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Cognitive Interventions for Older Adults: Does Approach Matter?

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Assisted living (AL) is the fastest growing option for residential care that is designed to provide older adults with needed supports while promoting independence¹. Nevertheless, AL residents typically experience progressive decline in cognitive ability and self-care that necessitates more intensive nursing care, and typically, most AL residents will transfer to a nursing home (NH) within one to three years^{1–4}.

Older adults require a variety of cognitive abilities to meet every day self-care challenges needed to remain in AL. Cognitive decline is key predictor of disability and NH placement for AL residents⁵. Someone in the US is diagnosed with Alzheimer's disease (AD) every 68 seconds, and the number of dementia sufferers will double by 2050, reaching 16 million⁶. Therefore, the development of new interventions to decrease cognitive decline is critical.

Cognitive training programs are gaining popularity based on the notion that “use it or lose it” applies to cognition^{7,8}. Research demonstrates that training in specific cognitive skills can improve memory, cognitive processing speed, spatial orientation, reasoning, and executive function in community dwelling older adults^{7,9}. Cognitive training can also benefit persons with dementia and mild cognitive decline. A meta-analysis of cognitive training research involving persons with early-stage AD reported overall effect sizes of 0.47 for interventions targeting learning, memory, and executive function, with improvements in activities of daily living (ADLs), problem solving, depression, and self-rated functioning¹⁰.

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A cognitive training intervention called Reasoning Exercises in Assisted Living (REAL) was developed to teach reasoning and problem solving skills to AL residents who are at risk for cognitive and functional decline. The intervention was modeled after the inductive reasoning skills found to improve cognition and maintain self-care over 5 years in healthy, independent older adults¹¹. The REAL program includes six, hour-long, sessions in which providers work individually with AL residents¹². The goal of this intervention is to improve older adults' everyday problem-solving skills so they can maintain their ability to care for themselves and "age in place" in AL. REAL successfully improved problem solving scores of AL residents in a preliminary study¹². Results from a subsequent cluster randomized clinical trial (reported elsewhere) also show potential for this intervention¹³.

REAL is provided to AL residents in a one-to-one format. This approach has been successful. However, having adequate interventionists to provide REAL to individual AL residents is a challenge and is costly. Considering that cost is one predictor of successful dissemination of interventions in real-world settings, more efficient ways to provide REAL to large numbers of AL residents are needed¹⁴. Thus, the purpose of this pilot study was to examine feasibility and compare costs and outcomes for REAL provided in individual versus small group formats.

Individualized Training

REAL was developed based on older adults' learning needs and preferences. This includes a focus on readily useable "need to know" content and experientially learning through application¹⁴. The one-on-one format allows the instructor to assess each participant's comprehension of content and their ability to apply learning in application exercises. One-to-one training overcomes the need to vary the speed and depth of training to meet needs of persons of different cognitive abilities and educational backgrounds. However, one-on-one sessions are costly and require multiple trained interventionists to reach all participants.

Small Group Training

Small group training is a popular and effective format for many behavioral interventions designed to improve health. Topics that naturally lend themselves to group presentations include mental health sessions that capitalize on the therapeutic roles of the leader and other group members. Successful group interventions include smoking and alcohol cessation, educational programs for chronic diseases (like diabetes), and support groups for cancer, HIV, and breastfeeding. Yet, little research has compared group versus individual formats for intervention delivery¹⁵. And research evaluating the effects and preferences for different intervention formats in older adults is lacking. Advantages of group sessions include reduced cost and staffing burden compared to one-to-one sessions. Cost and staffing are important factors that may limit dissemination and implementation across AL facilities¹⁴.

Distinct challenges and complex issues related to group dynamics must be considered when using a group training format. Effects of the group leader, cohesion, entrance to the group, and concerns about performance within the group must all be appreciated. Performance concerns are important for AL residents who frequently compare themselves with others and don't want other residents to notice their cognitive deficits^{16,17}.

