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Empirical Research

# Pilot testing of a mindfulness- and acceptance-based intervention for increasing cardiorespiratory fitness in sedentary adults: A feasibility study

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ABSTRACT

*Objective:* Vigorous physical activity (PA) has been promoted for improving cardiorespiratory fitness (CRF). However, therapeutic techniques designed to engage participants in vigorous PA have fallen short; one reason for this may be the unpleasant physical sensations associated with vigorous exercise (e.g., temporary shortness of breath and mild muscle soreness). Mindfulness and acceptance-based therapies such as Acceptance and Commitment Therapy (ACT) may be helpful at improving adherence to vigorous PA levels. In this open clinical trial, we sought to demonstrate the feasibility and acceptability of a mindfulness- and acceptance-based intervention for increasing CRF in sedentary adults and to generate initial outcomes data.
*Design:* Participants ($N=24$) engaged in a 10-week fitness walking program while attending regular group sessions based on ACT.
*Main outcome measures and results:* The feasibility and acceptability of the intervention were demonstrated through high levels of walking adherence (89.30%) and group session attendance (85.50%). A large significant decrease in total 1-mile walk test time [$t(18)=4.61$, $p=.0002$, $d=.64$] and a moderate significant increase in estimated $VO_{2max}$ [$t(18)=-4.05$, $p=.0007$, $d=-.43$] were observed. Analyses indicated a large significant increase in exercise-related experiential acceptance [$t(18)=-9.19$, $p<.0001$, $d=-2.09$].
*Conclusion:* This study demonstrates the feasibility and acceptability of an ACT-based intervention for supporting participation in vigorous PA in sedentary individuals.


## 1. Introduction

Increasing physical activity (PA) has long been supported as an important behavior change for health improvement. Vigorous PA, in particular, has been promoted for improving cardiorespiratory fitness (CRF), which has a strong inverse relationship with premature morbidity and mortality in adults (Lee et al., 2011; Williams & Thompson, 2013). Further epidemiological research has shown that vigorous PA has greater health benefits, in terms of blood pressure and glucose control, than moderate-intensity PA (Swain & Franklin, 2006). In addition, it has been found that vigorous PA produces greater cardioprotective benefits, including decreased risk for coronary heart disease, while lower intensity PA is associated with minimal risk reduction (Lee et al., 2011; Lee, Sesso, Oguma, & Paffenbarger, 2003; Sesso, Paffenbarger, & Lee, 2000; Tanasescu et al., 2002). However, the dose–response curve between CRF levels and risk reduction has not shown an evenly graded relationship. The largest risk reduction occurs in individuals moving from the lowest to the second-lowest fitness category, suggesting that public health efforts should focus on the most sedentary individuals (Blair et al., 1989; Blair, & Church, 2003; Kodama et al., 2009; Lee et al., 2011; Myers et al., 2002, 2004).

### 1.1. CRF and PA

Although the greatest health gains are made through vigorous PA, many fitness and PA trials prescribe moderate-intensity exercise programs, perhaps because they expect to observe

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difficulties in adherence to high-intensity regimens (Duncan et al., 2005; Swain & Franklin, 2006). The affective response to varying exercise intensity levels has been investigated to elucidate these differences in adherence rates. Ekkekakis (2003) purported, in his Dual Mode Model, that affective responses to exercise are impacted by both cognitive factors (e.g., self-efficacy) and interoceptive cues (e.g., muscular or respiratory). Furthermore, while intensity may not influence affective response from pre- to post-exercise, affective responses during exercise are likely to become more negative as the intensity increases, possibly impacting adherence (Ekkekakis, Hall, & Petruzello, 2008).

Cognitive–behavioral therapies (CBTs) widely used in fitness and PA trials (e.g., Duncan et al., 2005; Dunn et al., 1999) often seek to modify cognitions and affective responses to internal sensations during PA by controlling, restructuring, or eliminating negative thoughts, with the goal of promoting behavioral engagement. For example, restructuring a negative self-statement such as "I am a failure at exercising" into a positive self-statement like "I am proud of myself for trying to exercise" can impact an individual's motivation as well as their self-efficacy to engage in PA behaviors. However, these trials have yielded only modest improvements of about 1/2 metabolic equivalent (MET)[3] or less (a disease risk reduction goal is 1–2 METs) (Blair et al., 1989; Lee et al., 2011) and highlight the difficulty of having individuals maintain even moderate-intensity PA (Church, Earnest, Skinner, & Blair, 2007; Duncan et al., 2005; Dunn et al., 1999).

