Journal of Anxiety Disorders 52 (2017) 43–52

Contents lists available at ScienceDirect

Journal of Anxiety Disorders

journal homepage: www.elsevier.com/locate/janxdis

The efficacy of aerobic exercise and resistance training as transdiagnostic interventions for anxiety-related disorders and constructs: A randomized controlled trial

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ARTICLE INFO

Keywords:
Randomized controlled trial
Transdiagnostic
Anxiety disorders
Aerobic exercise
Resistance training

ABSTRACT

Evidence supports exercise as an intervention for many mental health concerns; however, randomized controlled investigations of the efficacy of different exercise modalities and predictors of change are lacking. The purposes of the current trial were to: (1) quantify the effects of aerobic exercise and resistance training on anxiety-related disorder (including anxiety disorders, obsessive-compulsive disorder, and posttraumatic stress disorder) status, symptoms, and constructs, (2) evaluate whether both modalities of exercise were equivalent, and (3) to determine whether exercise enjoyment and physical fitness are associated with symptom reduction. A total of 48 individuals with anxiety-related disorders were randomized to aerobic exercise, resistance training, or a waitlist. Symptoms of anxiety-related disorders, related constructs, and exercise enjoyment were assessed at pre-intervention and weekly during the 4-week intervention. Participants were further assessed 1-week and 1-month post-intervention. Both exercise modalities were efficacious in improving disorder status. As well, aerobic exercise improved general psychological distress and anxiety, while resistance training improved disorder-specific symptoms, anxiety sensitivity, distress tolerance, and intolerance of uncertainty. Physical fitness predicted reductions in general psychological distress for both types of exercise and reductions in stress for aerobic exercise. Results highlight the efficacy of different exercise modalities in uniquely addressing anxiety-related disorder symptoms and constructs.

1. Introduction

Anxiety-related disorders (including anxiety disorders, obsessive-compulsive disorder, and posttraumatic stress disorder) are highly prevalent and comorbid, affecting approximately 28.8% of individuals over their lifetime (Kessler et al., 2005). Although these disorders share superficial similarities, such as overlap in diagnostic criteria (Barlow, 2014), evidence suggests that they also share common etiology (Bienvenu, Hettema, Neale, Prescott, & Kendler, 2007; Brown & Naragon-Gainey, 2013; Carleton, 2016; Hettema, 2006), latent structure and higher dimensions (Brown, 2007; Paulus, Talkovsky, Heggeness, & Norton, 2015), and response to treatment (Hadjistavropoulos et al., 2014; Norton & Barrera, 2012). These shared factors have fostered the development of transdiagnostic treatments that can effectively target a relatively wide array of anxiety-related psychopathological concerns and that can be widely and efficiently distributed to the individuals in need of treatment.

In recent years, there has been increasing empirical support for the role of exercise as a legitimate standalone or adjuvant treatment for a variety of mental health concerns (Asmundson et al., 2013). Particularly, specific types of exercise, such as aerobic exercise and resistance training, have shown promise for social anxiety disorder, panic disorder, generalized anxiety disorder, obsessive-compulsive disorder, and posttraumatic stress disorder (Broocks et al., 1998; Fetzner & Asmundson, 2015; Herring, Jacob, Suveg, & O'Connor, 2011; Jazaieri, Goldin, Werner, Ziv, & Gross, 2012; Powers et al., 2015; Rector, Richter, Lerman, & Regev, 2015). Potential differences in the efficacy of distinct exercise paradigms have seldom been systemically evaluated using robust empirical methodology in the form of randomized controlled trials.

