The Effect of Resistance Exercise Training on Anxiety Symptoms: A Systematic Review and Meta-Analysis

Gordon BR.1 Lyons MJ.2 Herring MP.1
1Department of Physical Education and Sport Sciences; 2Health Research Institute; University of Limerick, Limerick, Ireland

Abstract

Purpose: To estimate the population effect sizes for resistance exercise training (RET) effects on anxiety and to determine whether variables of logical, theoretical, and/or empirical relation to anxiety moderate the overall effect.

Methods: Thirty-one effects were derived from 56 articles published between February, 2017, located using Google Scholar, MEDLINE, PsycINFO, PubMed, and Web of Science. Trials involved 922 participants and broadly randomized to RET or a non-active control condition (n=436), and a validated anxiety outcome measured at baseline, mid- and post-intervention. Hedge’s d effect sizes were computed and random effects models were used for all analyses. Meta-regression quantified the extent to which participant and trial characteristics modulated the mean effect size.

Results: Hedge’s d effect sizes were calculated by subtracting the mean change in the comparison condition from the mean change in the exercise condition, and dividing this difference by the standard deviation of baseline height. Meta-regression was used as the overall analysis of moderator effects. Random effects models were used with macro (SPSS MeanDiff, MetaStat, SPSS) to aggregate mean effect size delta (δ) and to test variations in effects according to moderator variables.

Significant moderation was identified for sex, treatment duration, and intensity. The mean effect size δ of Hedge’s d was 0.13 (0.05 to 0.20) for female participants, 0.31 (0.25 to 0.37) at a treatment duration of <12 weeks, and 0.22 (0.17 to 0.28) for an intensity of 12+ weeks. When directly comparing the effects of RET to AET, with RET serving as the intervention alone, the anxiolytic effects of RET are modest and may not be clinically significant. For participants with an anxiety disorder, the mean effect size δ of Hedge’s d was 0.31 (0.27 to 0.34) for a treatment duration of >12 weeks and 0.31 (0.27 to 0.34) for an intensity of 12+ weeks.

Conclusion: The available evidence supports the anxiolytic effects of acute exercise, and future trials should compare RET to other empirically-supported therapies for anxiety.

Methods

Inclusion criteria were: (1) English language post-reviewed publications, (2) randomized allocation to either an exercise intervention or a non-active control condition, and (3) an anxiety outcome measured at baseline and mid- and post-intervention. The main outcome was the effect size (Hedge’s d) of the intervention compared to the control group. Studies were included if they contained an anxiety outcome with a validated anxiety outcome measure. In total, 1,117 effects were identified through the following databases: MEDLINE, Google Scholar, Web of Science, PubMed, SPORTDiscus, and PsycINFO (n = 1,699). Records identified through the following databases: MEDLINE, Google Scholar, Web of Science, PubMed, SPORTDiscus, and PsycINFO (n = 1,699). A total of 56 studies were included in the review (n = 102). The effect size (Hedge’s d) was calculated for sex, treatment duration, and intensity. The mean effect size δ of Hedge’s d was 0.13 (0.05 to 0.20) for female participants, 0.31 (0.25 to 0.37) at a treatment duration of <12 weeks, and 0.22 (0.17 to 0.28) for an intensity of 12+ weeks. When directly comparing the effects of RET to AET, with RET serving as the intervention alone, the anxiolytic effects of RET are modest and may not be clinically significant. For participants with an anxiety disorder, the mean effect size δ of Hedge’s d was 0.31 (0.27 to 0.34) for a treatment duration of >12 weeks and 0.31 (0.27 to 0.34) for an intensity of 12+ weeks.

Future Research

The empirical evidence reviewed herein supports RET as a potential low-risk, alternative/adjunct therapy for anxiety symptoms. Future trials should compare RET to other empirically-supported therapies for anxiety, examine plausible mechanisms (e.g., neurotransmitter, time spent actively engaged in exercise, muscle groups exercised). The evidence regarding the effects of RET among people with knee pain, elderly, and people with knee pain is limited. Studies included in systematic review (n = 18).