

## Supplementary Online Content

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**eFigure 1.** Flowchart of Study Selection

**eFigure 2.** Funnel Plot of Hedges  $d$  Effect Sizes vs Study Standard Error

**eTable 1.** Individual Scores on Amended Detsky Quality Assessment

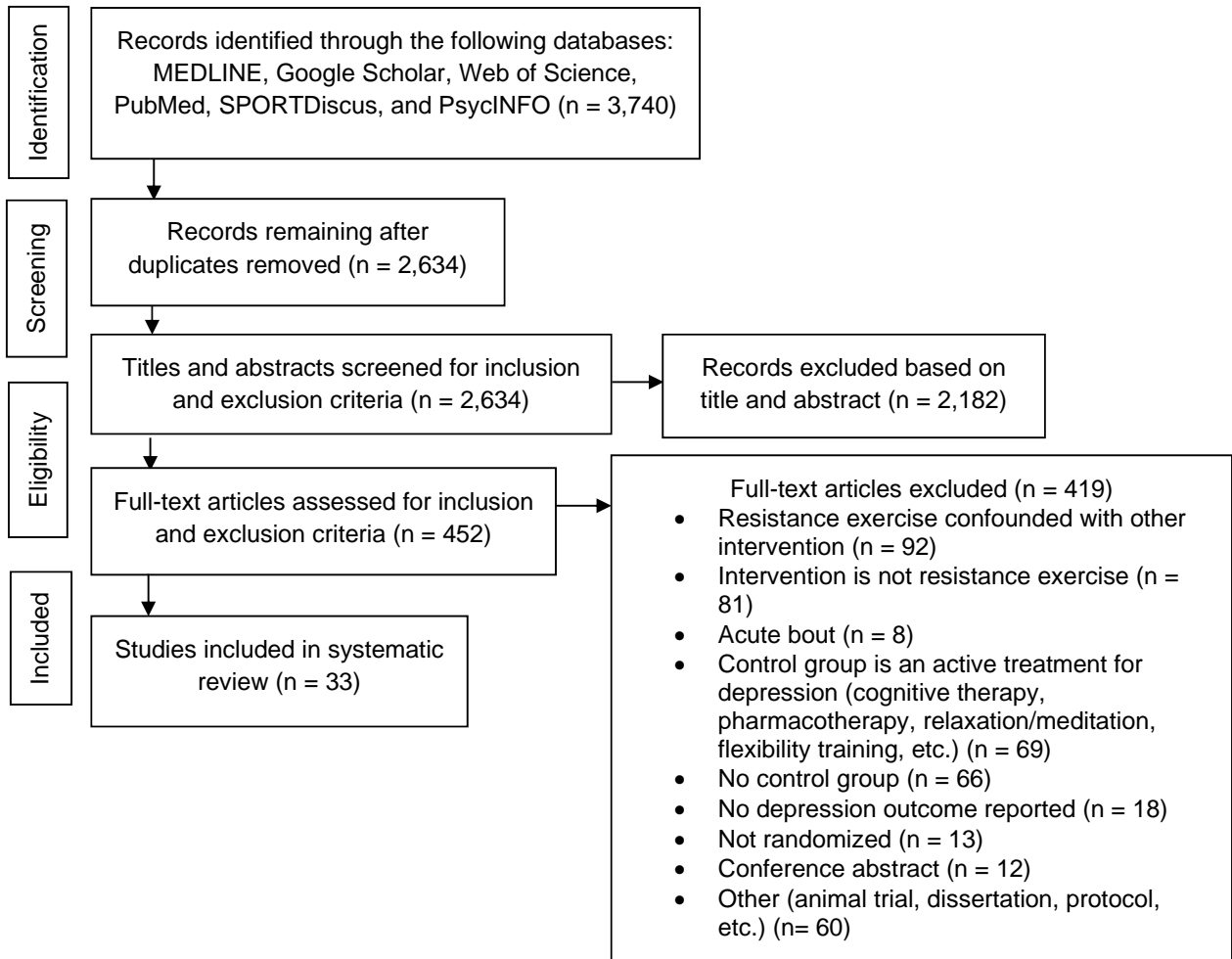
**eTable 2.** Values Used to Calculate Hedges  $d$  Effect Size and Primary Moderator Values

