



short communication

## Exercise training and health-related quality of life in generalized anxiety disorder



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### ABSTRACT

**Objective:** To quantify the effects of six-weeks of resistance (RET) and aerobic exercise training (AET) on quality of life (QoL) among sedentary women with Generalized Anxiety Disorder (GAD).

**Design:** Data from our published randomized controlled trial of the effects of six-weeks of either RET or AET among GAD patients were analyzed.

**Method:** Thirty women with GAD were randomized to either six weeks of twice-weekly lower-body weightlifting or cycling, or wait-list control (WL). SF-36 subscales assessed dimensions of QoL. Hedges' *d* effect sizes (95%CI) quantified the magnitude of change in response to exercise training compared to WL.

**Results:** RET significantly improved role-physical ( $d = 1.04$ ; 95%CI: [0.11–1.97]), role-emotional ( $d = 0.96$ ; [0.04–1.89]), and mental health ( $d = 1.05$ ; [0.11–1.98]). AET resulted in significant improvements in physical function ( $d = 1.31$ ; [0.34–2.27]) and vitality ( $d = 0.93$ ; [0.01–1.85]).

**Conclusions:** Exercise training improves dimensions of QoL among GAD patients. The largest effects were observed for role impairments, physical function, vitality, and mental health.

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## 1. Introduction

Patients with Generalized Anxiety Disorder (GAD) are characterized by role and quality of life (QoL) impairments of comparable, if not greater, magnitude to other disabling chronic physical and mental disorders (Hoffman, Dukes, & Wittchen, 2008; Kessler, Ormel, Demler, & Stang, 2003; Newman, Llera, Erickson, Przeworski, & Castonguay, 2013). After adjusting for other mental disorders and sociodemographic variables, individuals with GAD experienced an average of 1.5–5.4 impairment days in the prior month (Alonso et al., 2011; Kessler et al., 2002), and greater than 56% of individuals with GAD have reported severe disability (Kessler et al., 2009). These values are comparable to past month role impairment, or problems with work or other daily activities due to physical or emotional health, among individuals with ulcers, arthritis, diabetes, and autoimmune disease (Alonso et al., 2011; Kessler, Greenberg, Mickelson, Meneades, & Wang, 2001).

Additionally, trait worry, the hallmark symptom of GAD, has been positively associated with impaired QoL (Henning, Turk, Mennin, Fresco, & Heimberg, 2007).

Exercise training is a feasible, well-tolerated, potential adjuvant therapy that reduces the severity of GAD (Herring, Jacob, Suveg, Dishman, & O'Connor, 2012). Remission rates of 60% and 40% were recently reported following six weeks of resistance (RET) and aerobic exercise training (AET), respectively (Herring et al., 2012). Exercise training also improves associated signs and symptoms of GAD, including trait anxiety, depressive symptoms, feelings of tension, fatigue, and energy, the frequency and intensity of irritability, difficulty concentrating, and pain intensity (Herring, Jacob, Suveg, & O'Connor, 2011). No randomized controlled trial has examined the effects of exercise training on QoL among patients with GAD.

Because exercise training improves health-related quality of life (HRQoL) among healthy adults (Martin, Church, Thompson, Earnest, & Blair, 2009) and patients with chronic physical illnesses (van Tol, Huijsmans, Kroon, Schothorst, & Kwakkel, 2006), we reasoned that exercise training would also improve broad physical and mental dimensions of HRQoL. Thus, we conducted an

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ancillary analysis of data from our previous RCT (Herring et al., 2012) to quantify and compare the effects of RET and AET on QoL among sedentary women, defined by a seven-day physical activity recall value  $\leq 260$  kcal/kg/week, with GAD.

## 2. Methods

Existing data from a published randomized controlled trial were analyzed; detailed methods have been reported elsewhere (Herring et al., 2012). *A priori* Institutional Review Board approval was obtained. Briefly, 1044 women completed an online battery of screening measures and were assessed for eligibility of which 18.3% ( $n = 191$ ) fulfilled screening criteria and were invited to complete a diagnostic interview. Fifty-five potentially eligible participants completed diagnostic interviews of which 30 sedentary women with GAD agreed to participate and provided written informed consent (Herring et al., 2012). Included women were: (1) 18–37 years of age; (2) engaged in no concurrent psychiatric or psychological therapy other than medication; and, (3) had a principal DSM-IV diagnosis of GAD. Women were excluded for: (1) too few worry symptoms, defined by both a Psychiatric Diagnostic Screening Questionnaire (Zimmerman & Mattia, 2001) GAD subscale score  $< 6$  and a Penn State Worry Questionnaire (Meyer, Miller, Metzger, & Borkovec, 1990) score  $< 45$ ; (2) too high a level of physical activity, defined by a seven-day physical activity recall (Blair et al., 1985) value  $> 260$  kcal/kg/week; (3) pregnancy; and/or, (4) contraindications to moderate intensity exercise. The Anxiety Disorders Interview Schedule (Brown, DiNardo, Barlow, & DiNardo, 1994) was administered by clinicians blinded to treatment allocation. Potential participants assigned a clinician severity rating  $\geq 4$  were diagnosed with GAD, and were then enrolled in the intervention within 1–15 days following diagnostic interview. Patients were stratified on psychotropic medication use (no medication vs. medication use) and block randomized in blocks of three to conditions based on the intervention condition [RET, AET, and wait list control (WL)], resulting in three groups of 10 patients.

