



## THE EFFECTS OF COGNITIVE STIMULATION AND COMPUTERIZED MEMORY TRAINING AMONG OLDER ADULTS RESIDING IN INDEPENDENT-LIVING FACILITIES

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A dissertation submitted in partial fulfillment of the requirement for the degree of Doctor of Philosophy School of Aging Studies, College of Behavioral and Community Sciences, University of South Florida

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### Abstract

**OBJECTIVE:** This study examined whether two cognitive interventions, cognitive training and cognitive stimulation, were effective at enhancing memory performance.

**BACKGROUND:** With age, older adults experience declines in both short- and long-term memory. One way to counter these age-related declines is through memory interventions which include computerized cognitive training and noncomputerized cognitive stimulation. This dissertation examined whether a cognitive training program, Dakim BrainFitness (Dakim, Inc., 2002) and a program of cognitive stimulation, Mind Your Mind (Seagull & Seagull, 2007), enhance memory performance among cognitively-intact older adults residing in independent-living retirement communities. Specifically, the following research questions were proposed: (A) How effective is the computerized cognitive training program in improving memory performance relative to the cognitive stimulation program or a no-contact control condition? (B) How effective is the noncomputerized cognitive stimulation program, Mind Your Mind, at improving memory performance relative to a control condition? and (C) Will memory training gains endure 3-months post-training for those who participate in cognitive training?

**PARTICIPANTS:** Fifty-three older adults were randomized to cognitive training (n = 19), cognitive stimulation (n = 17), or a no-contact control (n = 17) condition.

**MEASUREMENT:** Participants in the cognitive training and cognitive stimulation conditions were asked to complete five 25-minute sessions per week for a 10-week period. Memory outcome measures included the Auditory Verbal Learning Test (AVLT), the Hopkins Verbal Learning Test (HVL), and the Wechsler Memory Scale-Third Edition (WMS-III) Family Pictures subtest. Outcome measures were administered at baseline, immediately post-training (or equivalent delay), and again at 3-months post-training.

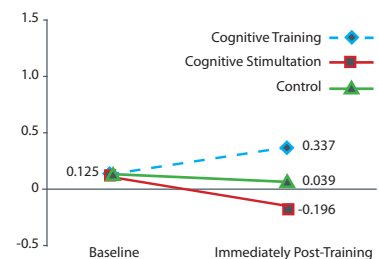
**RESULTS:** Multivariate Analysis of Variance indicated no significant differences between the three training

conditions on baseline characteristics and memory outcome scores ( $p = .660$ ). To test hypotheses one and two, memory outcome measures were compared across training conditions and testing occasions. A repeated measures MANOVA indicated a significant group x time interaction, Wilks'  $\Lambda = .585$ ,  $F(10,92) = 2.83$ ,  $p = .004$ , partial  $\eta^2 = .235$ . Follow-up analyses for each memory outcome measure from baseline to immediately post-training were conducted with training condition as the independent variable. Significant group x time interactions were found between conditions for AVLT delayed recall,  $F(2,50) = 3.683$ ,  $p = .032$ , partial  $\eta^2 = .128$ , and the HVL immediate recall,  $F(2,50) = 5.059$ ,  $p = .010$ , partial  $\eta^2 = .168$ . No significant group x time interaction was indicated on the AVLT immediate recall,  $F(2,50) = 2.544$ ,  $p = .089$ , partial  $\eta^2 = .092$ . There was a marginally significant group x time interaction on the WMS-III Family Pictures delayed recall  $F(2,50) = 2.975$ ,  $p = .060$ , partial  $\eta^2 = .106$ . Post-hoc comparisons for significant outcome measures were conducted using Fisher's LSD test, while controlling for baseline performance. Results indicated that the cognitive training condition performed significantly better than the cognitive stimulation condition from baseline to immediately post-training on the AVLT delayed recall ( $p = .012$ ), as well as on HVL immediate recall ( $p < .001$ ). The cognitive training condition also performed significantly better from baseline to immediately post-training as compared to the no-contact control condition ( $p = .011$ ). A significant difference between the cognitive training condition and the no-contact control condition was also found on the WMS-III delayed recall measure ( $p = .030$ ) immediately post-training. No significant differences between any of the conditions were found on either AVLT immediate or WMS-III Family Pictures immediate recall ( $ps > .05$ ). There were no differences between the cognitive stimulation and control conditions across all memory outcomes ( $ps > .05$ ). For hypothesis three, a repeated measures MANOVA indicated no main effect of time within the cognitive training condition for the memory

outcome measures, Wilks'  $\Lambda = .047$ ,  $F(6,11) = 2.11$ ,  $p = .135$ , partial  $\eta^2 = .535$ .

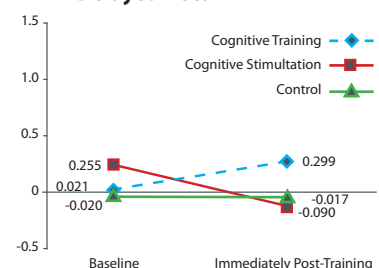
**CONCLUSION:** This study examined whether two cognitive interventions, cognitive training and cognitive stimulation, were effective at enhancing memory performance. This study found that the adaptive cognitive training program, Dakim BrainFitness, was effective at enhancing memory performance as measured by AVLT delayed recall, HVL immediate recall, and WMS-III Family Pictures delayed recall. There was no evidence that the non-adaptive program of cognitive stimulation, Mind Your Mind, is effective at significantly improving memory performance. These findings coincide with the Model of Adult Cognitive Plasticity that in order to improve cognitive performance, brain exercises need to be adaptive so that there is a continuous mismatch between the individual's cognitive capacities and the demands of the task.