**eTable 3.** Definitions for Each Moderator and Associated Levels

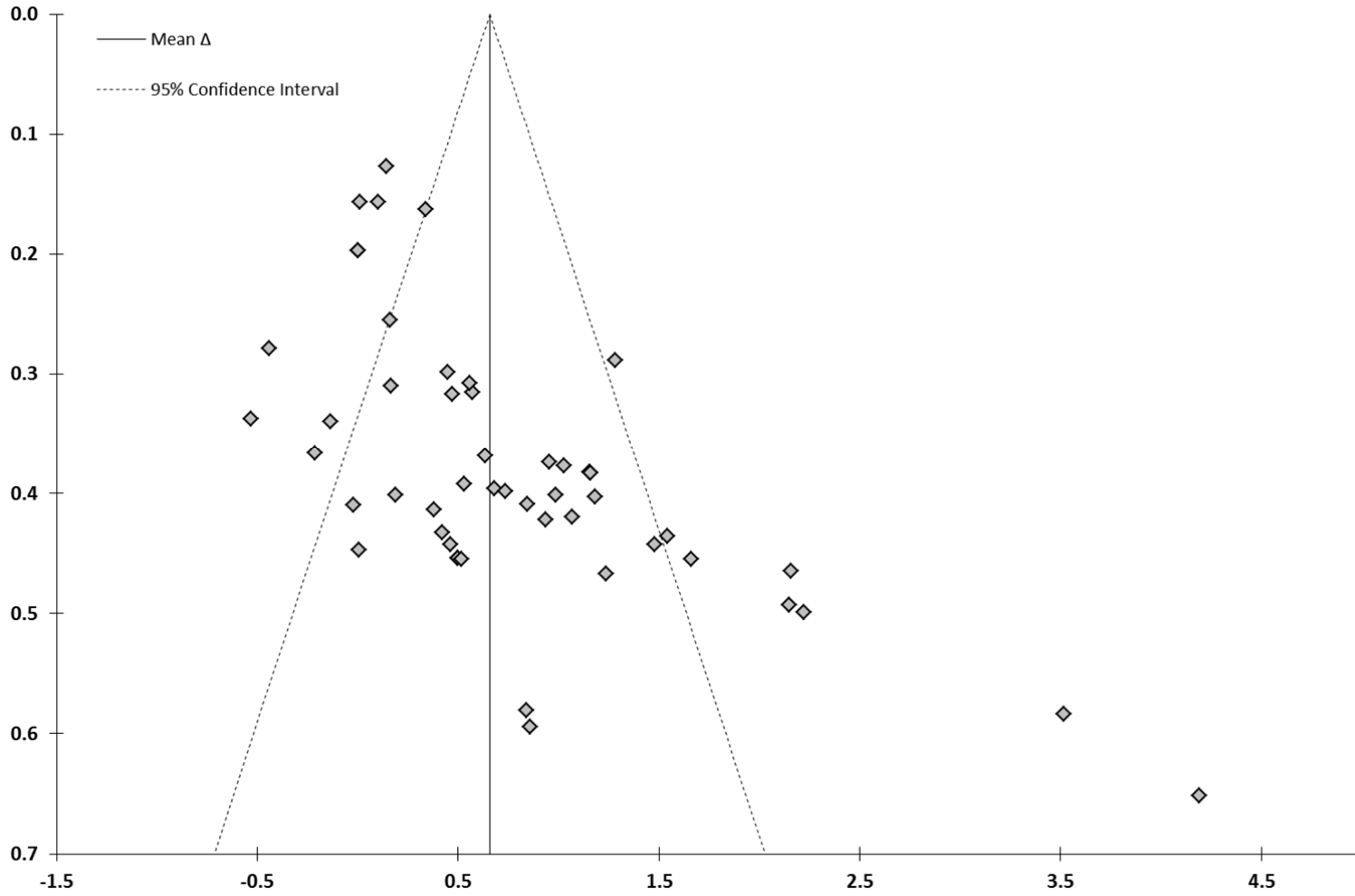
**eReferences**

This supplementary material has been provided by the authors to give readers additional information about their work.

