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Self-help memory training for healthy older adults in a residential care center: specific and transfer effects on performance and beliefs

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Background: Cognitive flexibility has repeatedly been shown to improve after training programs in community-dwelling older adults, but few studies have focused on healthy older adults living in other settings.

Objectives: This study investigated the efficacy of self-help training for healthy older adults in a residential care center on memory tasks they practiced (associative and object list learning tasks) and any transfer to other tasks (grocery lists, face–name learning, figure–word pairing, word lists, and text learning). Transfer effects on everyday life (using a problem-solving task) and on participants' beliefs regarding their memory (efficacy and control) were also examined. With the aid of a manual, the training adopted a learner-oriented approach that directly encouraged learners to generalize strategic behavior to new tasks. The maintenance of any training benefits was assessed after 6 months.

Method: The study involved 34 residential care center residents (aged 70–99 years old) with no cognitive impairments who were randomly assigned to two programs: the experimental group followed the self-help training program, whereas the active control group was involved in general cognitive stimulation activities.

Results: Training benefits emerged in the trained group for the tasks that were practiced. Transfer effects were found in memory and everyday problem-solving tasks and on memory beliefs. The effects of training were generally maintained in both practiced and unpracticed memory tasks.

Conclusion: These results demonstrate that learner-oriented self-help training enhances memory performance and memory beliefs, in the short term at least, even in residential care center residents.

Key words: self-help memory training; learner-oriented approach; older adults; residential care center; transfer effects; maintenance effects
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Introduction

A longer life expectancy carries a higher likelihood of older adults being institutionalized, so it is worth assessing the benefits of memory intervention for people no longer living in the community. One reason why this is important is because of the role of the environment in influencing older adults' cognitive functioning (Williams and Kemper, 2010). Institutionalization impoverishes an individual's environment, leading to a

faster cognitive decline (see Volkers and Scherder, 2011). It may therefore be beneficial for residential geriatric services to offer residents appropriate mental training activities to minimize this effect and preserve an adequate cognitive functioning wherever possible. Memory training is one such activity. To the best of our knowledge, few studies (Günther *et al.*, 2003; Carretti *et al.*, 2011; Vranic *et al.*, 2013) have investigated the benefits of memory training for healthy older people no longer living in the community. Hence, the present research examines the efficacy of memory intervention for healthy older adults in a residential care center.

One of the interventions recently proposed to improve the memory of community-dwelling older adults is the "learner-oriented approach" (Cavallini *et al.*, 2010; Bottiroli *et al.*, 2013). In the more common "trainer-oriented approaches," older adults learn strategies but are not taught to apply them to new tasks to sustain the positive effect on their memory in other situations. This approach has generally failed to achieve transfer effects on untrained tasks (Rebok *et al.*, 2007). Using the learner-oriented approach, on the other hand, participants become active partners in the effort to obtain a generalized effect of the training on tasks other than those practiced. Participants are taught to extend the strategies they have learned to other tasks too, and they receive information on how to adapt these strategies to new material. Because metacognitive theory emphasizes that the effective spontaneous use of strategies involves analyzing the characteristics of a task and using strategies adapted to its features (Lemaire, 2010), including a strategy-adaptation component in memory training interventions may be the innovative key to their success. The assumption behind this new approach is that telling older adults how to adapt memory strategies makes it easier for them to do so when faced with other memory-demanding tasks (McDaniel and Bugg, 2012). Learner-oriented training appears to be effective in older adults, in both trained and transfer tasks, be it delivered by a trainer or in the form of a self-help manual (Bottiroli *et al.*, 2013). The latter method consists of memory training sessions completed at home following instructions provided in a manual describing a set of strategies and prompting readers to practice with them. Self-help manuals have generated promising results, and this method seems to be particularly valuable (Hastings and West, 2009; Bailey *et al.*, 2010) because (i) it is less expensive to administer than group training sessions and (ii) interventions can be customized. People may also be more likely to apply strategies they have learnt to everyday life if these strategies were learnt in their own environment.

