BRIGHT-Mind Study: A Prospective, Randomized Trial of Digital Cognitive Training Effects on Cognitive, Functional and Imaging Outcomes

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Background and Objective

Large randomized trials of digital cognitive training programs combining active controls, participant-reported outcomes and neuroimaging remain limited. BRIGHT-Mind tested whether 12 weeks of at-home multidomain digital cognitive training improved cognitive, functional and imaging outcomes in generally healthy adults.

Study Design and Analysis

Design

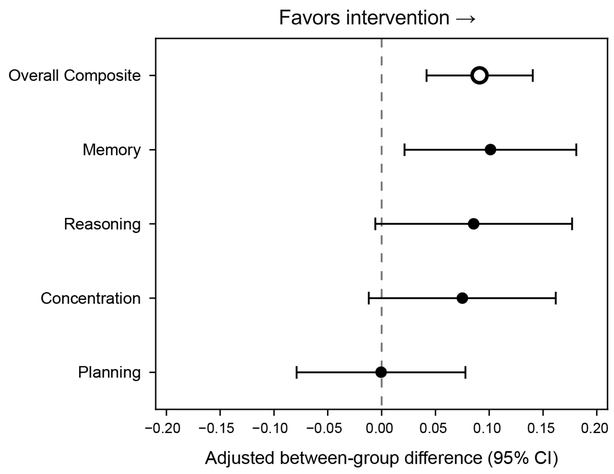
- 12-week randomized, blinded, active-controlled trial. Participants were assigned 2:1 to Lumosity (n = 535) or educational videos (n = 266).
- 801 generally healthy adults ages 25–80 from 44 US states (mean age approximately 50 years, 58.6% female). A prespecified MRI subgroup included 266 participants.
- The video control was intended to match expectancy, time on task and computer use. Participants, outcome assessors and imaging analysts were blinded.

Program use

- Instructed use: 15–25 minutes/day, at least 5 days/week for 12 weeks.
- Mean actual use: 18.4 hours with Lumosity versus 17.7 hours with videos.
- No program-related adverse events occurred (safety population, n = 816, including lead-in participants).

Analysis sample sizes reflect valid data for each endpoint.

Cognitive Outcomes



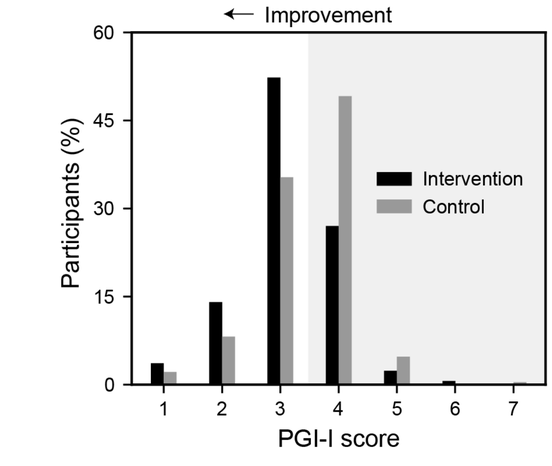
Cognitive performance

The primary Overall Composite from a 12-test neurocognitive battery (Creyos, formerly Cambridge Brain Sciences) improved with intervention (n = 677). Adjusted mean changes were 0.173 versus 0.082, a difference of 0.091 (95% CI 0.042–0.140, p = 0.00032, Hedges' g = 0.30). Secondary domain estimates numerically favored intervention for Memory, Reasoning and Concentration, consistent with contributions from multiple domains to the Overall Composite effect.

ANCOVA adjusted for baseline, age and age × group. There was no age × group interaction (p = 0.21).

The cognitive effect corresponded to 6.7 years of cross-sectional age-related cognitive difference.

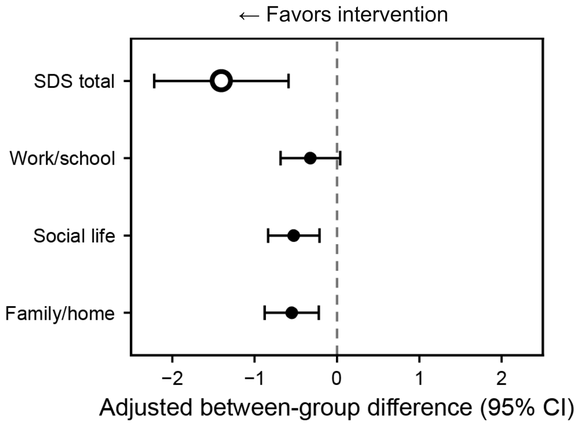
Participant-Reported Outcomes



Global cognitive improvement

At Day 84, the Patient Global Impression of Improvement (PGI-I) favored intervention (mean 3.12 versus 3.48, difference −0.36, 95% CI −0.49 to −0.22, p < 0.0001; prespecified exploratory endpoint, n = 702).

70.0% versus 45.7% reported any improvement (RR 1.53, 95% CI 1.32–1.78), and 17.7% versus 10.3% reported much or very much improvement (RR 1.71, 95% CI 1.11–2.61) (post hoc).