**eFigure 1. Flowchart of Study Selection**



**Figure 2.** Funnel Plot of Hedges  $d$  Effect Sizes vs Study Standard Error



**eTable 1.** Individual Scores on Amended Detsky Quality Assessment\*

Study	Blinded Allocation	Blinded assessment	Described outcomes	Objective outcomes	Defined inclusion	Report n excluded	RET clearly described	Control clearly described	Statistical analysis provided	P value provided	Analysis appropriate	Justify Sample Size	Adherence Compliance Reported	Total
Aidar et al. <sup>e7</sup>	1	0	1	1	1	0	1	1	1	1	1	0	0	9
Abrahao et al. <sup>e6</sup>	0	1	1	1	1	1	1	1	1	1	1	1	0	11
Alves et al. <sup>e8</sup>	1	1	1	1	1	1	1	1	1	1	1	1	1	13
Ansai et al. <sup>e9</sup>	1	0	1	1	1	1	1	1	1	1	1	1	1	12
Courneya et al. <sup>e10</sup>	1	0	1	1	1	1	1	1	1	1	1	1	1	12
Dalgas et al. <sup>e11</sup>	1	1	1	1	1	1	1	1	1	1	1	0	1	12
Damush et al. <sup>e12</sup>	0	0	1	1	0	0	1	1	1	1	1	0	0	7
Doyne et al. <sup>e15</sup>	0	1	1	1	1	1	1	1	1	1	1	0	0	10
Geliebter et al. <sup>e16</sup>	0	1	1	1	1	0	1	1	1	1	1	0	0	9
Goldfield et al. <sup>e17</sup>	0	1	1	1	1	1	1	1	1	1	1	1	1	12
Häkkinen et al. <sup>e22</sup>	0	0	1	1	1	0	1	1	1	1	1	0	0	8
Herring et al. <sup>e18</sup>	1	1	1	1	1	1	1	1	1	1	1	1	1	13
Herring et al. <sup>e4</sup>	1	0	1	1	0	1	1	1	1	1	1	1	0	10
Karahan et al. <sup>e23</sup>	1	1	1	1	1	1	1	1	1	1	1	1	0	12
Lau et al. <sup>e5</sup>	0	0	1	1	0	1	1	1	1	1	1	0	0	8
Levinger et al. <sup>e3</sup>	1	0	1	1	1	1	1	1	1	1	1	0	1	11
Lincoln et al. <sup>e24</sup>	0	1	1	1	1	1	1	1	1	1	1	0	0	10
Martins et al. <sup>e19</sup>	0	0	1	1	1	0	1	1	1	1	1	0	0	8
Norvell et al. <sup>e25</sup>	0	0	1	1	1	1	1	1	1	1	1	0	0	9
Nyberg et al. <sup>e26</sup>	1	1	1	1	1	1	1	1	1	1	1	1	0	12
O'Reilly et al. <sup>e27</sup>	1	0	1	1	1	1	1	1	1	1	1	1	0	11
Penninx et al. <sup>e20</sup>	1	1	1	1	1	1	1	1	1	1	1	1	0	12
Pilu et al. <sup>e28</sup>	0	0	1	1	1	0	0	1	1	1	1	0	0	7
Putiri et al. <sup>e29</sup>	0	0	1	1	1	1	0	1	1	1	1	0	0	8

<b>Study</b>	<b>Blinded Allocation</b>	<b>Blinded assessment</b>	<b>Described outcomes</b>	<b>Objective outcomes</b>	<b>Defined inclusion</b>	<b>Report n excluded</b>	<b>RET clearly described</b>	<b>Control clearly described</b>	<b>Statistical analysis provided</b>	<b>P value provided</b>	<b>Analysis appropriate</b>	<b>Justify Sample Size</b>	<b>Adherence Compliance Reported</b>	<b>Total</b>
Sims et al. <sup>e30</sup>	1	0	1	1	1	1	1	1	1	1	1	1	1	12
Singh et al. <sup>e1</sup>	1	1	1	1	1	1	1	1	1	1	1	1	1	13
Singh et al. <sup>e31</sup>	1	1	1	1	1	1	1	1	1	1	1	1	1	13
Sparrow et al. <sup>e2</sup>	1	1	1	1	1	1	1	1	1	1	1	1	1	13
Tapps et al. <sup>e14</sup>	0	0	1	1	1	0	1	1	1	1	1	0	0	8
Van der Kooi et al. <sup>e32</sup>	1	1	1	1	1	1	1	1	1	1	1	1	0	12
Vizza et al. <sup>e33</sup>	1	0	1	1	1	1	1	1	1	1	1	0	1	11
Zanuso et al. <sup>e13</sup>	0	0	1	1	1	1	1	1	1	1	1	0	0	9

\*Amended to include randomization and blinding methods, description of RET and control, and reporting of adherence and/or compliance