Exercise conditions involved two weekly sessions for six weeks. Sessions were conducted approximately 48-h apart on Monday/Wednesday, Tuesday/Thursday, or Wednesday/Friday.

The RET condition involved seven sets of 10 repetitions each of leg press, leg curl, and leg extension exercises beginning at 50% of predicted one-repetition maximum (1-RM) and progressing by 5% of the originally determined 1-RM weekly. Each exercise was preceded by a warm-up set of 10 repetitions beginning at 35% 1-RM the first week and progressing by 5% of the originally determined 1-RM weekly. Each set required 40s and a rest interval of 80s separated each set and each exercise, resulting in 16 min of active lifting exercise and a total session duration of 46 min and 40s (Herring et al., 2012).

AET was matched to the RET condition on four features of the exercise stimulus: (1) the time spent actively exercising, (2) the positive work completed each session, (3) a weekly 5% progression in load (intensity), and (4) a focus on lower-body exercise. AET involved two weekly sessions of 16 min of continuous, dynamic leg cycling exercise.

Patients randomized to the WL condition delayed entry into any intervention for six weeks, but were tested on all outcomes. At the completion of the six weeks, each WL patient was offered a six-week exercise intervention, but no data were obtained.

Subscales of the Medical Outcomes Study 36-item Short Form (SF-36 (Ware, Kosinski, Dewey, & Gandek, 2000)) were administered at baseline and following the six-week intervention to measure physical and mental health status in relation to eight health-related concepts: physical and social functioning, role limitations due to physical or emotional health, bodily pain, general mental

and physical health perceptions, and vitality. Higher subscale scores represent better self-perceived health and QoL (Ware et al., 2000).

Given increased calls across the psychological literature to move beyond null-hypothesis significance testing in favor of estimating effect sizes and including their confidence intervals (Cumming, 2014), we sought to quantify the magnitude of treatment effects for RET and AET conditions compared with the WL condition using Hedges'  $d$  effect sizes and associated 95% CIs. For each subscale of the SF-36, the mean change from baseline for the WL condition was subtracted from the mean change from baseline for the RET or AET condition and the difference was divided by the baseline pooled standard deviation. Effect sizes were adjusted for small sample bias and calculated such that an improvement in HRQoL resulted in a positive effect size (Hedges & Olkin, 1985). Associated 95% CIs were examined to determine statistical significance.

## 3. Results

Participants showed baseline QoL impairments indicated by scores below population norms (Ware et al., 2000) on all subscales other than physical functioning, role physical, and bodily pain (Fig. 1). Pre- and post-intervention SF-36 scores and Hedges'  $d$  (95% CI) values are presented in Table 1. Hedges'  $d$  ranged from  $-0.16$  to  $1.05$  and from  $-0.01$  to  $1.31$  for RET and AET, respectively. RET significantly improved role physical ( $d = 1.04$ ; 95% CI: [0.11–1.97]), role emotional ( $d = 0.96$ ; [0.04–1.89]), and mental health ( $d = 1.05$ ; [0.11–1.98]) subscale scores. AET significantly improved physical functioning ( $d = 1.31$ ; [0.34–2.27]) and vitality ( $d = 0.93$ ; [0.01–1.85]) subscale scores. RET improved all subscales other than bodily pain, and resulted in non-significant moderate-to-large improvements in general health ( $d = 0.33$ ), vitality ( $d = 0.55$ ), and physical functioning ( $d = 0.76$ ). AET improved all subscales except social functioning, and resulted in non-significant moderate-to-large improvements in general health ( $d = 0.35$ ), bodily pain ( $d = 0.51$ ), role emotional ( $d = 0.75$ ), and mental health ( $d = 0.75$ ).

## 4. Discussion

Six weeks of exercise training resulted in moderate-to-large improvements in dimensions of HRQoL among young women with GAD. These findings are comparable to or larger than exercise effects on HRQoL among samples of healthy adults (Martin et al., 2009; Sillanpää, Häkkinen, Holviala, & Häkkinen, 2012) and chronically-ill adults (van Tol et al., 2006). The present results are consistent with cross-sectional results which revealed that people with mental disorders who reported regular physical activity had higher scores on all SF-36 dimensions than those who did not report regular physical activity. The largest differences between exercising and non-exercising anxiety disorder patients were reported for general health and physical function dimensions of HRQoL (Schmitz, Kruse, & Kugler, 2004). The present findings are also consistent with a quantitative review which concluded that physical activity improves QoL among people with mental illness (Rosenbaum, Tiedemann, Sherrington, Curtis, & Ward, 2014).

Specific exercise modes appeared to affect HRQoL differentially which cannot be explained by differences in baseline demographics, medication use, weekly energy expenditure or exercise training attendance (cf., Herring et al., 2012). Six weeks of resistance exercise training significantly improved role physical, role emotional, and mental health subscales of HRQoL. Though not significant, moderate-to-large improvements were also shown for general health, vitality, and physical functioning. Significant improvements in mental health following a 12-week resistance training intervention have been reported in healthy older adults

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