Enhancing Older Adult's Everyday Memory Function

Statistical Analysis Plan

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Statistical Analysis Plan: Study 2

Participants will be randomly assigned to one of two intervention arms: Everyday Memory Metacognitive Intervention (EMMI) and Memory Strategy Control (MSC). The EMMI group is trained in everyday memory skills applicable to self-management of cognitive challenges; the MSC group is trained in mnemonic strategies to form new memories for subsequent memory tests. We are planning to enroll 30 persons in each of the two intervention arms (total N = 60).

We have designated selected primary and secondary outcomes to evaluate. The hypotheses are that (1) EMMI training will improve everyday memory, but not typical memory test performance; and (2) MSC training will improve typical memory test performance but not everyday memory. These hypotheses translate into directional null and alternative hypotheses in standard frequentist statistics. Outcomes are differentiated by whether they are administered at both pretest and posttest or at posttest only. For everyday memory, the posttest-only outcomes include (1) everyday memory failures, or memory blips; (2) laboratory contact task to measure prospective memory, with (a) number of successful calls and (b) timeliness relative to scheduled contact time; and (3) computer simulated tasks assessing complex IADLs, including ATM use and medication management. We predict better performance by the EMMI group at posttest on these measures. The posttest-only cognitive measure is Story Recall, which is seen as a transfer task unlikely to show training benefits, but the directional hypothesis is for better performance in the MSC group.

We estimate the design has a .80 statistical power to detect a standardized mean difference favoring the EMMI group of $d = 0.64$, $\alpha = .05$, 1-tailed.

For outcomes measured at pretest and posttest, we administered several metamemory questionnaires, and designated the following key secondary outcomes: change on MFQ Frequency of Forgetting (a measure of everyday memory complaints), change in PBMI Specific Memory Self-Efficacy and Perceived Control over Memory scales, and change in the Memory Compensation Questionnaire's scales of External Use and Internal Use, assessing use of strategies to support everyday memory. For these measures we hypothesized that the EMMI group would improve in subjective memory more than the MSC group from pretest to posttest. We also administered two memory tests at pretest and posttest, an associative recall test and a free recall test. We hypothesized greater improvement from pretest to posttest for the MSC group who received training in relevant mnemonic strategies that should benefit level of remembering.

Posttest-only analyses will be conducted as independent samples t-tests on key measures with a one-tailed test, according to the direction of the relevant hypotheses. Pretest-Posttest data will be analyzed using Group X Time mixed effects models using SAS PROC MIXED, with repeated measures specified for Time (pretest-postttest).

We also predict that the everyday memory intervention will reduce memory complaints and increase memory self-efficacy and perceived control from pretest to posttest in the EMMI group alone, leading to the prediction of a group (MSC vs. EMMI) X time (pretest, posttest) interaction. Conversely, we predict that memory strategy training in the MSC group will improve memory test performance, leading to the prediction of a group (MSC vs. EMMI) X time (pretest, posttest) interaction. The interaction is a direct analog of a 1 *df* planned comparison for differential gain for the two groups, and hence is also amenable to a directional hypothesis test, halving the critical p-value used for the typical F-test for interaction. We estimate that the design has .80 power to detect these interactions, assuming a training benefit effect size (difference in *d*) of 0.75, 1 tailed (comparable to pretest-posttest associative mnemonic training gains in our lab.

Given that we have selected critical outcome measures and specified a priori hypotheses, no adjustments of critical p-values will be made, especially because we do not wish to sacrifice statistical power for a conservative control over the Type I error rate.