**eTable 2.** Values Used to Calculate Hedges *d* Effect Size and Primary Moderator Values

Study	RET Pre Mean	RET Pre SD	RET Post Mean	Control Pre Mean	Control Baseline SD	Control Post Mean	Hedges' <i>d</i>	Lower 95%CI	Upper 95%CI	Blind	Total Volume RET	Health Status	Strength Improved
Abrahao et al. <sup>e6</sup>	19.40	5.00	17.30	19.10	5.60	20.10	0.57	-0.04	1.19	Yes	1800	Ill	No
Aidar et al. <sup>e7</sup>	17.70	8.20	13.90	16.90	8.60	16.40	0.38	-0.43	1.19	No	2160	Ill	Yes
Alves et al. <sup>e8</sup>	3.92	2.39	3.00	3.46	2.37	3.00	0.19	-0.60	0.97	Yes	960	healthy	No
Alves et al. <sup>e8</sup>	3.92	2.39	2.22	3.46	2.37	4.06	0.93	0.11	1.76	Yes	1920	healthy	No
Alves et al. <sup>e8</sup>	2.50	1.74	1.64	2.00	1.83	1.92	0.42	-0.43	1.27	Yes	960	healthy	No
Alves et al. <sup>e8</sup>	2.50	1.74	0.30	2.00	1.83	2.10	0.124	0.32	2.15	Yes	1920	healthy	No
Ansai et al. <sup>e9</sup>	3.90	2.60	3.20	3.30	2.20	3.70	0.45	-0.14	1.03	Yes	2880	healthy	No
Courneya et al. <sup>e10</sup>	13.80	10.10	10.60	13.90	9.70	10.80	0.01	-0.30	0.32	Yes	NR	Ill	Yes
Courneya et al. <sup>e10</sup>	13.80	10.10	12.60	13.90	9.70	13.70	0.10	-0.21	0.41	Yes	NR	Ill	Yes
Dalgas et al. <sup>e11</sup>	10.30	6.10	7.90	8.80	4.42	9.90	0.64	-0.09	1.36	Yes	NR	Ill	Yes
Damush et al. <sup>e12</sup>	79.50	20.20	81.60	84.30	18.50	83.20	0.16	-0.34	0.66	No	720	healthy	Yes
Doyne et al. <sup>e15</sup>	19.50	9.18	10.96	16.06	5.12	15.72	1.07	0.25	1.89	Yes	NR	Ill	No
Doyne et al. <sup>e15</sup>	16.51	4.32	9.13	15.81	2.88	16.57	2.15	1.18	3.11	Yes	NR	Ill	No
Doyne et al. <sup>e15</sup>	13.80	3.82	7.78	12.58	4.58	10.23	0.84	0.04	1.65	Yes	NR	Ill	No
Doyne et al. <sup>e15</sup>	19.50	9.18	5.93	16.06	5.12	15.25	1.66	0.77	2.55	Yes	NR	Ill	No
Doyne et al. <sup>e15</sup>	16.51	4.32	8.01	15.81	2.88	12.92	1.48	0.61	2.35	Yes	NR	Ill	No
Doyne et al. <sup>e15</sup>	13.80	3.82	5.13	12.58	4.58	13.58	2.22	1.24	3.20	Yes	NR	Ill	No
Geliebter et al. <sup>e16</sup>	8.30	6.20	4.70	9.70	6.80	7.20	0.17	-0.44	0.77	Yes	NR	Ill	No
Goldfield et al. <sup>e17</sup>	2.70	2.65	1.70	2.80	2.62	2.70	0.34	0.02	0.66	Yes	3872	Ill	No
Häkkinen et al. <sup>e22</sup>	6.40	5.00	3.60	6.60	4.90	7.50	0.72	-0.17	1.60	No	NR	Ill	Yes
Herring et al. <sup>e18</sup>	17.50	8.15	10.00	20.40	13.14	18.60	0.50	-0.39	1.39	Yes	184	Ill	Yes
Herring et al. <sup>e18</sup>	17.50	8.15	10.40	20.40	13.14	19.00	0.50	-0.39	1.39	Yes	368	Ill	Yes
Herring et al. <sup>e18</sup>	17.50	8.15	8.10	20.40	13.14	16.90	0.52	-0.37	1.40	Yes	552	Ill	Yes
Herring et al. <sup>e4</sup>	9.50	3.70	5.50	7.90	2.30	5.40	0.46	-0.41	1.33	Yes	2160	Ill	No
Karahan et al. <sup>e23</sup>	11.00	5.70	6.90	11.20	5.60	9.80	0.47	-0.15	1.09	Yes	720	Ill	Yes
Lau et al. <sup>e5</sup>	4.73	3.70	6.27	5.56	2.30	5.38	-0.53	-1.19	0.13	No	1080	Ill	No
Levinger et al. <sup>e3</sup>	82.60	21.27	67.80	62.90	17.82	67.90	0.99	0.20	1.77	Yes	1800	Ill	No
Levinger et al. <sup>e3</sup>	65.50	23.88	65.00	67.90	22.35	66.90	-0.02	-0.82	0.78	Yes	1800	healthy	No
Lincoln et al. <sup>e24</sup>	11.50	7.50	3.10	11.10	7.40	12.40	1.28	0.72	1.85	Yes	2160	Ill	No
Martins et al. <sup>e19</sup>	0.80	1.00	1.10	1.10	0.80	1.00	-0.44	-0.99	0.10	No	2160	healthy	No
Norvell et al. <sup>e25</sup>	53.86	8.32	45.21	52.40	6.02	52.53	1.18	0.39	1.97	No	960	healthy	No
Nyberg et al. <sup>e26</sup>	3.50	2.37	2.80	3.20	0.79	3.50	0.56	-0.05	1.16	Yes	1440	Ill	Yes
O'Reilly et al. <sup>e27</sup>	4.58	2.91	4.01	4.79	2.91	4.90	0.23	-0.07	0.53	Yes	NR	Ill	No