The goal of the present study was to test the efficacy of self-help training based on a learner-oriented approach for older adults in a residential care center. To achieve this goal, we adopted the same procedure as Bottiroli *et al.* (2013) used with community-dwelling older adults. The benefits of this intervention appear to stem from having discussed with participants how to apply the strategies they learnt to other tasks too (i.e., transfer instructions) and having asked them questions that prompted them to analyze a memory task and adapt the strategies as necessary before completing it. In our study, we adapted the same materials to our sample of residential care center residents (by reducing the tasks' complexity and length), because the age range of our sample was also older than in the Bottiroli study. We looked for (1) any benefit of the training on the tasks practiced; (2) any transfer effects on memory tasks, everyday life cognitive functioning (i.e., everyday problem solving), and memory beliefs; and (3) any long-term effects after 6 months. To assess the efficacy of the strategy-adaptation component characterizing our training, the memory tasks were separated into tasks that were practiced, tasks for which transfer instructions were given during the training, and transfer tasks neither practiced nor discussed. The difference between these categories lay in how much they were practiced and discussed during the training.

We predicted that our learner-oriented approach would generate gains for the trained group in the tasks practiced and transfer effects on the other tasks by comparison with the control group (Bottiroli *et al.*, 2013). Concerning memory beliefs, encouraging participants to think they could improve and control their memory might change their beliefs and induce them to engage effectively in activities of everyday life. As for any long-term effects, maintenance effects were expected for the tasks actually practiced and also explored for the transfer tasks.

Method

Participants

Participants were healthy native Italian speakers. The inclusion criteria were a score of at least 27 on the Mini-Mental State Examination (Folstein *et al.*, 1975), no psychiatric or neurological diseases, and no cognitive impairments. Participants were recruited during a meeting at a residential care center in Treviso (ISRAA), Italy, where residents are self-sufficient and have no particular health issues but have opted to live

Table 1 Demographic characteristics of the trained and control groups

	Trained group		Control group	
	N = 16		*N* = 18	
	M	*SD*	*M*	*SD*
Age	83.19	7.34	87.06	5.30
Education	9.94	4.72	8.94	3.53
Vocabulary	41.44	6.69	39.78	6.66
MMSE	27.76	2.45	28.80	1.51

MMSE, Mini-Mental State Examination.
Maximum vocabulary score = 50; maximum MMSE score = 30.

in a "protected" environment because they feel safer, they find running a household too tiring, and so on. At this meeting, participants were invited to take part in some cognitive activities. Thirty-six of the older adults were eligible, and they all volunteered for the study. They were randomly assigned to two groups, experimental training or active control. Two participants assigned to the training group dropped out before the study began because of poor health. Of the other 34 (aged 70–99 years old), 16 completed, the training and 18 served as controls.

The trained and control groups did not differ significantly in age, years of education, or scores in a vocabulary test (drawn from the Primary Mental Abilities test; Thurstone and Thurstone, 1963) that involved identifying synonyms for 50 target words in 8 min, or in the Mini-Mental State Examination (Folstein *et al.*, 1975; Table 1; for all, $F < 3.15$).

Materials

Tasks that were practiced. ***Associative learning.*** Participants were shown 20 word pairs printed on index cards, then the first word in the pair was presented individually, and they were asked to write down the second word in the pair.

Object list learning. Participants were shown 15 words naming common objects (e.g., umbrella) printed on index cards, then they were asked to write down as many object words as they could remember (in any order).

Tasks for which transfer instructions were given during the training. ***Grocery list learning.*** Participants were shown 15 grocery items (e.g., butter) printed on index cards, then they were asked to write down as many grocery items as they could remember (in any order).

Face–name learning. Participants were shown 10 black and white photographs of faces with names printed below them, then each face was presented separately, and they were asked to write down the name previously paired with it.

Transfer tasks (neither practiced nor discussed during the training). ***Figure–word pairing.*** Participants were shown 20 index cards with a figure and a word printed below it, then each figure was presented separately, and they were asked to write down the word that had previously been paired with it.

Word list learning. Participants were shown 15 words printed on index cards, then they were asked to write down as many words as they could remember.

Text learning. Participants read a story containing 35 main ideas, then they were asked to write as much of the story as possible. One point was awarded for each main idea recalled.

