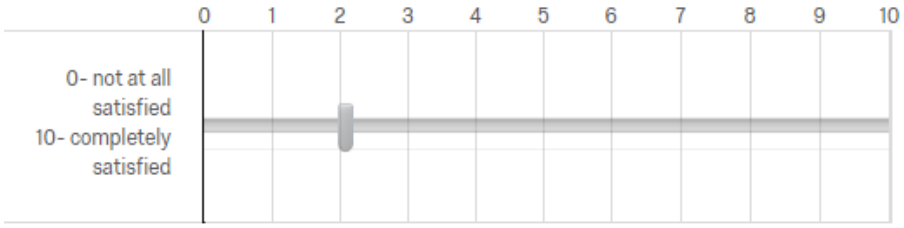
I enjoy it	1	2	3	4	5	6	7	I hate it
I feel bored	1	2	3	4	5	6	7	I feel interested
I dislike it	1	2	3	4	5	6	7	I like it
I find it pleasurable	1	2	3	4	5	6	7	I find it unpleasurable
I am very absorbed in physical activity	1	2	3	4	5	6	7	I am not at all absorbed in physical activity
It's no fun at all	1	2	3	4	5	6	7	It's a lot of fun
I find it energizing	1	2	3	4	5	6	7	I find it tiring
It makes me depressed	1	2	3	4	5	6	7	It makes me happy
It's very pleasant	1	2	3	4	5	6	7	It's very unpleasant
I feel good physically while doing it	1	2	3	4	5	6	7	feel bad physically while doing it
It's very invigorating	1	2	3	4	5	6	7	It's not at all invigorating
I am very frustrated by it	1	2	3	4	5	6	7	I am not at all frustrated by
It's very gratifying	1	2	3	4	5	6	7	It's not at all gratifying
It's very exhilarating	1	2	3	4	5	6	7	It's not at all exhilarating
It's not at all stimulating	1	2	3	4	5	6	7	It's very stimulating
It gives me a strong sense of accomplishment	1	2	3	4	5	6	7	It does not give me any strong sense of accomplishment
It's very refreshing	1	2	3	4	5	6	7	It's not at all refreshing
I felt as though I would rather be doing something else	1	2	3	4	5	6	7	I felt as though there was nothing else I would rather be doing

ID:_____ VISIT: B DATE:_____

Appendix J

Satisfaction Survey

1. How satisfied were you with the affective/behavioral strategies program?



2. What did you like the most?

3. What did you like the least?

4. Is there anything you would change or add? For example, would you be interested in (select all that apply)-
    a. Receiving text messages
    b. Using wearable technology (i.e. fitbit)?
    c. Using a physical activity app?

5. Other comments or recommendations?

Appendix K

Affective Intervention Protocol

Session #1: Overview of Intervention

30-45 mins

1) "Hello again! Welcome to the Affective Behavioral Strategies group."
   This first step is to get to know the participant a little more by asking the following questions. I want to make sure she/he is excited about the program so they continue to be compliant with the intervention calls. Start by asking the following questions.
   a. Thanks so much for joining the study. How have you been?
   b. How was wearing the ActiGraph?
   c. How are things going in general?
   d. How are you feeling physically?
   e. Can you tell me what your activity looks like in a typical week?
   f. Are there specific things that keep you from being physically active (barriers)?

2) Purpose of The Calls
   a. Motivate you to become physically active
   b. Teach you how to harness and focus on the feeling of activity (opposite of "no pain no gain").

3) Physical Activity Prescription
   a. Go over current physical activity recommendations
   b. I want you to pick out what type of activity and the setting that's going to work best for you. Talk about physical activity vs. exercise- either is okay, doesn't have to be "in the gym" traditional type exercise
      i. What type of activity?
      ii. What setting?
   c. You are also going to pace yourself on the intensity of your physical activity
      i. Chose a pace that feels comfortable or right to you
      ii. Explain Feeling Scale
   d. I want you to find at least 10 min blocks where you can do some activity. Those 10+ min blocks are what you are going to record in the physical activity logs.

4) Materials
   a. Did you receive the booklet, logs, and FS link?
   b. Booklet
      i. We will use the different tip sheets to help direct our conversations.
   c. Physical Activity Logs
      i. Explain how to complete the logs

ii. Does this make sense? Would you prefer a paper copy instead?

d. FS

i. I want you to fill that out before you begin a workout, 10 mins in and then again 20 mins in. This should be completed once a week.