Study	RET Pre Mean	RET Pre SD	RET Post Mean	Control Pre Mean	Control Base SD	Control Post Mean	Hedges' <i>d</i>	Lower 95%CI	Upper 95%CI	Blind	Total Volume RET	Health Status	Strength Improved
<b>Penninx et al.</b> <sup>e20</sup>	*	*	*	*	*	*	0.14	-0.11	0.39	Yes	2160	III	No
<b>Pilu et al.</b> <sup>e28</sup>	20.50	7.10	8.10	19.30	5.70	16.70	1.54	-0.69	2.40	No	3840	III	No
<b>Putiri et al.</b> <sup>e29</sup>	5.20	2.60	2.60	5.00	3.10	5.10	0.86	-0.31	2.02	No	2160	III	No
<b>Sarsan et al.</b> <sup>e21</sup>	13.95	7.27	10.80	14.85	9.25	15.85	0.49	-0.14	1.12	Yes	NR	III	Yes
<b>Sims et al.</b> <sup>e30</sup>	15.43	7.49	15.13	22.37	8.86	20.62	-0.17	-0.76	0.41	Yes	NR	III	No
<b>Singh et al.</b> <sup>e28</sup>	21.30	7.42	9.80	18.40	6.58	13.80	0.95	0.22	1.69	Yes	1500	III	Yes
<b>Singh et al.</b> <sup>e28</sup>	5.20	1.65	2.00	4.60	1.55	3.30	1.16	0.41	1.91	Yes	1500	III	Yes
<b>Singh et al.</b> <sup>e28</sup>	16.90	6.60	8.60	13.90	5.42	12.00	1.03	0.29	1.77	Yes	1500	III	Yes
<b>Singh et al.</b> <sup>e28</sup>	12.30	3.71	5.30	11.40	3.87	8.90	1.16	0.41	1.91	Yes	1500	III	Yes
<b>Singh et al.</b> <sup>e31</sup>	19.90	6.73	11.20	18.00	7.21	14.20	0.68	-0.09	1.46	Yes	900	III	Yes
<b>Singh et al.</b> <sup>e31</sup>	16.20	6.36	9.10	13.70	5.77	11.20	0.73	-0.05	1.51	Yes	900	III	Yes
<b>Singh et al.</b> <sup>e31</sup>	11.60	3.74	7.20	11.20	4.33	9.00	0.53	-0.24	1.30	Yes	900	III	Yes
<b>Sparrow et al.</b> <sup>e2</sup>	3.80	4.30	4.70	5.00	6.30	5.90	0.00	-0.39	0.39	Yes	2160	healthy	No
<b>Sparrow et al.</b> <sup>e2</sup>	3.80	4.30	4.60	5.00	6.30	5.80	0.00	-0.39	0.39	Yes	4320	healthy	No
<b>Tapps et al.</b> <sup>e14</sup>	8.27	2.33	6.73	1.55	1.37	3.91	2.16	1.28	3.07	No	360	healthy	No
<b>Tapps et al.</b> <sup>e14</sup>	8.27	2.33	2.73	1.55	1.37	2.36	3.52	2.33	4.66	No	720	healthy	No
<b>Tapps et al.</b> <sup>e14</sup>	8.27	2.33	1.73	1.55	1.37	2.58	4.19	2.91	5.47	No	1080	healthy	No
<b>van der Kooi et al.</b> <sup>e32</sup>	2.40	2.80	1.90	2.20	2.71	1.10	-0.21	-0.93	0.51	Yes	4680	III	No
<b>van der Kooi et al.</b> <sup>e32</sup>	0.70	2.91	0.70	1.90	2.87	1.50	-0.14	-0.80	0.53	Yes	4680	III	No
<b>Vizza et al.</b> <sup>e33</sup>	10.80	6.80	5.40	12.70	9.60	14.70	0.84	-0.30	1.98	Yes	2880	III	No
<b>Zanuso et al.</b> <sup>e13</sup>	40.93	1.73	40.04	41.34	5.98	40.48	0.01	-0.87	0.88	No	5040	healthy	No