The goal of this pilot study was to evaluate the feasibility and preliminary efficacy of REAL provided in group training sessions compared to the original one-on-one format. It was hypothesized that group training would yield less gain on problem solving and functional performance measures. In contrast, group delivery has potential to be less costly and more feasible, increasing the likelihood of future dissemination and implementation across AL settings¹⁸.

Methods

This pilot study compared AL residents participating in group REAL sessions to those who completed one-on-one REAL training in a larger study¹³. Using a wait-list design, control group participants attended REAL training that was modified for group presentation. Figure 1 presents the flow chart for participants in the pilot group and individual format comparison groups.

Sample and Recruitment

One AL facility was recruited to participate in testing the group REAL sessions. Within this facility, individual resident participants (N=12) were invited to participate in the pilot research study testing group REAL training sessions. Participants provided informed consent per study protocols approved by each facility and the University Institutional Review Board for the Protection of Human Subjects. Residents who met inclusion criteria (expressed concerns about cognitive decline and scoring 20 to 28 on the MMSE) were enrolled. Group sessions were scheduled at a time that would not compete with other activities within the setting. Other residents living in the facility were also invited to attend the group REAL program.

The comparison group included participants who received one-on-one REAL training in the parent study¹³. This group met the same inclusion criteria and completed the six individual REAL sessions over a three-week period.

REAL INTERVENTION

Individual Format

REAL was originally designed for one-on-one provision to AL residents in six sessions^{12,13}. Each session or module focuses on a specific topic and uses a workbook to present materials. Topics include introduction to reasoning and problem solving, finding and using resources, medications, eating out, nutritional choices, and review and advanced practice exercises. The materials used large font and colorful illustrations to stimulate interest. The interventionists met with participants one-on-one in a private area to review the workbook program.

Group Format

REAL group sessions were conducted in small groups that ranged in size from 2 to 15 residents. The REAL program content was delivered in a PowerPoint presentation with selected handouts adapted from the workbook. All information content and application exercises were included in both program formats. Like the individually provided sessions,

each group session lasted 45 to 60 minutes and the 6 sessions were provided twice weekly over a three week period.

In preparation for group sessions, research testing physical activity interventions provided to older adults was reviewed. Physical activity training is similar to cognitive training interventions because both allow participants to compare themselves to others in the group. A meta-analysis compared physical activity interventions provided in a variety of formats¹⁹ ranging from home-based programs without interventionist contact, home-based programs with contact (frequently by phone), exercises classes, and “true group” exercise classes. The “true group” format capitalizes on group-dynamics to increase cohesiveness. This meta-analysis found significantly improved outcomes for in-home interventions “with contact” compared to those with no contact. Groups capitalizing on group dynamics were more effective than simple collective classes. In-home interventionist-provided interventions and group classes had equivalent outcomes. These included increased social interaction as well as improved quality of life, adherence, and physiological and functional outcomes.

The group sessions were provided by the same interventionists that provided the individual REAL sessions. One interventionist led all sessions to provide consistency and was assisted by a graduate student. After the REAL group training sessions were completed, outcome measures were collected.

Outcome Measures

The primary outcomes included the Everyday Problems for Cognitively Challenged Elders (EPCCE) assessment²⁰ that measures applied problem solving in response to a written stimulus. A second measure was the Direct Assessment of Functional Status (DAFS), a performance-based measure of ADL and IADL (functional) skills²¹. The Modified Cumulative Illness Scale was collected with each assessment to evaluate whether outcome score differences or changes could be explained by physical health factors or changes (i.e. stroke or hospitalization). The outcome measures were collected in private sessions with individual residents. A different research team member collected baseline and post-intervention assessments to avoid expectation bias.

The costs for providing REAL in each format were tabulated using traditional accounting of costs for set up, scheduling, and administration of the sessions (interventionist time, materials and supplies)²². It was anticipated that the cost of the REAL intervention would be offset by savings in other areas, including self-care, and extended AL residency. Thus, any savings would represent only part of the benefits of REAL, as improved efficacy for solving everyday problems and maintained self-care should also improve quality of life. The focus of the cost analysis was the cost per unit score change in problem solving and self-care performance, measured by differences in EPCCE and DAFS self-care scores post-intervention.