All these tasks (adapted from Bottiroli *et al.*, 2013) were presented visually and self-paced, and participants were given up to 15 min to commit the target stimuli to memory (except for the face–name pairs, for which they had 10 min). The dependent variable for all tasks was the number of stimuli correctly recalled.

Everyday Problems Test. This paper and pencil test (adapted from the 42 item version; see for example Willis and Marsiske, 1993, by Borella, Cantarella, Carbone, and De Beni) measures the ability to solve problems of daily living. We selected those stimuli/situations closest to the Italian culture. This led to 10 stimuli, with two open-ended questions each, representing "real-life" situations covering the instrumental activities (e.g., consumer/shopping). Participants answered questions about how they would solve them (the final score per session was the total number of appropriate answers, max = 10).*

*Preliminary analyses on the 10 stimuli showed an acceptable reliability, $\alpha = 0.70$.
The areas covered concern household management, health/medication use, consumer/shopping, financial management, phone bill, transportation, and food preparation. In particular, for the household area, a washing machine troubleshooting list and instructions about stain removal stimuli were presented. For the transportation area, taxi rates stimulus was presented. For the food preparation area, the stimuli concerned instructions on how to defrost vegetables. For the financial management area, a catalog mail order information stimulus was presented. For the health/medication use area, stimuli concerning the use of an elastic bandage and instructions on taking medicine for a cough were presented. For the consumer area, a membership application form and hotel solutions for a vacation stimuli were presented. Finally, for the phone scale, stimulus concerning a phone bill chart was presented.

Table 2 Description of training sessions by group

Session	Timing	Trained group	Control group
Pretest	Week 1		
Session 1	Day 1	Demographic questionnaire, MMSE, vocabulary test, associative learning test, figure–word pairing test, object list learning test, and text learning	
Session 2	Day 3	Grocery list learning, word list learning, face–name learning, EPT, and PBMI tasks	
Pre-training	Day 5	(a) The experimenter explains the training timeline (b) The two mnemonic devices (sentence creation and interactive imagery) to use during the training are explained (see below) (c) Practice on three concrete paired associates (d) The strategy-adaptation questions are presented and explained (1) *Does the memory task involve a cue, and if so, what is it?* (2) *What is the nature of the materials that you need to add meaning to?* (3) *How can you adapt sentences and images to help you to meaningfully process the materials to learn?*	Presentation of the activity program by the experimenter and delivery of the timetable
	Day 5	Manual delivery. Participants were given a manual containing five lessons on how to use two mnemonics (sentence generation and interactive imagery) and strategy adaptation (the three questions for adapting strategies to new materials), and six practice sessions. In lesson 1, participants were presented with pairs of associated words, and they were asked to answer the three strategy-adaptation questions. Lesson 2 introduced the object list task, and participants were asked to answer the same three questions for this task. Lessons 1 and 2 both ended with two practice sessions on each type of material. Lesson 3 involved stimulating participants to think about how to adapt these mnemonics to grocery lists and to face–name learning tasks by answering the three questions for these new materials (without any previous practice). Lessons 4 and 5 consisted in a brief summary of the previous explanations and practice sessions on increasing numbers of pairs and objects to learn. Each time participants were presented with new material and asked to answer the three questions, they were given instructions on the type of task and an example of an item for the type of material involved. Each time they answered the three questions, they were given the solutions in the following pages of the manual. The structure of the five lessons and of the corresponding six practice sessions is outlined below.	
Lesson 1	Week 2	(a) Description of the two mnemonics (sentence creation and interactive imagery) referred to associated pairs of words, with examples	Newspaper reading. For example, the experimenter suggested that participants follow a political debate without focusing on how to interpret it or on how to identify the main information in the text.
	Day 9	(b) Presentation and explanation of the strategy-adaptation questions referred to associated pairs of words (1) *Does the memory task involve a cue, and if so, what is it?* The task involves a cue (i.e., the first word of each pair); (2) *What is the nature of the materials that you need to add meaning to?* The task includes verbal materials, comprising pairs of words (3) *How can you adapt sentences and images to help you to meaningfully process the materials to learn?* You can devise sentences to link the words in each pair together in a meaningful	

