Statistical Analysis Approach

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A video game to enhance cognitive health in older adults, children, and adolescents

"Characterizing the Synergistic Effects of Physical and Cognitive Training on Attention and Working Memory"

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Statistical Analysis Approach:

Analyses were conducted by researchers who were blind to group membership. To test for training effects on each of the collected outcome measures, we used an repeated measures ANOVA approach as in our previous work[1,2]. Statistically, no between-group differences assessed using independent t-tests were observed for at baseline involving: (1) age (t_{47}= 0.35, p= 0.73); (2) gender (t_{47}= -0.15, p= 0.88); (3) CPT performance (t_{45}= 1.84, p= .07); (4) Filter task performance (t_{46}= 1.34, p= .19); (5) mft power (t_{44}= 1.70, p= .10); (6) mft ITC (t_{41}= 1.11, p= .28); (7) limits of stability (t_{44}= 1.05, p= .30); (8) diastolic blood pressure (t_{43}= 1.77, p= .08). For those measures that showed a trend towards a group difference at baseline (CPT performance, mft power, and blood pressure), we performed an analysis of covariance (ANCOVA) with post-training performance as the dependent variable, pre-training performance as the covariate, and group as the fixed factor. Our reasoning for using this approach is that this analysis accounts for variation around the post-test means that arises from the variation where participants began at pretest[3]. Using this approach, we observed a nearly significant group difference following training for the CPT task ($F_{(1,46}$= 3.85, p=0.056), a significant group effect for mft power ($F_{(1,44}$= 4.35, p=0.043) and a significant group effect for diastolic blood pressure ($F_{(1,42}$= 6.93, p=0.012), supporting the assertion that the reported ANOVA effects were not driven by trending baseline differences between groups. For post-hoc analysis of the within-group changes, we performed two-tailed, paired-sample t-tests on each group separately to test for significant differences between each testing session. We report Cohen's d for all significant (p< .05) and trending (p< .10) ANOVA results, using the Hedges and Olkin correction[4] for small sample bias.

References

1 Anguera, J. A. *et al.* Video game training enhances cognitive control in older adults. *Nature* **501**, 97-101, doi:nature12486 [pii] 10.1038/nature12486 [doi] (2013).

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3 Khammar, A., Yarahmadi, M. & Madadizadeh, F. What Is Analysis of Covariance (ANCOVA) and How to Correctly Report Its Results in Medical Research? *Iran J Public Health* **49**, 1016-1017 (2020).
4 Hedges, L. V. & Olkin, I. *Statistical methods for meta-analysis*. (Academic Press, 1985).