Analyses

One goal of this study was to evaluate the feasibility of providing group compared to one-on-one REAL sessions. Data on enrollment, attendance, and drop-out were compared to

assess feasibility. A second goal was to compare the mean changes in scores on the EPCCE and DAFS measures after REAL training between participants in group (N=4) versus one-on-one presentation formats (N=29). Costs were tabulated by adding expenses for materials and supplies and interventionist time and dividing by the average number of participants (N=10) in the group sessions. Average cost for materials and interventionist time were also tabulated for individual sessions for comparison. These computations allow comparison of the costs for each presentation format in relation to mean score improvements between the groups.

Results

Twelve residents were invited to attend the REAL group sessions. All twelve attended at least one session, but due to scheduling conflicts, only four completed all six REAL sessions. Only those completing all sessions were included in the analysis. An average of five residents who were not part of the research study also attended each group session.

REAL individual session participants lived in four AL facilities that were equivalent on demographic factors and participation and dropout rates¹³. Thirty-six residents were enrolled in this group, but one failed to meet inclusion criteria and five dropped out due to poor vision, illness, or scheduling conflicts.

Table 1 provides demographic information for participants in both groups including their baseline scores on the Mini Mental State Examination²³ and the Modified Cumulative Illness Rating Scale²⁴. Mean score increases were statistically significant for residents trained in the individual format (n = 29), rising both on the Every Day Problems Test for Cognitively Challenged Elders (EPCCE) (d=3.10, p<0.01) and the Direct Assessment of Functional Status (DAFS) (d=3.52, p<0.001). Participants in the group format training (N=4) had mean score increases of 2.75 on the EPCCE and 3.5 for DAFS measures. Due to the small sample size, only descriptive statistics were used to evaluate score changes in the small group. Figure 2 shows EPCCE and DAFS scores for residents during their participation as controls (Times 1–4) and after participating in group REAL training (Time 5). Table 2 provides the mean baseline, post-intervention, and change scores yielded by the two training formats.

The REAL training provided in the one-to-one format cost \$132 per participant, whereas training in small groups cost an estimated \$25.60 per person. Costs in relation to group assignment and improvement scores are displayed in Table 2.

Discussion

One aim of the pilot study was to evaluate the feasibility of providing group versus individual REAL training. Although all twelve participants in the group pilot attended at least one session, only one-fourth of the group participants completed all six sessions. This is a smaller proportion than those completing individualized REAL training. Group sessions were held only once on a set schedule, while the individual sessions were arranged by appointment with the interventionist for subsequent sessions, allowing flexibility for each participant's unique schedule. Although no facility activities conflicted with the group

sessions, many residents had other appointments such as clinic visits, outings with family and friends, and beauty appointments. Although individualized scheduling increased participation in the sessions, the costs for multiple interventionist visits to meet divergent resident scheduling needs are reflected in the total session costs. Future research should explore scheduling group sessions farther in advance and offering each session at multiple times. Collection of outcome scores for participants not completing all sessions would also be valuable evaluative information.

REAL presented in both the individual and group formats improved mean scores on problem solving and functional assessments. As hypothesized, individual REAL training score gains were greater than those for group session participants. But based on a cost of \$132 per participant for individual sessions, the cost per unit change (rise in score of one point) was \$42.48 for the EPCCE and \$37.71 for DAFS. In contrast, group training was less expensive, but also yielded slightly lower score improvements. Based on a cost of \$25.60 per person (considering a group size of 10 participants), the cost per unit change (increase in score by one point) in EPCCE is \$9.31 and DAFS is \$7.31. Future research is needed to establish the significance of each unit of score change in relation to actual self-care functioning and length of residency in AL.