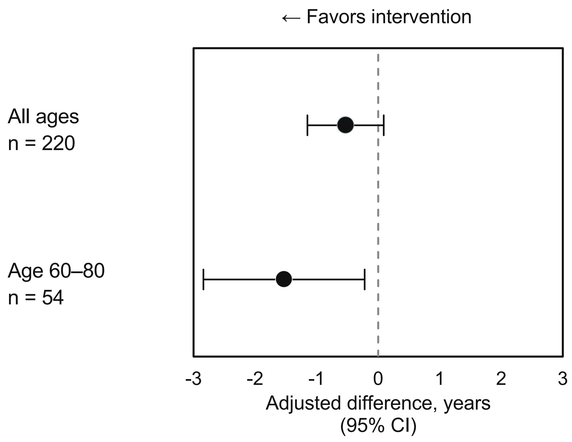


Cognition-related functional impact

The Sheehan Disability Scale (SDS) favored intervention in ANCOVA (adjusted change −0.36 versus +1.04, difference −1.40, 95% CI −2.22 to −0.59, p = 0.00080; prespecified exploratory endpoint, n = 702).

Among participants with baseline SDS >0, 62.9% versus 47.3% reported any decrease (RR 1.33, 95% CI 1.10–1.61) (post hoc).

Brain-Predicted Age from MRI



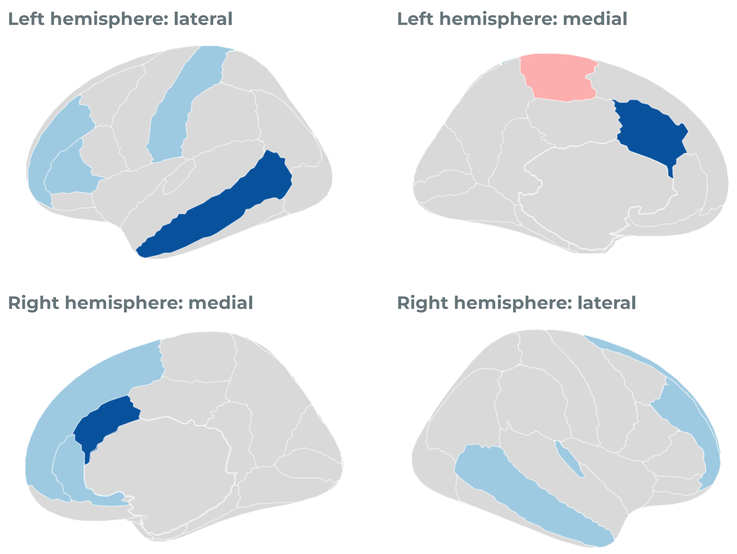
Brain-PAD

Brain age was estimated from structural MRI using the brainageR method (Cole et al.). The secondary endpoint was change in brain-predicted age difference (Brain-PAD), predicted age minus chronological age.

Across all ages, the adjusted difference was −0.53 years (95% CI −1.15 to 0.09). Type II ANCOVA tests gave p = 0.071 for the group effect and p = 0.025 for the age × group interaction.

Among adults ages 60–80, the difference was −1.53 years (95% CI −2.84 to −0.22, p = 0.024, g = −0.64) (prespecified exploratory).

Structural MRI Effects in Older Adults



Cortical thickness

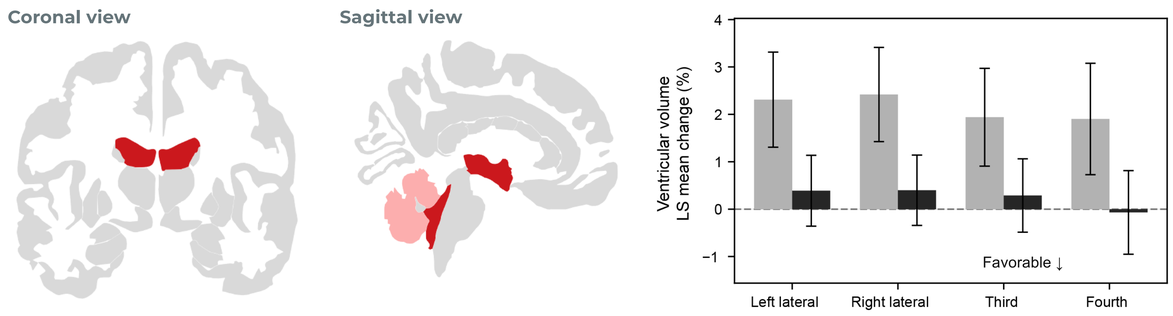
Cortical thickness was greater with intervention in caudal anterior cingulate, middle temporal and prefrontal regions, with Hedges' g values of 0.41–0.72.

Regional ANCOVA models were exploratory and used 218 participants with valid data; effects are estimated at age 70.

Effect sizes (Hedges' g)

<−0.6
−0.6 to −0.4
0.4 to 0.6
>0.6

Ventricular expansion



Model-estimated ventricular volume changes at age 70 showed attenuated expansion with intervention with medium to large effect sizes. Between-group differences ranged from −1.65 to −2.02 percentage points (Hedges' g = −0.84 to −0.65). Black bars represent intervention and gray bars represent control.

Frontoparietal functional connectivity decreased relative to control, opposite to prediction. A fractional anisotropy composite did not differ between groups. Both were secondary endpoints and will be investigated further.

Conclusions

12 weeks of digital cognitive training improved objective cognitive performance, the primary outcome, compared with educational videos in generally healthy adults ages 25–80 (p = 0.00032).

Participant-reported outcomes also favored training on prespecified exploratory measures of global cognitive improvement (PGI-I, p < 0.0001) and cognition-related functional improvement (SDS, p = 0.00080).

The secondary Brain-PAD analysis showed an age × treatment interaction, with improvement in older adults. Exploratory regional MRI analyses showed greater cortical thickness in cognition-related regions and attenuated ventricular expansion at age 70.

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