Abbreviations: RET, Resistance exercise training; 95%CI, 95% confidence interval; NR, not reported. BDI, Beck Depression Inventory; BRUMS-D, Brunel Mood Scale Questionnaire-depression; CDS, Cardiac Depression Scale; CESD, Center for Epidemiologic Studies Depression Scale; DACL, Depression Adjective Checklist; DASS-21, Depression, Anxiety and Stress Scale; DSM, Diagnostic Statistics Manual-IV symptoms; GDS, Geriatric Depression Scale; HADS, Hospital Anxiety and Depression Scale; SCL-90-D, Hopkins Symptom Checklist-depression; HRSD, Hamilton Rating Scale for Depression; MDI, Major Depression Inventory; MHFI, Mental Health Functioning Index-depression; POMS-D, Profile of Mood States-depression, wk, weeks. \*Age presented as mean ± SD if reported, if not, age range is presented.

\*Effect sizes approximated from exact *p* values reported in manuscript, and confirmed with previous meta-analyses.

**eTable 3.** Definitions for Each Moderator and Associated Levels

<b>Primary moderators</b>	<b>Definition</b>
<b>Total Volume (continuous variable)</b>	Intervention length x frequency x session duration
<b>Significant improvement in Strength</b>	
Yes	The 95% confidence interval corresponding to the Hedges' <i>d</i> effect size for strength change did not encompass zero
No	Strength was not reported, or the 95% confidence interval corresponding to the Hedges' <i>d</i> effect size for strength change encompassed zero.
<b>Blind</b>	
Yes	Authors reported allocation and/or administration and assessment of outcomes as blinded
No	Authors did not report allocation and/or administration and assessment of outcomes as blinded
<b>Health</b>	
Healthy	Participants did not have a physical or mental illness
Ill	Participants had a physical or mental illness
<b>Secondary moderators</b>	
<b>Sex</b>	
Female	Participants were female only
Mixed	Participants were not female only
<b>Age(years)</b>	
<55	Participant mean age was less than 55 years of age
55+	Participants mean age was 55 years of age or older
<b>Mental Health</b>	
Mental Illness	Participants had a diagnosed mental illness [GAD, depression]
No Mental Illness	Participants did not have a diagnosed mental illness
<b>Physical Health</b>	
Physical Illness	Participants had a physical illness [cancer, obesity, lupus, etc.]
No Physical Illness	Participants did not have a physical illness
<b>Control condition</b>	
Attention placebo control	The comparison condition involved an attention placebo control
No attention placebo control	The comparison condition did not involve an attention placebo control
<b>Comparison type</b>	
Wait list	The comparison condition involved waiting to participate in the intervention
Patient education	The comparison condition involved an education program
No treatment	The comparison condition involved no treatment
Usual care	The comparison condition involved usual medical care
Placebo or second treatment	The comparison condition involved a placebo or second treatment that was added to the intervention group as well.
<b>Program</b>	
<12 weeks	The program lasted less than 12 weeks
12+ weeks	The program lasted 12 weeks or more
<b>Session</b>	
<45 minutes	The exercise session lasted less than 45 minutes
45+ minutes	The exercise session lasted 45 minutes or more
<b>Frequency</b>	
2 days/week	The exercise program was conducted 2 times per week
3 days/week	The exercise program was conducted 3 times per week
<b>Secondary moderators</b>	
<b>Intensity</b>	