5) Introduction to Affective Behavioral Strategies
    a. Introduce booklet
    b. We will be using a variety of different strategies across the next 3 months, the purpose is to find which ones will work best for you.
    c. Some of the strategies are: goal setting, utilizing your social support, setting yourself reminders, creating rewards
    d. All of these strategies will be geared towards highlighting how you feel during physical activity. For example, we may try setting reminders for you that involve you taking a picture of yourself during a good workout or walk outside. Then using that picture as a reminder that goes off on your phone in the morning to remind you how you felt when being active. Something that will motivate you to go out and get that feeling again.
    e. That's just one example. So we can be creative and play around will what that looks like for you.

6) First week
    a. What I'd like you to do this week is find time in your week next week to get some activity in (insert the type they named). While you're working out I want you to spend a couple mins focusing on how you feel. Do this by filling out the FS before, 10 mins in and then 20 mins in. week we'll start talking about integrating that into some strategies.

7) Talk about next steps:
    a. Call schedule- once a week for one month, every other week for next two months
    b. Our first calls will be longer, 30-45 mins, but later calls will be more like 15-20 mins.
    c. Do you have any questions before we schedule next week's call?
    d. Remind them to log and fill out FS.

8) Schedule next week's session (one week).

Session #2: Visual & Auditory Stimuli
20-30 mins

1) How was your week?

2) Assess how the physical activity went in general.
    a. What did you work in? Did anything get in your way?
    b. How did it feel to self-pace the activity?
    c. Any issues?

3) Assess the affect they focused on after their activity.
    a. How did you feel once you were finished?
    b. Discuss.

4) Discuss ease/difficulty of using PALs or FS.

5) Discuss how to harness physical activity affect- Visual and Auditory Stimuli
    a. Visual and Auditory Stimuli-
        i. Provide tailored examples of the affect the participant offered and how that could be used as a stimulus.

6) Finalize affective strategy to try this week
    a. Which one sounds like a strategy you want to try?
    b. What will that look like this week?

7) Remind them to log and fill out FS.

8) Schedule next week's session (one week)

Session #3: Reminders & Rewards
20 mins

1) How was your week?

2) Assess how the physical activity went in general.
    a. Go over logs.
    b. What did you work in?
    c. How did it feel to self-pace the activity?
    d. Any issues?

3) Assess how the strategy from last week went.
    a. How did you use it?
    b. Thoughts on how it helped/didn't help?

4) Did you fill out the FS?

5) Discuss how to harness physical activity affect- Reminders and Rewards
    a. Reminders-
        i. Provide tailored examples of the affect the participant offered and how that could be used as a reminder.
    b. Rewards-
        i. Provide tailored examples of the affect the participant offered and how that could be used as a reminder.

6) Finalize affective strategy to try this week
    a. Which one sounds like a strategy you want to try? New one or keep old one?
    b. What will that look like this week?

7) Remind them to log and fill out FS.

8) Schedule next week's session (one week)

Session #4: Goal Setting & Action Plans
15-20 mins

9) How was your week?

10) Assess how the physical activity went in general.
    a. Go over logs.
    b. What did you work in?
    c. How did it feel to self-pace the activity?
    d. Any issues?

11) Assess how the strategy from last week went.
    a. How did you use it?
    b. Thoughts on how it helped/didn't help?

12) Did you fill out the FS?

13) Discuss how to harness physical activity affect- Goal Setting and Action Plans
    a. Goal Setting-
        i. Provide tailored examples of the affect the participant offered and how that could be used as goal setting.
    b. Action Plans-
        i. Provide tailored examples of the affect the participant offered and how that could be used as an action plan.

14) Finalize affective strategy to try this week
    a. Which one sounds like a strategy you want to try? New one or keep old one?
    b. What will that look like this week?

15) Remind them to log and fill out FS.

16) Schedule next week's session (one week)

Session #5: Social Support
15-20 mins

1) How was your week?

2) Assess how the physical activity went in general.
    a. Go over logs.
    b. What did you work in?
    c. Any issues?

3) Assess how the strategy from last week went.
    a. How did you use it?
    b. Thoughts on how it helped/didn't help?

4) Did you fill out the FS?

5) Discuss how to harness physical activity affect- Social support
    a. Social Support-
        i. Provide tailored examples of the affect the participant offered and how that could be used as social support.

6) Finalize affective strategy to try the next 2 weeks.
    a. Which one sounds like a strategy you want to try? New one or keep old one?
    b. What will that look like this week?

7) Remind them to log and fill out FS.