The reported score improvement results are similar to those reported for interventions promoting health and physical activity^{15,19} with parallel improvements noted for both individual and small group interventions. Nevertheless the sample size in this pilot study was very limited, so the results must be interpreted with caution and replicated in a larger sample. In addition, the group real participants were recruited from one facility that volunteered; so the results from this study may not generalize to other AL facilities.

Potential confounding factors should be considered and controlled for in ongoing research. Participation rates differed by facility. Differences in recruiting and retention reflected the level of support and enthusiasm of facility staff. Interventionist presentations skills and the group dynamics or culture in each facility can also vary and differentially impact group sessions¹⁶. AL residents may be reluctant to participate in a group where cognitive deficits might be noticed by others. Performance anxiety concerns may be reduced by a skillful instructor and by emphasizing potential cognitive improvement from group training. An alternative approach would provide sessions in smaller groups of residents with similar scores on cognitive tests, so that the interventionist can tailor pace and content appropriately. Instructor assistants may be helpful in these groups.

This pilot study provides directions for future research. For older adults who had limited opportunities to socialize, the one-on-one attention and relationship with a consistent interventionist could have significantly influenced the outcomes. A randomized clinical trial of REAL tested an attention control intervention that did not increase problem solving and functional scores. A no attention control condition also failed to demonstrate gains in scores that may have occurred due to outcome measure practice effects¹³.

This study suggests a number of foci for ongoing research. Interventions focused on cognitive training may require a unique format that differs compared to other health

promotion interventions. Using computer-based formats may be appealing; however the lack of contact with a professional could impact outcomes and should be carefully evaluated. There may also be other qualitative differences between cognitive and physical health promotion interventions. Additional research evaluating how older adults respond to group versus individual training formats across interventions is needed.

The rigor of this study is limited by the small sample size for the group intervention. In addition, the group sessions included other facility residents who were not consented or screened (and may not have met the inclusion criteria). These attendees may have affected the group dynamics and outcomes. Due to the low rate of completion, methods to schedule group sessions to encourage consistent participation should be explored. Despite the differences between the four group REAL participants' cognitive abilities, on average their scores improved. This suggests that REAL could be effective across a variety of cognitive levels. If similar gains in functional outcomes can be achieved on a larger scale, the less costly group format is more realistic for dissemination across AL settings. Group REAL training could be incorporated into regular AL facility activities where it could improve the lives and promote aging in place for the growing population of AL residents.