Low to moderate	Relative intensity: <80% 1RM, 12-16 RPE or authors reported exercise was of a low/moderate intensity
Vigorous	Vigorous intensity: ≥80% 1RM, >16 RPE, or authors reported exercise was of a vigorous intensity
<b>Supervision</b>	
Combination of supervised and unsupervised	The program was not fully supervised
Yes	The program was fully supervised
<b>Primary Outcome Depression</b>	
Yes	The primary outcome of the study was depression
No	The primary outcome of the study was not depression

**Abbreviations:** GAD, generalized anxiety disorder; RM, repetition maximum; RPE, rate of perceived exer

## eReferences

- e1. Singh NA, Clements KM, Fiatarone MA. A randomized controlled trial of the effect of exercise on sleep. *Sleep*. 1997;20(2):95-101.
- e2. Sparrow D, Gottlieb DJ, DeMolles D, Fielding RA. Increases in muscle strength and balance using a resistance training program administered via a telecommunications system in older adults. *J Gerontol A Biol Sci Med Sci*. 2011;66(11):1251-7.
- e3. Levinger I, Selig S, Goodman C, Jerums G, Stewart A, Hare DL. Resistance training improves depressive symptoms in individuals at high risk for type 2 diabetes. *J Strength Cond Res*. 2011;25(8):2328-33.
- e4. Herring LY, Wagstaff C, Scott A. The efficacy of 12 weeks supervised exercise in obesity management. *Clin Obes*. 2014;4(4):220-7.
- e5. Lau, PWC, Yu CW, Lee A, Sung RYT. The physiological and psychological effects of resistance training on Chinese obese adolescents. *J Exerc Sci Fit*. 2004;2(2):115-20.
- e6. Abrahão MI, Gomiero AB, Peccin MS, Grande AJ, Trevisani VF. Cardiovascular training vs. resistance training for improving quality of life and physical function in patients with systemic lupus erythematosus: a randomized controlled trial. *Scand J Rheumatol*. 2016;45(3):197-201.
- e7. Aidar FJ, Gama de Matos D, Jacó de Oliveira R, Carneiro AL, Cabral BGAT, Dantas PMS, et al. Relationship between depression and strength training in survivors of the ischemic stroke. *J Hum Kinet*. 2014;43(1):7-15.
- e8. Alves CRR, Filho CAAM, Benatti FB, Brucki S, Pereira RMR, Pinto ALS, et al. Creatine supplementation associated or not with strength training upon emotional and cognitive measures in older women: a randomized double-blind study. *PLoS One*. 2013;8(10):e76301.

- e9. Ansai JH, Rebelatto JR. Effect of two physical exercise protocols on cognition and depressive symptoms in oldest-old people: A randomized controlled trial. *Geriatr Gerontol Int*. 2015;15(9):1127-34.
- e10. Courneya KS, Segal RJ, Mackey JR, Gelmon K, Reid RD, Friedenreich CM, et al. Effects of aerobic and resistance exercise in breast cancer patients receiving adjuvant chemotherapy: a multicenter randomized controlled trial. *J Clin Oncol*. 2007;25(28):4396-404.
- e11. Dalgas U, Stenager E, Jakobsen J, Petersen T, Hansen HJ, Knudsen C, et al. Fatigue, mood and quality of life improve in MS patients after progressive resistance training. *Mult Scler*. 2010;16(4):480-90.
- e12. Damush TM, Damush JG. The effects of strength training on strength and health-related quality of life in older adult women. *Gerontologist*. 1999;39(6):705-10.
- e13. Zanuso S, Sieverdes JC, Smith N, Carraro A, Bergamin M. The effect of a strength training program on affect, mood, anxiety, and strength performance in older individuals. *Int J Sport Psychol*. 2012;43(1):53-66.
- e14. Tapps T, Passmore T, Lindenmeier D, Bishop A. An investigation into the effects of resistance based physical activity participation on depression of older adults in a long-term care facility. *Annual in Therapeutic Recreation*. 2013;21:63-72.
- e15. Doyne EJ, Ossip-Klein DJ, Bowman ED, Osborn KM, McDougall-Wilson IB, Neimeyer R. Running versus weight lifting in the treatment of depression. *J Consult Clin Psychol*. 1987;55(5):748.
- e16. Geliebter A, Maher MM, Gerace L, Gutin B, Heymsfield SB, Hashim SA. Effects of strength or aerobic training on body composition, resting metabolic rate, and peak oxygen consumption in obese dieting subjects. *Am J Clin Nutr*. 1997;66(3):557-63.