8) Schedule next session (two weeks)

Session #6: Strategy Follow-up
15-20 mins

1) How was your week?

2) Assess how the physical activity went in general.
    a. Go over logs.
    b. What did you work in?
    c. Any issues?

3) Assess how the strategy from last 2 weeks went.
    a. How did you use it?
    b. Thoughts on how it helped/didn't help?

4) Did you fill out the FS?

5) We've covered all the different strategies we are going to go over.
    a. Review which strategies they've tried.
    b. Discuss which they thought were most helpful.

6) Finalize affective strategy to carry through the next two weeks.
    a. Set specifics around how to cement this strategy

7) Remind them to log and fill out FS.

8) Schedule next session (two weeks).

Session #7: Strategy Follow-up
15-20 mins

1) How was your week?

2) Assess how the physical activity went in general.
    a. Go over logs.
    b. What did you work in?
    c. Any issues?

3) Assess how the strategy from last 2 weeks went.
    a. How did you use it?
    b. Thoughts on how it helped/didn't help?
    c. Did it feel like it got more routine for you?

4) Did you fill out the FS?

5) Reminder them of the current physical activity guidelines
    a. Discuss where they are in relation to meeting guidelines
    b. Discuss activity type, are they finding it pleasant?

6) Finalize affective strategy to carry through the next two weeks.
    a. Set specifics around how to cement this strategy

7) Remind them to log and fill out FS.

8) Schedule next session (two weeks). Let them now there's 2 calls left.

Session #8: Final Strategy Follow-up
15-20 mins

1) Remind them this is last call. How was your week?
2) Assess how the physical activity went in general.
    a. Go over logs.
    b. What did you work in?
    c. Any issues?
3) Assess how the strategy from last 2 weeks went.
    a. How did you use it?
    b. Thoughts on how it helped/didn't help?
    c. Did it feel like it got more routine for you?
4) Did you fill out the FS?
5) Finalize goals to take out the study.
    a. Based on what we've been able to accomplish this last 12-weeks, I think it's important for you to take some specific aims out of the study. It's totally up to you what they are, but my hope is that you can start holding yourself accountable to them now that you've learned some different skills through our sessions.
    b. Feel free to focus on where you'd like to be with weekly physical activity or if there are bigger things in the next 6 months or a year you'd like to work on. Whatever makes the most sense for you.
    c. What would be some goals for you to take out of the study?
6) Review study process.
    a. How was the experience for you?
    b. What did you find most helpful? What strategies did you like?
    c. What will you take with you out of the study?
7) Discuss final steps.
    a. Now, that phone sessions are complete, I will be mailing you another ActiGraph to wear for 3-days again. It is the same process as before.
    b. Once you have worn it and sent it back, my research assistant, (Luke), will be giving you a call to take you through the post-intervention assessment over the phone. It's very similar to the questionnaires you and I went through at the beginning of the study.
    c. (Luke) will also be scheduling with you a time to complete another follow-up assessment over the phone, one-month from now.
    d. Once you have completed the ActiGraph wear and the first assessment, I will send out your first incentive of $25 and then I'll send an additional $25 for completing the one-month follow-up assessment.
    e. Questions?

8) Thank them for being a part of the study. Let them know they can call throughout the following assessment process if they have any issues or questions.

Final Assessment Steps

1) Send ActiGraph packet w/in 3 days of last session.

2) Turn contact information over to research assistant.

3) Once ActiGraph is returned and surveys are complete, send satisfaction survey link and first $25 incentive.

4) Research assistant will schedule follow-up assessment.

5) Upon notice from research assistant that all assessments are complete, send out final $25 incentive.

Appendix L

Behavioral Comparison

Session #1: Overview of Intervention

30-45 mins

1) "Hello again! Welcome to the Behavioral Strategies group."
   This first step is to get to know the participant a little more by asking the following questions. I want to make sure she/he is excited about the program so they continue to be compliant with the intervention calls. Start by asking the following questions.
   a. Thanks so much for joining the study. How have you been?
   b. How was wearing the ActiGraph?
   c. How are things going in general?
   d. How are you feeling physically?
   e. Can you tell me what your activity looks like in a typical week?
   f. Are there specific things that keep you from being physically active (barriers)?

2) Purpose of The Calls
   a. Teach you behavioral strategies to help you become more physically active

3) Physical Activity Prescription
   e. Go over current physical activity recommendations
   f. I want you to pick out what type of activity and the setting that's going to work best for you. Talk about physical activity vs. exercise- either is okay, doesn't have to be "in the gym" traditional type exercise
      i. What type of activity?
      ii. What setting?
   g. You are also going to pace yourself on the intensity of your physical activity
      i. Chose a pace that feels comfortable or right to you
      ii. Note- should you experience any chest pain, dizziness, lightheadedness, or nausea you should cease activity and may want to consult your physician.

