

Resistance Training and Executive Functions; A 12-Month Randomized Controlled Trial

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Background: Cognitive decline among persons 65 and older is a pressing health care issue, so prevention strategies would greatly benefit individuals and society. The authors focused on executive cognitive functions because they are highly associated with the ability to perform instrumental activities of daily living and mobility.

Definitions:

Selective attention and conflict resolution – the ability to selectively focus attention on one piece of information while ignoring conflicting information. For example, showing subjects a page with color words printed in incongruent ink colors (eg, the word *blue* printed in red ink), then asking them to name the ink color while ignoring the word itself.

Set shifting – the ability to quickly shift from one “set” of information to another. For example, subjects are presented a set of numbers and asked to draw a line from the numbers 1 to 2, 2 to 3, and 3 to 4. Then they are presented a set of numbers and letters and asked to draw a line from 1 to A, A to 2, 2 to B, B to 3, and so on, until completion.

Working memory – the ability to recall multiple sets of information. For example, subjects were asked to recall increasingly larger pairs of random number sequences in the same order as given, and in reverse order.

Study: The authors compared the effect of resistance training with the effect of balance and tone exercise training on executive cognitive functions in senior women. They also sought to determine if resistance training frequency (1 or 2 times per week) impacted outcomes. 155 community-dwelling women aged 65-75 years were randomly assigned to either a once-weekly or twice-weekly resistance-training group, or to twice-weekly balance and tone training (control group). For their primary cognitive outcome measure the authors used the Stroop test to assess selective attention and cognitive resolution. Secondary cognitive measures included set shifting (assessed by the Trial Making Tests), and working memory (assessed by verbal digit span forward and backward tests). Gait speed, muscular function, and whole-brain volume were also secondary outcome measures.

Results: Both resistance-training (RT) groups significantly improved their performance on the Stroop test compared with those in the balance and tone group. Cognitive performance improved by 12.6% in the once-weekly RT group, and by 10.9% in the twice-weekly RT group. Cognitive performance deteriorated by 0.5% in the balance and tone group. Improved selective attention and conflict resolution was also significantly associated with increased gait speed. Peak muscle power increased by 13.4% in the twice-weekly RT group but decreased for both the once-weekly RT and

balance and training groups. Both RT groups demonstrated reductions in whole-brain volume compared with the balance and tone group at the end of the study. The authors conclude that twelve months of once-weekly or twice weekly resistance training benefited the executive cognitive functions of selective attention and conflict resolution among senior women.

Discussion: This is the first study to demonstrate that engaging in progressive resistance training as infrequently as once a week can significantly benefit cognitive function in community-dwelling senior women. Cognitive function increased more for the once weekly RT group (12.6%) than for the twice weekly RT group (10.9%). However, the injury rate was higher in the once weekly RT group so the increased risk of one-time per week training must be weighed against its benefits. In addition, twice weekly RT resulted in the added benefits of improved peak power. It's interesting to note that midpoint (6 months) assessments showed no significant difference between groups in selective attention and conflict resolution, but there was a significant difference between groups at the end of the trial. This may indicate that RT programs need to be long-term to benefit cognitive function. The authors' findings also support previous observations of a strong relationship between gait speed and cognitive function. In summary, this study shows that long-term progressive resistance training benefits older women both physically and cognitively.

Keiser Pieces Used: biceps curl, triceps extension, upper back, lat pull-down, leg press, hamstring curl, and calf raise machines

Published: Arch Intern Med. Jan. 2010; vol. 170(No. 2);pgs. 170-178