**AVLT Immediate Recall**



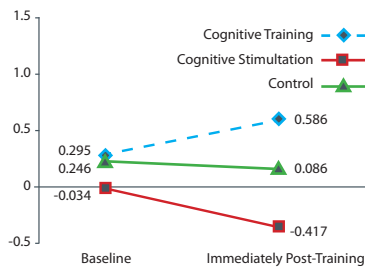
**Figure 1: Mean z-scores for the AVLT Immediate Recall at Baseline and Immediately Post-Training.**

**AVLT Delayed Recall**



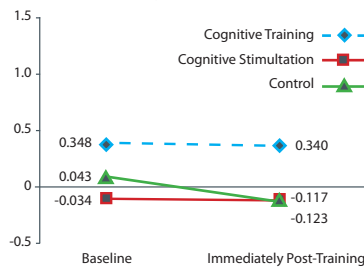
**Figure 2: Mean z-scores for the AVLT Delayed Recall at Baseline and Immediately Post-Training.**

**HVLT Mean Score**



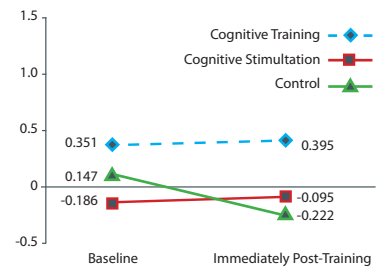
**Figure 3:** Mean z-scores for the HVLT Immediate Recall at Baseline and Immediately Post-Training.

**WMS-III Family Pictures Immediate**



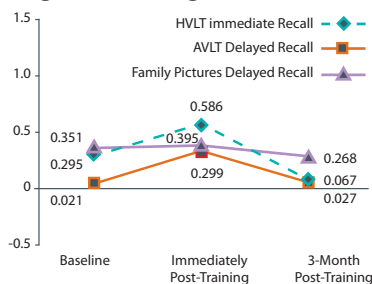
**Figure 4:** Mean z-scores for the WMS-III Family Pictures Immediate Recall at Baseline and Immediately Post-Training.

**WMS-III Family Pictures Delayed**



**Figure 5:** Mean z-scores for the WMS-III Family Pictures Delayed Recall at Baseline and Immediately Post-Training.

**Cognitive Training Mean Scores**



**Figure 6:** Scores on the memory Outcomes Measures across Time among the Cognitive Training Condition.

**Table 1. Baseline Description Means and Standard Deviation by Training Condition.**

| Variable   | Cognitive Training<br>n=17 M(SD) | Cognitive Stimulation<br>n=19 M(SD) | Control<br>n=17 M(SD) | Overall<br>n=53 M(SD) |
|--|----------------------------------|-------------------------------------|-----------------------|-----------------------|
| Age, mean (SD), y                                | 83.41 (6.68)                     | 81.32 (9.68)                        | 83.82 (6.55)          | 82.24 (7.89)          |
| Education, mean (SD), y                          | 15.06 (2.2)                      | 15.84 (2.29)                        | 15.18 (2.88)          | 15.39 (2.53)          |
| Gender (% female)                                | 64.7%                            | 78.9%                               | 77.8%                 | 74.1%                 |
| Ethnicity (% Caucasian)                          | 100%                             | 94.7%                               | 100%                  | 98.1%                 |
| Near Visual Acuity†                              | 0.1529                           | 0.1537                              | 0.1500                | 0.1522                |
| MMSE   | 28.18 (1.98)                     | 27.58 (2.01)                        | 27.22 (2.02)          | 27.65 (2.00)          |
| Cognitive Status (Montreal Cognitive Assessment) | 25.53 (3.06)                     | 23.74 (3.84)                        | 24.12 (3.46)          | 24.43 (3.51)          |

Notes: M = Mean, SD = Standard Deviation, † Near Visual Acuity is reported in LogMAR scores.

**Table 2. Neuropsychological Test Scores of Subjects**

| Variable                         | Cognitive Training<br>n = 17 M (SD) | Cognitive Stimulation<br>n = 19 M (SD) | Control Condition<br>n = 17 M (SD) | Total<br>n = 53 M (SD) |
|----------------------------------|-------------------------------------|--|------------------------------------|------------------------|
| AVLT Immediate Recall            | -                                   | -                                      | -                                  | -                      |
| Baseline                         | 49.29 (15.42)                       | 48.05 (17.51)                          | 48.00 (17.54)                      | 48.43 (16.56)          |
| Immediately Post-Training        | 59.88 (15.29)                       | 50.84 (15.46)                          | 54.82 (18.55)                      | 55.02 (16.57)          |
| AVLT Delayed Recall              | -                                   | -                                      | -                                  | -                      |
| Baseline                         | 6.47 (4.37)                         | 7.47 (4.54)                            | 6.29 (4.63)                        | 6.77 (4.46)            |
| Immediately Post-Training        | 9.12 (3.82)                         | 7.53 (3.79)                            | 7.82 (4.64)                        | 8.13 (4.07)            |
| HVLT Immediate Recall            | -                                   | -                                      | -                                  | -                      |
| Baseline                         | 23.53 (6.08)                        | 21.53 (6.45)                           | 23.24 (6.54)                       | 22.72 (6.31)           |
| Immediately Post-Training        | 25.76 (6.53)                        | 18.68 (5.55)                           | 22.24 (7.14)                       | 22.09 (6.94)           |
| Family Pictures Immediate Recall | -                                   | -                                      | -                                  | -                      |
| Baseline                         | 32.53 (10.92)                       | 26.00 (14.77)                          | 30.06 (10.52)                      | 29.40 (2.40)           |
| Immediately Post-Training        | 37.53 (10.48)                       | 30.95 (15.57)                          | 29.24 (13.15)                      | 32.51 (13.55)          |