4) Materials
   a. Did you receive the booklet, logs, and weekly assessment link?
   b. Booklet
      i. We will use the different tip sheets to help direct our conversations.
   c. Physical Activity Logs
      i. Explain how to complete the logs
      ii. Does this make sense? Would you prefer a paper copy instead?

d. Weekly Assessment
    i. Describe FS scale (labeled as weekly assessment)
    ii. I want you to fill that out before and during one bout of activity a week. You'll respond to this scale before you begin and then at 10 mins and 20 mins into the bout. You will complete this on your mobile device. Would you prefer paper copies instead?

5) Introduction to Behavioral Strategies
    a. Introduce booklet
    b. We will be using a variety of different strategies across the next 3 months, the purpose is to find which ones will work best for you.
    c. Some of the strategies are: self-talk, utilizing your social support, setting yourself reminders, and creating rewards
    d. All of these strategies will be geared towards helping you integrate physical activity in your daily life.

6) First week
    a. What I'd like you to do this week is find time in your week next week to get some activity in (insert the type they named). Fill out the PAL and weekly assessment before and the two times during. Next week we'll start talking about integrating that into some strategies.

7) Talk about next steps:
    a. Call schedule- once a week for one month, every other week for next two months
    b. Our first calls will be longer, 30-45 mins, but later calls will be more like 15-20 mins.
    c. Do you have any questions before we schedule next week's call?
    d. Remind them to log and fill out weekly assessment.

8) Schedule next week's session (one week).

Session #2: Benefits of PA
20-30 mins

1) How was your week?

2) Assess how the physical activity went in general.
    a. What did you work in? Did anything get in your way?
    b. How did it feel to self-pace the activity?
    c. Any issues? Did you experience any adverse feelings or symptoms with your physical activity? If so, what?
        i. Determine if they should contact their healthcare provider (chest pain, dizziness, lightheadedness, or nausea).

3) Discuss ease/difficulty of using PALs or weekly assessment.

4) Discuss benefits of PA
    a. Examples- Increased energy, decreased stress, improved sleep, increased strength, long-term reduced risk for stroke, cancer, diabetes

5) Finalize behavioral strategy to try this week
    a. Which benefits are the most meaningful to you?
    b. Let's have you focus on keeping that central this week. Suggest ways to do that (i.e. write it down, sticky notes).
    c. Activity goals?

6) Remind them to log and fill out weekly assessment.

7) Schedule next week's session (one week).

Session #3: Reminders & Rewards
20 mins

1) How was your week?

2) Assess how the physical activity went in general.
    a. Go over logs.
    b. What did you work in?
    c. How did it feel to self-pace the activity?
    d. Any issues? Did you experience any adverse feelings or symptoms with your physical activity? If so, what?
        i. Determine if they should contact their healthcare provider (chest pain, dizziness, lightheadedness, or nausea).

3) Assess how the strategy from last week went.
    a. How did you use it?
    b. Thoughts on how it helped/didn't help?

4) Did you fill out the weekly assessment?

5) Discuss reminders and rewards.
    a. Reminders-
        i. Provide tailored examples.
    b. Rewards-
        i. Provide tailored examples.

6) Finalize behavioral strategy to try this week
    a. Which one sounds like a strategy you want to try? New one or keep old one?
    b. What will that look like this week?
    c. Activity goals?

7) Remind them to log and fill out weekly assessment.

8) Schedule next week's session (one week).

Session #4: Goal Setting & Social Support
15-20 mins

1) How was your week?

2) Assess how the physical activity went in general.
    a. Go over logs.
    b. What did you work in?
    c. Any issues? Did you experience any adverse feelings or symptoms with your physical activity? If so, what?
        ii. Determine if they should contact their healthcare provider (chest pain, dizziness, lightheadedness, or nausea).

3) Assess how the strategy from last week went.
    a. How did you use it?
    b. Thoughts on how it helped/didn't help?

4) Did you fill out the weekly assessment?

5) Discuss goal setting and social support
    a. Goal Setting-
        i. Provide tailored examples.
    b. Social Support-
        i. Provide tailored examples.

6) Finalize behavioral strategy to try the next 2 weeks.
    a. Which one sounds like a strategy you want to try? New one or keep old one?
    b. What will that look like this week?
    c. Activity goals?