### 1.2. Contextual CBTs

Acceptance and Commitment Therapy (ACT) (Hayes, Strosahl, & Wilson, 1999) is part of a larger class of therapeutic approaches known as "contextual CBTs" (Hayes, Luoma, Bond, Masuda, and Lillis, 2006; Hayes et al., 2011). This label is derived from their focus on the context or function of a problematic cognition or emotion rather than its content, form, or frequency. The overarching goal of ACT is to produce greater psychological flexibility, decreasing experiential avoidance of negative internal events (Hayes et al., 2006). Psychological flexibility can be thought of as the ability to accept the presence of unwanted sensations, thoughts, or feelings in the present moment and to act in a values-based fashion (Hayes, 2004; Lillis, Hayes, Bunting, & Masuda, 2009). Experiential avoidance, in the ACT paradigm, refers to the tendency of humans to avoid or escape negative internal experiences (Hayes, Stroshal, & Wilson, 1999; Hayes, 2004); attempts to fix, alter, or restructure these unwanted private experiences can distract individuals from a values-based behavioral path.

There are six core processes that facilitate psychological flexibility in the ACT model: values, committed action, acceptance, cognitive defusion, present-moment contact, and self-as-context. The process of acceptance is defined as a willingness to experience uncomfortable or even painful internal events (e.g., thoughts, feelings, sensations, and memories) without engaging in avoidance or change strategies for the sake of valued living (Hayes et al., 1999; Hayes, 2004). Cognitive defusion refers to the process through which one creates a distance or "space" between themselves and their thoughts, so that one may hold thoughts lightly and increase their behavioral repertoire (Hayes et al., 1999; Hayes, 2004). Self-as-context refers to "the self" being a perspective from which thoughts, feelings, and experiences are observed, without judgment, as they pass through the context of the self (Hayes et al., 2006). The primary goal of ACT is to help an individual engage in mindful, values-based living. Values are persistent, may be enacted on an ongoing basis, and have a global quality, uniting various patterns of action (Hayes et al., 1999). Once values have been clarified, committed actions designed to achieve values-based goals are carried out as mindful, purposeful behaviors (Hayes et al., 1999; Hayes, 2004).

### 1.3. Contextual CBTs as applied to PA

A considerable amount of research exists regarding the efficacy of contextual CBTs in the area of mental health (Hayes, Villatte, Levin, & Hildebrandt, 2011; Ruiz, 2012), and empirical support is growing for their application to behavioral medicine, including issues such as chronic pain (McCracken, MacKichan, & Eccleston, 2007; Vowles & McCracken, 2008), type 2 diabetes management (Gregg, Callaghan, Hayes, & Glenn-Lawson, 2007), smoking cessation (Bricker, Wyszynski, Comstock, & Heffner, 2013; Gifford et al., 2004), epilepsy (Lundgren, Dahl, Melin, & Kies, 2006), obesity (Lillis et al., 2009), weight management (Forman, Butryn, Hoffman, & Herbert, 2009; Tapper et al., 2009), and PA (Butryn, Forman, Hoffman, Shaw, & Juarascio, 2011). These ACT-based promotions of health-related behavior change suggest that this mindfulness and acceptance-based approach may be uniquely suited for interventions in behavioral medicine (Gregg et al., 2007; Lillis et al., 2009; Tapper et al., 2009).

Promising findings from recent randomized controlled trials of ACT-based interventions for weight loss and PA-directed behaviors include a significant effect of a mindfulness-based weight loss intervention on PA (Tapper et al., 2009) and a significant impact of a brief ACT-based intervention on increasing gym visits among college students (Butryn et al., 2011). Recently, Moffitt and Mohr (2015) trial of a self-managed ACT-based intervention DVD for PA showed significant increases in post-intervention PA levels. However, one limitation of these trials was the use of self-reported measures for PA or proxy behaviors (e.g., entering the university gym), which are often inaccurate and do not allow for the interpretation of objective changes in participants' health status (Dhurandhar et al., 2014; Helmerhorst, Brage, Warren, Besson, & Ekelund, 2012; Prince et al., 2008; Sloane, Snyder, Demark-Wahnefried, Lobach, & Kraus, 2009). The use of objective measures for PA and disease risk is an important next step in moving physical health research forward (Dhurandhar et al., 2014).

### 1.4. Current study

One reason that other therapeutic techniques have fallen short in engaging participants in vigorous PA may be the unpleasant physical sensations associated with vigorous exercise (e.g., temporary shortness of breath and mild muscle soreness). Mindfulness and acceptance-based therapies such as ACT may be particularly helpful in this regard, as these techniques have proven effective in fostering psychological flexibility towards negative internal events and health-related behavior change (Ruiz, 2010).

In this open trial, we determined the feasibility and acceptability of a manualized group intervention to promote adherence to an assigned fitness walking intervention for CRF in sedentary individuals. While the use of psychotherapeutic approaches for PA is not new, previous studies have often used techniques of cognitive change and control. This study is novel in that it used mindfulness- and acceptance-based techniques to address the potentially aversive aspects of PA. The findings of this study will support the feasibility and acceptability of this type of therapeutic intervention for PA and provide initial data for future studies to build on regarding the efficacy of this approach.

[3] One MET is equivalent to a $VO_2$ of 3.5 ml/kg/min or the energy expenditure of sitting at rest.