



Can a Single Bout of Exercise Reduce Negative Affect and Related Vulnerability to Emotional Disorders? A Randomized Controlled Trial

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Introduction

- ◆ Trait anxiety is a vulnerability factor for emotional disorders (e.g., anxiety and depressive disorders) as heightened levels increase the likelihood to experience negative affect and predict the development of clinical symptoms of emotional disorders (Reiss, 1997; Schweizer et al., 2017).
- ◆ Interventions capable of reducing trait anxiety may help protect against the development of emotional disorder symptoms.
- ◆ Exercise interventions can efficaciously reduce trait anxiety and are easily implemented regardless of access to a mental health professional, location, or financial costs (Stonerock, Hoffman, Smith, & Blumenthal, 2015).
- ◆ Research has shown significant changes in trait anxiety require, on average, at least ten weeks of 21+ minute exercise sessions (Petruzzello et al., 1991); however, researchers have not thoroughly investigated the effects of a single session of exercise on trait anxiety, perhaps because trait anxiety was conceptualized as a stable characteristic (Sharp, Miller, & Heller, 2015).
- ◆ A single exercise session may offer immediate and temporary relief from distressing symptoms (e.g., anxiousness) or reduce the likelihood to experience negative affect.
- ◆ An additional consideration for prescribing exercise is adherence, which may be particularly challenging for individuals with high trait anxiety (Mason, Faller, LeBouthillier, & Asmundson, 2018). Preference for length and intensity of exercise interventions may affect adherence. Participants reported shorter, high intensity bouts as more enjoyable than continuous bouts (Jung, Bourne, & Little, 2014).
- ◆ Our study was the first to evaluate the effects of a single session of moderate intensity continuous training (MICT) or sprint interval training (SIT) on trait anxiety.

Methods

- ◆ Inactive participants ($N = 56$) were randomly assigned to a 50-minute MICT protocol ($n = 20$), 10-minute SIT protocol ($n = 16$), or waitlist control group ($n = 20$).
- ◆ MICT protocol: 45 minutes of continuous moderate intensity stationary cycling with 5 minutes warm up and cool down. A certified personal trainer research assistant ensured participants maintained an intensity of 70% of their age-adjusted maximum heart rate (HRmax) and moderate ratings of perceived exertion (RPE).
- ◆ SIT protocol: the 10-minute protocol involved three 20-second sprints (at least 85% HRmax and high RPE) on a stationary bike, separated by 2 minutes of low intensity cycling, with 5 minutes for warm up and cool down.
- ◆ Participants in experimental conditions completed a measure of trait anxiety before and after completing their assigned exercise protocols.
- ◆ Participants in the waitlist control group completed pre- and post- measures and no exercise.

Results

- ◆ Multilevel modeling was used to evaluate whether either exercise protocol significantly reduced trait anxiety as compared to the waitlist control (see table 1).
- ◆ Multilevel models were built using the effects of group, time, and group-by-time interaction on STAI-Y2 baseline/post-exercise difference scores. The waitlist control group was used as the reference group.
- ◆ All models were bootstrapped using 1000 samples to generate robust probability values and corresponding confidence intervals.
- ◆ For the MICT group, there were significant reductions in trait anxiety, over time as compared to the waitlist. Significant reductions in trait anxiety were not found for the SIT condition.
- ◆ See Table 2 for descriptive statistics for the STAI-Y2 and participant sample by exercise group.

Discussion

- ◆ The conceptualization of trait anxiety as a stable characteristic has historically indicated that trait anxiety is less malleable to change, especially within a single bout of exercise. Our results contrast this conceptualization and indicate that a single session of longer, moderate intensity training can significantly reduce trait anxiety.
- ◆ Conversely, our finding that briefer, higher intensity exercise did not reduce trait anxiety underscores the importance to investigate duration and intensity factors for optimal exercise prescription targeting specific clinical symptoms.
- ◆ Future research investigating the extent to which trait anxiety is malleable within a single session of exercise, as well as within physically active or clinical samples is warranted.
- ◆ Our findings that trait anxiety is amenable to change in a brief intervention support (1) supplementing mental health treatment with exercise to reduce the onset of clinically significant symptoms and (2) implementing exercise when immediate mental health providers are not available.

Table 1. MLM for STAI-Y2 from Baseline to Post-Exercise

	Estimate	95% CI	SE	df	t	p
Fixed effects						
Intercept	41.91	[39.07, 45.01]	2.36	111.21	17.76	.001
SIT	5.44	[-2.55, 8.10]	3.81	101.89	0.68	.308
MICT	5.44	[-1.12, 12.06]	2.72	74.38	2.00	.150
Time	-0.35	[-2.20, 1.27]	-0.37	57.91	-2.27	.727
SIT x Time	-1.21	[-4.28, 1.65]	-0.84	57.91	-4.09	.477
MICT x Time	-4.90	[-8.62, -1.19]	-3.61	57.91	-7.62	.034
Random effects						
Intercept	97.47	[65.64, 144.74]	19.66			.000
Residual	9.20	[6.39, 13.24]	1.71			.000

Note. MLM = multilevel model; STAI-Y2 = State/Trait Anxiety Inventory-Trait Version; SIT = sprint interval training; MICT = moderate intensity continuous training.

Table 2. Descriptive Statistics

	n	Mean	SD	Range	Skew	Kurtosis
STAI-Y2	246	20.77	21.78	0-67	0.31	-1.53
		MICT n = 20		SIT n = 20		
		M/n	SD/%	M/n	SD/%	
Age		27.75	12.91	22.81	5.99	
Sex						
		Male	4	20	2	13
		Female	16	80	14	87

