Increased Physical Strength is Associated with Improved Brain Integrity in Older People Living with HIV

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BACKGROUND

- Exercise programs have been associated with improved brain integrity in people living without HIV.
- Emerging evidence that better physical fitness and higher levels of activity are associated with better brain integrity in people living with HIV (PLWH), but the effects of an exercise intervention in PLWH has not been well-studied.
- The aim of the current study was to examine changes in cognition, brain volumes, and inflammatory markers in a cohort of older (>50 years) PLWH who completed a six-month exercise intervention.

METHODS

- Participants:
  - 30 older (>50 years old), sedentary PLWH who were virologically well-controlled (<50 copies/mL)
- Exercise intervention:
  - Participants completed three gym sessions a week for 6 months with an on-site personal trainer
  - A one-repetition maximum (1RM), or the highest weight a participant could lift for one successful repetition, was recorded for four strength exercises (leg press, chest press, latissimus dorsi (lat) pull-down, and seated row) at baseline and at the 6-month follow-up
- Neuroimaging:
  - All participants completed an MRI at baseline and at the six-month follow-up session
  - 3T Siemens Tim Trio MR scanner
  - FreeSurfer software (v5.3) determined frontal, parietal, temporal, occipital, total gray matter (GM), subcortical GM, cortical, and total white matter volumes.
- Neuropsychological testing:
  - Participants completed a 15-test NP battery that incorporated tests from executive function (EF), learning (L), delayed recall (DR), and psychomotor/processing speed (PM) domains
  - Raw scores converted into demographically-corrected Z-scores and averaged to create domain Z-scores
- Inflammatory markers:
  - Measured from blood draw completed at baseline and at six-month follow-up
  - Examined plasma soluble CD14 (sCD14)

Title: An increase in physical strength after a six-month exercise intervention was associated with increased cognition, larger brain volumes, and decreased markers of inflammation in older PLWH who were previously sedentary.

RESULTS

- The 1RM of all four strength exercises significantly improved over time for all participants (p-values <.001)

Figure 1. Increases in Lat Pulldown 1RM associated with changes in frontal lobe volumes

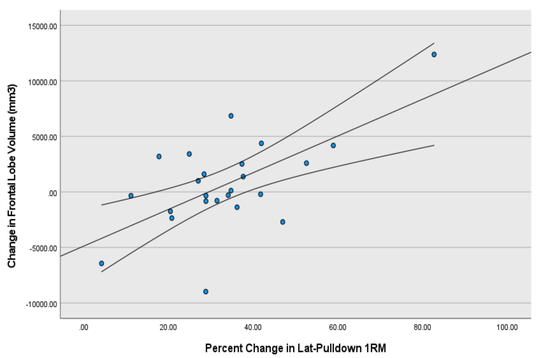
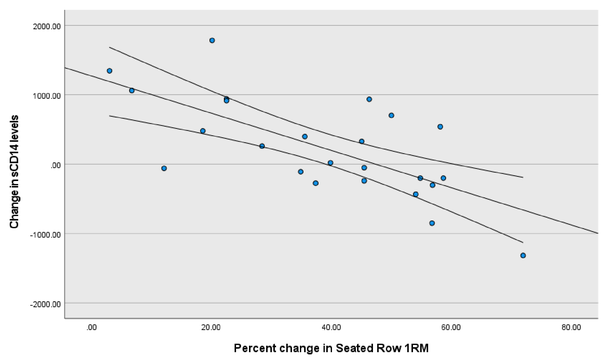


Figure 2. Increases in Lat Pulldown 1RM associated with changes in frontal lobe volumes



RESULTS (continued)

- Strength and neuroimaging:
  - Greater increases in lat pull-down 1RM were significantly associated with greater cortex (p=.001), cortical white matter (p=.03), total gray matter (p=.003), frontal lobe (p<.001; **Fig. 1**), parietal (p=.02), temporal (p=.01) and cingulate (p<.001) volumes. Greater increases in chest press 1RM associated with greater thalamic volume (p=.01).
- Strength and cognition:
  - Greater increases in the lat pull-down exercise were significantly associated with increases in executive function performance (p=.04).
- Strength and inflammatory markers:
  - Greater increases in lat pull-down (p=.02), seated row (<.001; **Fig. 2**), and chest press (p=.002) 1RM were associated with greater decreases in sCD14.

CONCLUSIONS

- A six-month exercise intervention significantly increased physical strength in this sample of older PLWH
- This increased strength was significantly associated with increased cognitive performance, larger brain volumes, and decreased levels of a marker of inflammation.
- Further research incorporating larger sample sizes (particularly female PLWH), longer exercise interventions, and different types of exercise interventions are needed to more fully understand these relationships.

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