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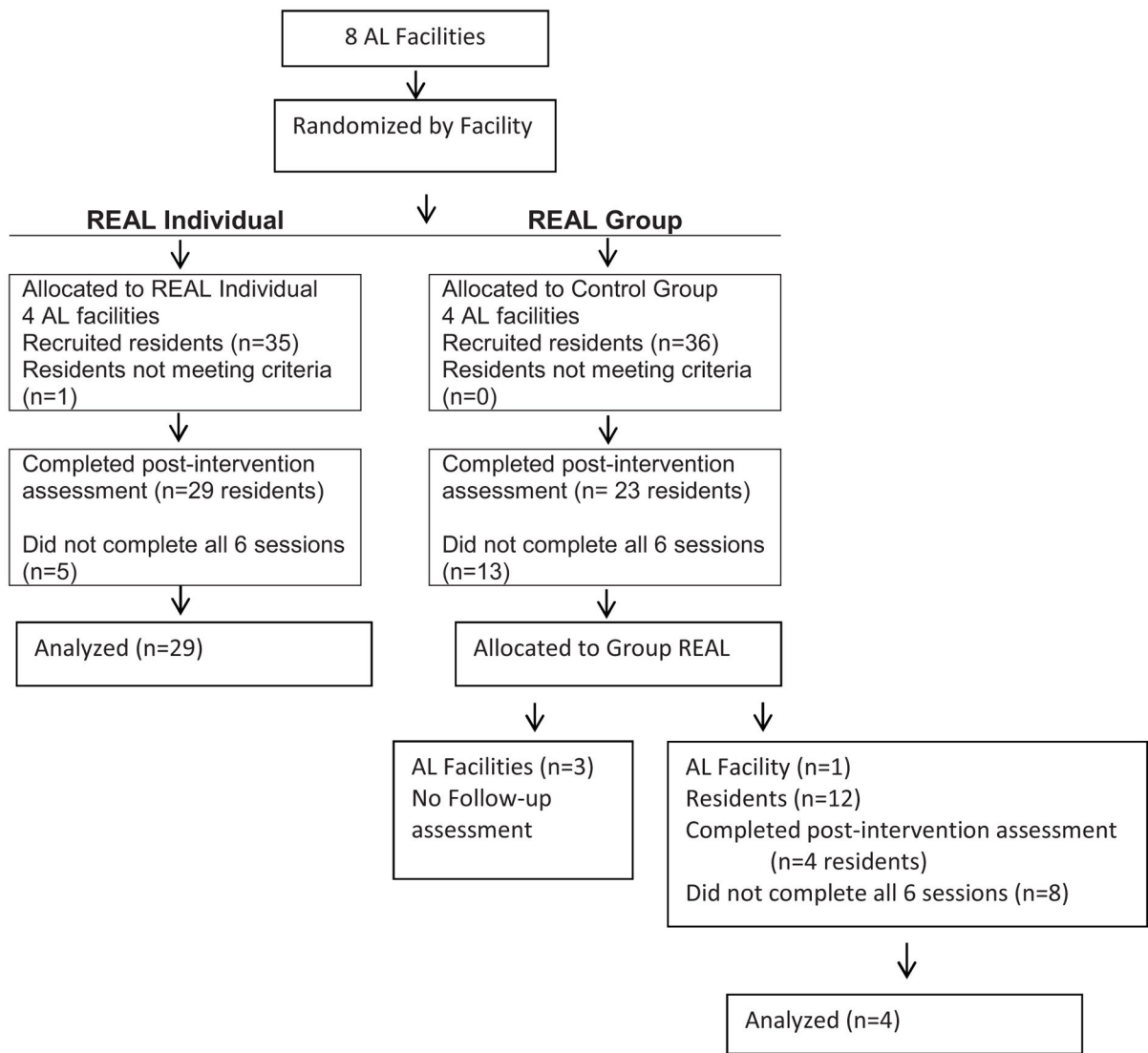


Figure 1.
Participant flow through study.
REAL, Reasoning Exercises in Assisted Living; AL, Assisted Living.