7) Remind them to log and fill out weekly assessment.

8) Schedule next session (two weeks)

Session #5: Staying Motivated
15-20 mins

1) How was your week?

2) Assess how the physical activity went in general.
    a. Go over logs.
    b. What did you work in?
    b. Any issues? Did you experience any adverse feelings or symptoms with your physical activity? If so, what?
        i. Determine if they should contact their healthcare provider (chest pain, dizziness, lightheadedness, or nausea).

3) Assess how the strategy from last 2 weeks went.
    a. How did you use it?
    b. Thoughts on how it helped/didn't help?

4) Did you fill out the weekly assessments?

5) We've covered all the different strategies we are going to go over.
    a. Review which strategies they've tried.
    b. Discuss which they thought were most helpful.

6) Finalize behavioral strategy to carry through the next two weeks.
    a. Set specifics around how to cement this strategy
    b. Activity goals?

7) Remind them to log and fill out weekly assessment.

8) Schedule next session (two weeks).

Session #6: Strategy Follow-up
15-20 Mins

1) How was your week?

2) Assess how the physical activity went in general.
    a. Go over logs.
    b. What did you work in?
    c. Any issues? Did you experience any adverse feelings or symptoms with your physical activity? If so, what?
        i. Determine if they should contact their healthcare provider (chest pain, dizziness, lightheadedness, or nausea).

3) Assess how the strategy from last 2 weeks went.
    a. How did you use it?
    b. Thoughts on how it helped/didn't help?
    c. Did it feel like it got more routine for you?

4) Did you fill out the weekly assessments?

5) Reminder them of the current physical activity guidelines
    a. Discuss where they are in relation to meeting guidelines
    b. Discuss activity type, are they finding it pleasant?

6) Finalize behavioral strategy to carry through the next two weeks.
    a. Set specifics around how to cement this strategy
    b. Activity goals?

7) Remind them to log and fill out weekly assessment.

8) Schedule next session (two weeks). Let them now there's 2 calls left.

Session #7: Strategy Follow-up
15-20 mins

1) How was your week?

2) Assess how the physical activity went in general.
    a. Go over logs.
    b. What did you work in?
    c. Any issues? Did you experience any adverse feelings or symptoms with your physical activity? If so, what?
        i. Determine if they should contact their healthcare provider (chest pain, dizziness, lightheadedness, or nausea).

3) Assess how the strategy from last 2 weeks went.
    a. How did you use it?
    b. Thoughts on how it helped/didn't help?
    c. Did it feel like it got more routine for you?

4) Did you fill out the weekly?

5) Remind them of the current physical activity guidelines
    a. Discuss where they are in relation to meeting guidelines
    b. Discuss activity type, are they finding it pleasant?

6) Finalize behavioral strategy to carry through the next two weeks.
    a. Set specifics around how to cement this strategy
    b. Activity goals?

7) Remind them to log and fill out weekly assessment.

8) Double-check address.

9) Schedule next session (two weeks). Let them know there's 1 call left.

Session #8: Final Strategy Follow-up
15-20 mins

1) Remind them this is last call. How was your week?
2) Assess how the physical activity went in general.
    a. Go over logs.
    b. What did you work in?
    c. Any issues? Did you experience any adverse feelings or symptoms with your physical activity? If so, what?
        i. Determine if they should contact their healthcare provider (chest pain, dizziness, lightheadedness, or nausea).
3) Assess how the strategy from last 2 weeks went.
    a. How did you use it?
    b. Thoughts on how it helped/didn't help?
    c. Did it feel like it got more routine for you?

4) Did you fill out the weekly assessment?
5) Finalize goals to take out the study.
    a. Based on what we've been able to accomplish this last 12-weeks, I think it's important for you to take some specific aims out of the study. It's totally up to you what they are, but my hope is that you can start holding yourself accountable to them now that you've learned some different skills through our sessions.
    b. Feel free to focus on where you'd like to be with weekly physical activity or if there are bigger things in the next 6 months or a year you'd like to work on. Whatever makes the most sense for you.
    c. What would be some goals for you to take out of the study?

6) Discuss final steps.
    a. Now, that phone sessions are complete, I will be mailing you another ActiGraph to wear for 3-days again. It is the same process as before.
    b. Once you have worn it and sent it back, my research assistant, (Luke), will be giving you a call to take you through the post-intervention assessment over the phone. It's very similar to the questionnaires you and I went through at the beginning of the study.
    c. (Luke) will also be scheduling with you a time to complete another follow-up assessment over the phone, one-month from now.
    d. Once you have completed the ActiGraph wear and the first assessment, I will send out your first incentive of $25 and then I'll send an additional $25 for completing the one-month follow-up assessment.
    e. Questions?