The effects of exercise on constructs thought to underlie and maintain anxiety-related disorders have been studied to varied and limited extent, including anxiety sensitivity (i.e., fear of anxiety-related sensations based on negative or catastrophic beliefs regarding their consequences; Reiss & McNally, 1985; Wheaton, Deacon, McGrath, Berman, & Abramowitz, 2012), distress tolerance (i.e., the ability to tolerate emotional distress; Leyro, Zvolensky, & Bernstein, 2010; Simons & Gaher, 2005), and intolerance of uncertainty (i.e., the inability to withstand ambiguous or uncertain situations; Carleton, 2012;

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http://dx.doi.org/10.1016/j.janxdis.2017.09.005
Received 31 July 2017; Received in revised form 14 September 2017; Accepted 19 September 2017
Available online 23 September 2017
0887-6185/

Laugesen, Dugas, & Bukowski, 2003; McEvoy & Mahoney, 2011). Aerobic exercise appears to reduce anxiety sensitivity (e.g., Fetzner & Asmundson, 2015; LeBouthillier & Asmundson, 2015; Smits et al., 2008), but only one study to date has examined the effects of resistance training (Broman-Fulks, Kelso, & Zawilinski, 2015). Limited evidence suggests that distress tolerance and intolerance of uncertainty are not amenable to change after acute exercise (Broman-Fulks et al., 2015; LeBouthillier & Asmundson, 2015), but the effect of longer exercise interventions remains untested. Greater research on the effects of exercise on these constructs could bolster exercise as a legitimate intervention for anxiety-related disorders and help elucidate mechanisms of action.

Likewise, little is known regarding factors that may affect the efficacy of exercise for anxiety-related psychopathology. Evidence suggests a role of physical fitness in predicting the effectiveness of these interventions: While individuals with posttraumatic stress disorder generally benefit from aerobic exercise, those with lower cardiorespiratory fitness experience relatively greater reductions in symptoms (LeBouthillier & Asmundson, 2015). Sedentary individuals also benefit more from acute exercise than active individuals (Ensari, Greenlee, Motl, & Petruzzello, 2015). Enjoyment of exercise is another potentially important factor that is seldom investigated. Individuals have greater enhancements in mood states following their most preferred compared to their least preferred exercise modality (Lane, Jackson, & Terry, 2005) and engaging in exercise that increases self-efficacy appears to effect greater reductions in anxiety (Bodin & Martinsen, 2004).

Despite the flourishing and diverse nature of research on the mental health benefits of exercise, integrative and controlled research on the relationship between exercise and anxiety-related disorders and constructs is lacking. Consequently, the purposes of the current trial were to: (1) quantify the effects of aerobic exercise and resistance training on anxiety-related disorder status, symptoms, and constructs, (2) evaluate whether both modalities of exercise are equivalent, and (3) to determine whether exercise enjoyment and physical fitness are associated with symptom reduction. We tested three hypotheses, namely that (1) aerobic exercise and resistance training would both be efficacious in improving disorder status, disorder-specific symptoms, and related construct (i.e., general psychological distress, depression, anxiety, stress, anxiety sensitivity, distress tolerance, intolerance of uncertainty) when compared to a waitlist control; (2) the efficacy of both types of exercise would be generally equivalent in reducing disorder-specific symptoms and related constructs, and (3) greater enjoyment of the assigned exercise condition and lower fitness would predict the magnitude of reductions in disorder-specific symptoms and related constructs. The present trial also addressed limitations in current literature by using a transdiagnostic approach to study a mixed sample of individuals with anxiety-related disorders, quantifying changes in other important anxiety-related constructs, and utilizing a randomized controlled trial design.

2. Methods

2.1. Participants

Ethical approval for the trial was obtained from the University of Regina Research Ethics Board. Data were from 48 community individuals diagnosed with an anxiety-related disorder (see below). Participants were eligible for the trial if they were between 18 and 65 years of age, resided in the Regina, Saskatchewan area, reported fewer than 150 min of moderate to vigorous exercise weekly, could safely engage in exercise, were not engaged in empirically supported therapy for anxiety (e.g., cognitive behavioural therapy), were not taking benzodiazepines or antipsychotic medication, were on at least 6 weeks of stable dosage of any other psychotropic medication, did not have symptoms of psychosis, were currently at low risk for suicide, and were not involved in litigation.