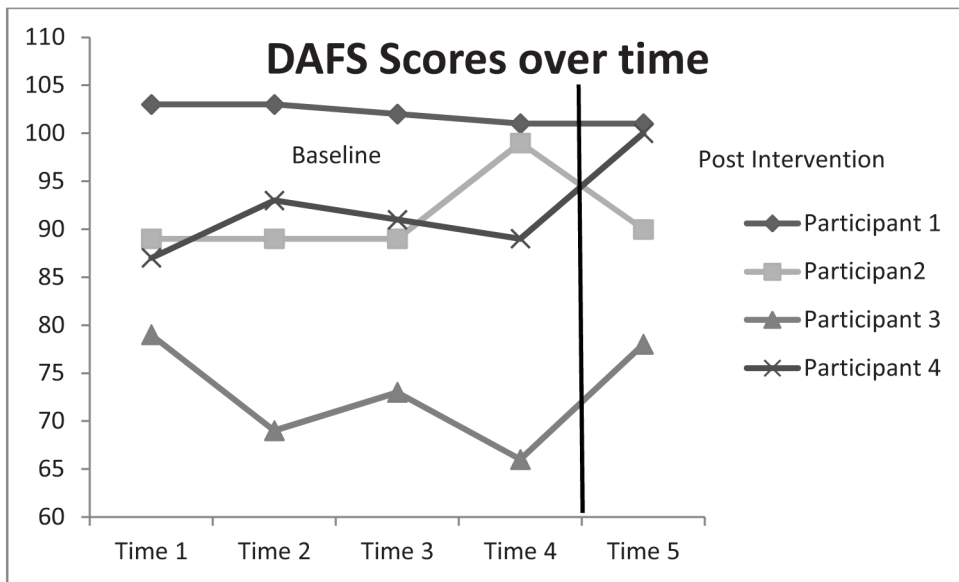
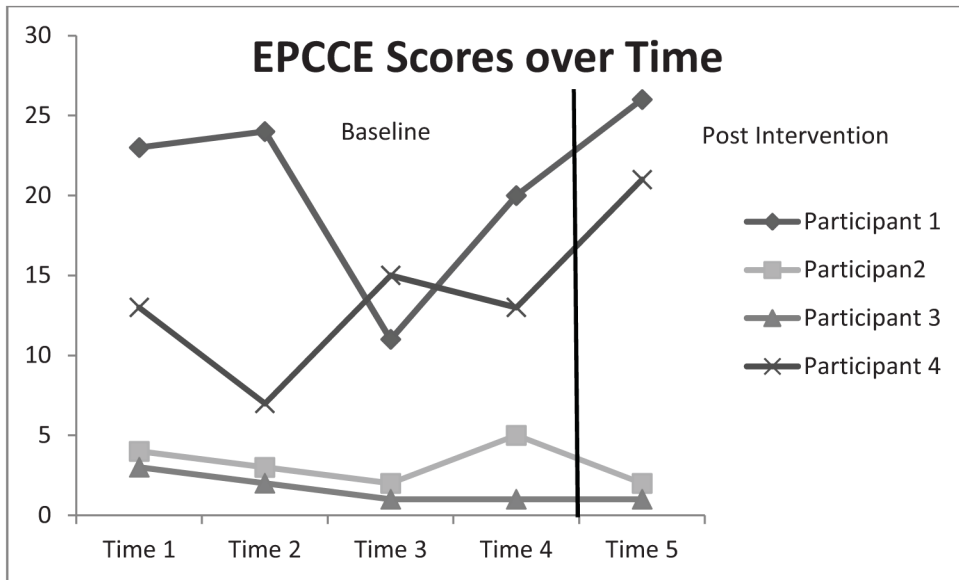


Figure 2. Group REAL participants’ EPCCE and DAFS score trajectories over entire study period. Times 1–4 are no intervention control assessment scores. Time 5 assessment scores are collected after the group REAL intervention. EPCCE, Everyday Problems for Cognitively Challenged Elders; DAFS, Direct Assessment of Functional Status; REAL, Reasoning Exercises in Assisted Living

Table 1

Baseline Characteristics of Assisted Living Residents

Characteristic	REAL Individual	REAL Group
Age, mean (SD) years	86 (5.9)	83 (3.3)
Gender		
Male	12	0
Female	17	4
MMSE score, mean (SD)	25.6 (2.7)	22.0 (4.7)
MCIS score, mean (SD)	25.7 (4.1)	25.5 (1.3)

SD, Standard Deviation; MMSE, Mini Mental State Examination; MCIS, Modified Cumulative Illness Scale

Table 2

Scores and baseline differences for EPCCE and DAFS at Baseline and Post intervention and costs of REAL training by training format.

Intervention Group	Immediately Pre-Intervention	Post Intervention	Cost per Unit of Change
<u>REAL Individual</u>			
EPCCE mean (SD)	12.69 (7.6)	15.79 (8.5)	
* bc difference mean (SD)		3.10 (5.2)	\$42.48
DAFS mean (SD)	93.41 (7.7)	96.93 (6.9)	
bc difference mean (SD)		3.52 (7.2)	\$37.71
<u>REAL Group</u>			
EPCCE mean (SD)	9.75 (8.5)	12.50 (12.9)	
* bc difference mean (SD)		2.75 (5.1)	\$9.31
DAFS mean (SD)	88.75 (16.0)	92.25 (10.7)	
* bc difference mean (SD)		3.5 (9.9)	\$7.31

* bc, individual baseline centered mean; SD, Standard Deviation.