- e17. Goldfield GS, Kenny GP, Alberga AS, Prud'homme D, Hadjiyannakis S, Gougeon R, et al. Effects of aerobic training, resistance training, or both on psychological health in adolescents with obesity: the HEARTY randomized controlled trial. *J Consult Clin Psychol*. 2015;83(6):1123-35.
- e18. Herring MP, Jacob ML, Suveg C, O'Connor PJ. Effects of short-term exercise training on signs and symptoms of generalized anxiety disorder. *Ment Health Phys Act*. 2011;4(2):71-7.
- e19. Martins R, Coelho-E-Silva M, Pindus D, Cumming S, Teixeira A, Verissimo M. Effects of strength and aerobic-based training on functional fitness, mood and the relationship between fatness and mood in older adults. *J Sports Med Phys Fitness*. 2011;51(3):489-96.
- e20. Penninx BWJH, Rejeski WJ, Pandya J, Miller ME, Di Bari M, Applegate WB, et al. Exercise and depressive symptoms a comparison of aerobic and resistance exercise effects on emotional and physical function in older persons with high and low depressive symptomatology. *J Gerontol B Psychol Sci Soc Sci*. 2002;57(2):P124-32.
- e21. Sarsan A, Ardiç F, Özgen M, Topuz O, Sermez Y. The effects of aerobic and resistance exercises in obese women. *Clin Rehabil*. 2006;20(9):773-82.
- e22. Häkkinen A, Häkkinen K, Hannonen P, Alen M. Strength training induced adaptations in neuromuscular function of premenopausal women with fibromyalgia: comparison with healthy women. *Ann Rheum Dis*. 2001;60(1):21-26.
- e23. Karahan AY, Sahin N, Baskent A. Comparison of effectiveness of different exercise programs in treatment of failed back surgery syndrome: A randomized controlled trial. *J Back Musculoskelet Rehabil*. 2017;30(1):109-20.

- e24. Lincoln AK, Shepherd A, Johnson PL, Castaneda-Sceppa C. The impact of resistance exercise training on the mental health of older Puerto Rican adults with type 2 diabetes. *J Gerontol B Psychol Sci Soc Sci*. 2011;66(5):567-70.
- e25. Norvell N, Belles D. Psychological and physical benefits of circuit weight training in law enforcement personnel. *J Consult Clin Psychol*. 1993;61(3):520-7.
- e26. Nyberg A, Lindström B, Rickenlund A, Wadell K. Low-load/high-repetition elastic band resistance training in patients with COPD: a randomized, controlled, multicenter trial. *Clin Respir J*. 2015;9(3):278-88.
- e27. O'Reilly SC, Muir KR, Doherty M. Effectiveness of home exercise on pain and disability from osteoarthritis of the knee: a randomised controlled trial. *Ann Rheum Dis*. 1999;58(1):15-19.
- e28. Pilu A, Sorba M, Hardoy MC, Floris AL, Mannu F, Seruis ML. Efficacy of physical activity in the adjunctive treatment of major depressive disorders: preliminary results. *Clin Pract Epidemiol Ment Health*. 2007;3(1):8.
- e29. Putiri AL, Lovejoy JC, Gillham S, Sasagawa M, Bradley R, Sun GC. Psychological effects of Yi Ren medical Qigong and progressive resistance training in adults with type 2 diabetes mellitus: a randomized controlled pilot study. *Altern Ther Health Med*. 2012;18(1):30-4.
- e30. Sims J, Galea M, Taylor N, Dodd K, Jespersen S, Joubert L, et al. Regenerate: assessing the feasibility of a strength-training program to enhance the physical and mental health of chronic post stroke patients with depression. *Int J Geriatr Psychiatry*. 2009;24(1):76-83.
- e31. Singh NA, Clements KM, Singh MA. The efficacy of exercise as a long-term antidepressant in elderly subjects: a randomized, controlled trial. *J Gerontol A Biol Sci Med Sci*. 2001;56(8):M497-504.

- e32. van der Kooi EL, Kalkman JS, Lindeman E, Hendriks JCM, van Engelen BGM, Bleijenberg G, et al. Effects of training and albuterol on pain and fatigue in facioscapulohumeral muscular dystrophy. *J Neurol*. 2007;254(7):931-40.
- e33. Vizza L, Smith CA, Swaraj S, Agho K, Cheema BS. The feasibility of progressive resistance training in women with polycystic ovary syndrome: a pilot randomized controlled trial. *BMC Sports Sci Med Rehabil*. 2016;8(1):14.