2.2. Measures

2.2.1. Structured Clinical Interview for DSM-5, Research Version

(SCID-5-RV; First, Williams, Karg, & Spitzer, 2015). The SCID-5-RV was used to screen for and establish diagnosis of anxiety-related disorders and to rule out symptoms of psychosis when suspected. Participants answered screening questions in a yes/no format. Disorder-specific sections of the SCID-5-RV were administered based on responses to the screening questions and disorder-specific symptom measures. The SCID-5-RV was also use to assess changes in disorder status (i.e., a change from meeting full criteria to no longer meeting full criteria for the primary disorder).

2.2.2. Disorder-specific outcome measures

Disorder-specific measures were administered to participants based on endorsement of screening questions and outcome of the SCID-5-RV. Questionnaires included the Severity Measure for Specific Phobia–Adult (SMSP–A; Craske et al., 2013b), Social Interaction Phobia Scale (SIPS; Carleton et al., 2009), Panic Disorder Severity Scale–Self Report (PDSS–SR; Shear et al., 1997), Severity Measure for Agoraphobia–Adult (SMAA; Craske et al., 2013a), Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990), Obsessive-Compulsive Inventory–Revised (OCI–R; Foa et al., 2002), and Posttraumatic Stress Disorder Checklist for *DSM*-5 (PCL-5; Weathers et al., 2013). As described in the procedures below, participants who reported substantial symptoms at screening were invited to complete the SCID-5-RV to determine eligibility for the trial. Scores deemed to represent substantial symptoms were as follows: 20 (*moderate*) on the SMSP–A (Craske et al., 2013b); 21 on the SIPS (Carleton et al., 2009); 8 on the PDSS–SR (Shear et al., 2000); 20 (*moderate*) on the SMAA (Craske et al., 2013a); 58 on the PSWQ (Behar, Alcaine, Zuellig, & Borkovec, 2003); and 30 on the PCL-5 (Weathers et al., 2013).

2.2.3. Transdiagnostic outcome measures

In addition to relevant disorder-specific measures, all participants completed transdiagnostic measures, including the Depression Anxiety Stress Scales–21 (DASS–21; Lovibond & Lovibond, 1995), Anxiety Sensitivity Index–3 (ASI–3; Taylor et al., 2007), Distress Tolerance Scale (DTS; Simons & Gaher, 2005), and Intolerance of Uncertainty Scale, Short Form (IUS–12; Carleton, Norton, & Asmundson, 2007). For screening purposes, a score of 5 on the DASS–21 Anxiety scale (Henry & Crawford, 2005) was deemed to represent substantial anxiety.

2.2.4. Exercise and fitness-related measures

Physical Activity Readiness Questionnaire for Everyone (PAR-Q +; Warburton, Jamnik, Bredin, & Gledhill, 2014). The PAR-Q+ is a 16-item self-report measure of potential barriers to safe engagement in physical activity. Items were answered in a yes/no format. The measure includes seven items relating to general health explicitly (e.g., heart condition, dizziness, joint problems). Individuals who endorse any of these items are directed to answer nine follow-up items relating to chronic health conditions (e.g., back problems, respiratory disease). Individuals who denied all screening items or all follow-up items were deemed to be able to physically engage in physical exercise. The PAR-Q + has high test-retest reliability, sensitivity, and specificity, and it is more robustly evidence-based than its predecessor, the PAR-Q (Bredin, Gledhill, Jamnik, & Warburton, 2013; Warburton, Bredin, Jamnik, & Gledhill, 2011).

Six-Minute Walk Test (6MWT). The 6MWT is a standardized submaximal test of functional capacity used as a general measure of exercise capacity (Crapo et al., 2002). The test assesses the global and integrated functioning of pulmonary, cardiovascular, circulatory, and muscular systems. Scores represent the distance that participants can walk (in meters) in 6 min.

Exercise enjoyment Participants rated enjoyment of exercise using the following statements created for the trial: (a) “I enjoy engaging in