7) Thank them for being a part of the study. Let them know they can call throughout the following assessment process if they have any issues or questions.

Final Assessment Steps

1) Send ActiGraph packet w/in 3 days of last session.

2) Turn contact information over to research assistant.

3) Once ActiGraph is returned and surveys are complete, send satisfaction survey link and first $25 incentive.

4) Research assistant will schedule follow-up assessment.

5) Upon notice from research assistant that all assessments are complete, send out final $25 incentive.

Appendix M

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Positive Mood for Physical Activity Program

Physical Activity Log

These physical activity logs are meant to help you keep track of your physical activity across the next 12 weeks. There are two purposes for using the logs: 1) They will help us stay focused during our calls so you can very quickly what you've done in the last week without having to try and remember and 2) They will help you stay on track with your goals, hold yourself accountable and also identify patterns of strengths or weaknesses in your physical activity.

- **Total Minutes of Physical Activity**- record your total minutes of dedicated physical activity, remember to add up minutes if you do two or more bouts across the day.
- **Type of Physical Activity**- keep track of what kind of physical activity you are doing. This will help us identify the right balance of variety and enjoyment.
- **Complete Feeling Scale**- be sure to complete the once weekly Feeling Scale rating *during* physical activity. Mark the day you complete it to ensure it's done!

Week 1

Date:_____

	Total Minutes of Physical Activity	Type of Physical Activity	Completed Feeling Scale?
Day 1			
Day 2			
Day 3			
Day 4			
Day 5			
Day 6			
Day 7			
Totals			

Week 2

Date:_____

	Total Minutes of Physical Activity	Type of Physical Activity	Completed Feeling Scale?
Day 1			
Day 2			
Day 3			
Day 4			
Day 5			
Day 6			
Day 7			
Totals			

Week 3

Date:_____

	Total Minutes of Physical Activity	Type of Physical Activity	Completed Feeling Scale?
Day 1			
Day 2			
Day 3			
Day 4			
Day 5			
Day 6			
Day 7			
Totals			

Week 4

Date:_____

	Total Minutes of Physical Activity	Type of Physical Activity	Completed Feeling Scale?
Day 1			
Day 2			
Day 3			
Day 4			
Day 5			
Day 6			
Day 7			
Totals			

Week 5

Date:_____

	Total Minutes of Physical Activity	Type of Physical Activity	Completed Feeling Scale?
Day 1			
Day 2			
Day 3			
Day 4			
Day 5			
Day 6			
Day 7			
Totals			

Week 6

Date:_____

	Total Minutes of Physical Activity	Type of Physical Activity	Completed Feeling Scale?
Day 1			
Day 2			
Day 3			
Day 4			
Day 5			
Day 6			
Day 7			
Totals			

Week 7

Date:_____

	Total Minutes of Physical Activity	Type of Physical Activity	Completed Feeling Scale?
Day 1			
Day 2			
Day 3			
Day 4			
Day 5			
Day 6			
Day 7			
Totals			

Week 8

Date:_____

	Total Minutes of Physical Activity	Type of Physical Activity	Completed Feeling Scale?
Day 1			
Day 2			
Day 3			
Day 4			
Day 5			
Day 6			
Day 7			
Totals			

Week 9

Date:_____

	Total Minutes of Physical Activity	Type of Physical Activity	Completed Feeling Scale?
Day 1			
Day 2			
Day 3			
Day 4			
Day 5			
Day 6			
Day 7			
Totals			

Week 10

Date:_____

	Total Minutes of Physical Activity	Type of Physical Activity	Completed Feeling Scale?
Day 1			
Day 2			
Day 3			
Day 4			
Day 5			
Day 6			
Day 7			
Totals			

Week 11

Date:_____

	Total Minutes of Physical Activity	Type of Physical Activity	Completed Feeling Scale?
Day 1			
Day 2			
Day 3			
Day 4			
Day 5			
Day 6			
Day 7			
Totals			

Week 12

Date:_____

	Total Minutes of Physical Activity	Type of Physical Activity	Completed Feeling Scale?
Day 1			
Day 2			
Day 3			
Day 4			
Day 5			
Day 6			
Day 7			
Totals			

Thank you for your participation in the

Positive Mood for Physical Activity Program!

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