ABSTRACT

Mobile cognitive training for the cognitive symptoms of depression in young adults: A double-blind, randomized pilot study with active control

by

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Background: Depression is associated with a broad range of cognitive symptoms, including reduced attention, verbal learning and memory, executive functioning (EF), and processing speed (PS). Cognitive symptoms commonly predate, co-occur, and increase the risk of relapse and recovery. Computerized cognitive training (CCT) has been shown to ameliorate the cognitive symptoms of depression. Younger adults, in particular, are understood to benefit more from CCT than older adults due to greater capacity for neuroplasticity. However, several issues remain unclear about the effectiveness of CCT; (1) whether the benefits of CCT are driven by the specific content or non-specific factors, such as engagement, motivation, novelty, and expectancy, which have been inadequately controlled in prior studies; (2) whether the benefits of CCT extend past the domains directly trained (i.e., far transfer) and (3) whether CCT response is moderated by socio-demographic and clinical variables. To address these issues, we devised an 8-week, double-blind randomized trial that compared the cognitive effects of PS and EF-based CCT (treatment group) versus verbal-based CCT (active control) in young adults with elevated depressive symptoms. We hypothesized PS/EF-based CCT would result in differentially larger improvements in near (PS and EF) and far transfer (attention and learning and memory) than verbal-based CCT. We also hypothesized CCT response was moderated by race-ethnicity, concurrent treatment, and depression severity.

Methods: 46 young adults (18-29 years old) with at least mild depressive symptoms (HDRS ≥ 10) were randomized to one of two CCT programs. Participants completed a baseline neuropsychological evaluation, downloaded an app with their respective training program, and were instructed to train for a minimum of 15 minutes a day, 5 days a week, for 8 weeks. They had an equal and limited amount of time with research personal, thereby controlling for social engagement. All modules scaled in difficulty and provided motivational reinforcement upon performance, thereby controlling for motivation, novelty, and expectancy. After 8 weeks, participants returned for a neuropsychological re-evaluation. The primary outcome variables were change scores (from baseline to week 8) for each cognitive test administered, as well as for mood and daily functioning. Race/ethnicity, concurrent treatment, and depressive severity were explored as potential moderators of CCT response.
Results: The PS/EF group demonstrated significantly greater gains on select measures of PS and EF than the verbal group. Comparable improvement was observed between groups on further measures of cognition, as well as in mood and daily functioning. Both groups reported comparable levels of engagement. CCT was largely not moderated by race/ethnicity, concurrent treatment status, and depressive severity, though several exceptions were noted. Persons of color improved less on PS than Whites; individuals receiving concurrent treatment improved more on verbal short-term memory than those without treatment; and individuals with lower depressive severity tended to demonstrate greater improvement on Inhibition than those with greater depressive severity.

Conclusion: PS/EF-based CCT was more effective on tasks of near transfer, but comparably effective as the active control on measures of far transfer. This suggests the mechanism of action in CCT is likely not driven by the specific training content, but on the factors common to both training conditions. The role of non-specific factors cannot be ruled out, given comparable levels of engagement and exposure to a novel and challenging activity. The possibility that CCT is effective insofar as it upregulates BDNF is discussed. Future research is recommended to better elucidate on the relationships among CCT, cognitive functioning, and modifying factors in young adults with depression.