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Muscle damage may be detrimental for exercise-induced cognitive improvement in older men: Pilot results from the BRAIN-M trial

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INTRODUCTION:
It is well documented that resistance training can augment muscle function and preserve brain health in older adults. It is also known that high-intensity resistance training can cause muscle damage, associated with low-grade inflammation, which has a negative effect on cognitive function. In this randomized controlled trial we hypothesized that muscle damage (expressed by increased creatine kinase, CK) would be associated with decreased cognitive performance in older adults. To examine this hypothesis we compared two resistance exercise intervention protocols consisting of either a high mechanic (high CK) or a high metabolic (low CK) loading.
METHODS:
Twenty-two older men (60-74y old) were randomly allocated to a single session of accentuated eccentric-only resistance training (ECC, n = 6), blood flow restriction training (BFRT, n = 10), or 45-min seated rest (n = 6). Both exercise groups performed three lower body exercises at an equal relative volume of 57.6% (number of exercises x sets x repetitions x % one repetition maximum, 1RM). ECC consisted of 4 sets and 4 repetitions each at 120% 1RM. BFRT consisted of 4x12 repetitions at 40% 1RM and 50% lower limb occlusion pressure. Two-way ANOVA (Group X Time) with repeated measures on the Time factor was used to assess pre-to-post 5-min changes in cognitive function and pre-to-post 48h changes in blood CK (U/L). Cognitive tests included a 2-Choice Reaction Time test, Go/No-Go test, Memory Search test, and a Switching task. The main cognitive outcome measures were response time (RT, ms) of the correct responses, and changes in performance index (PI; 100×[accuracy/response time of all responses]).
RESULTS:
A significant Group x Time interaction was found for CK level changes ($p=0.049$, partial $\eta^2 = 0.315$). CK levels significantly increased in the ECC group (+14.14 ±16.63 U/L), but not in the BFRT (+3.21 ±3.21 U/L) and control group (-0.12 ±0.97 U/L). The Group x Time interaction for RT in the Memory Search Test was not significant ($p=0.139$, partial $\eta^2 = 0.218$). Based on the large effect size it appears that RT improved only in the ECC group (-99.72 ms) but not in the BFRT (+64.36 ms) and control (+95.87 ms) groups. However, in the ECC group, improvement in RT on Memory Search test was significantly lower with higher Pre-Post increases in CK ($R = 0.921$, $p = 0.026$). There were no significant changes on other cognitive function tests.
CONCLUSION:
A single bout of ECC tended to improve memory function compared to BFRT and control groups. However, muscle damage may have detrimental effects on the magnitude of this improvement. Our findings suggest that resistance training may benefit cognitive function in older adults, however high level of muscle damage should be avoided.

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Topic: **Health and Fitness**

Presentation **Poster**