(*Continues*)

Table 2. (Continued)

Session	Timing	Trained group	Control group
		way. For instance, for the pair "spruce - balcony," you can use a sentence such as "the tip of the spruce touches the balcony," or you can mentally visualize this. (c) Practice on five associated pairs of words with a time limit of 5 min (Practice session #1) (d) Practice on 10 associated pairs of words with a time limit of 10 min (Practice session #2)	
Lesson 2	Week 2 Day 12	(a) Brief summary of the previous explanations on the two mnemonics and on strategy adaptation (b) Explanation of the strategy-adaptation questions referred to object list learning (1) *Does the memory task involve a cue, and if so, what is it?* This task has an internal cue. Starting from the mnemonics used to group the single object words, a cue can be identified with the number of object word groups obtained and with a key word related to each group; (2) *What is the nature of the materials that you need to add meaning to?* The material is verbal and concrete. (3) *How can you adapt sentences and images to help you to meaningfully process the materials to learn?* You can devise sentences and interactive images to link the objects together. For instance, for the objects "mozzarella," "glasses," and "newspaper," you could use a sentence such as "While I was eating my mozzarella, I dropped my glasses onto the newspaper," or you mentally visualize this happening. (c) Practice session with five objects to learn with a time limit of 5 min (Practice session #3) (d) Practice session with 10 objects to learn with a time limit of 10 min (Practice session #4)	Crossword puzzle. Participants were given two crossword puzzles. At the end, they checked whether their answers were correct.
Lesson 3	Week 3 Day 15	(a) Brief summary of previous explanations on the two mnemonics and on strategy adaptation (b) Answer the strategy-adaptation questions referred to grocery list learning (1) *Does the memory task involve a cue, and if so, what is it?* This task has an internal cue. Starting from the mnemonics used to group the grocery list items, a cue can be identified with the number of groups obtained and with a key word related to each group. (2) *What is the nature of the materials that you need to add meaning to?* The material is verbal and concrete. (3) *How can you adapt sentences and images to help you to meaningfully process the materials to learn?* You can devise sentences and interactive images to link the grocery list items together. For instance, to remember "ice cream" and "basil," you could use a sentence such as "It is too cold to eat a basil-flavored ice cream." (c) Answer the strategy-adaptation questions referred to the face–name learning task (1) *Does the memory task involve a cue, and if so, what is it?* The task involves a cue (i.e., the face on each photograph).	Music workshop. The experimenter proposed different types of classical music, and participants had to write the emotions they correlated with the music they heard.

(*Continues*)

Table 2. (Continued)

Session	Timing	Trained group	Control group
		(2) *What is the nature of the materials that you need to add meaning to?* The task includes visual materials (faces) and verbal materials (surnames). (3) *How can you adapt sentences and images to help you to meaningfully process the materials to learn?* First step: Make the surname concrete by giving it a personal meaning. Some surnames already have a meaning (e.g., Bald Red, Hall, Stone) or are well known (e.g., Bush, Clinton, Miller, Gere). Others demand a greater effort to make them meaningful, such as Spidersen (Spiders-en), Olson (Old-son), and so on. Second step: Pay attention to distinctive and stable features of the face, such as scars, hair, eyes, teeth, and lips. Third step: Link the face with the surname by creating a sentence or image such as "Mr. Bald has a lot of hair," where the surname Bald is in contrast with his thick hair.	
Lesson 4	Week 3 Day 18	(a) Brief summary of previous explanations on the two mnemonics and on strategy adaptation (b) Practice session with 15 pairs to learn with a time limit of 15 min (Practice session #5)	Physical activity: walking
Lesson 5	Week 4 Day 21	(a) Brief summary of previous explanations on the two mnemonics and on the strategy adaptation (b) Practice session with 15 objects to learn with a time limit of 15 min (Practice session #6)	Text writing. The experimenter asked participants to invent and write a story with a content and a main character of their own choice.
Posttest	Week 4		
Session 1	Day 23	Associative learning, figure–word learning, object list learning, and text learning tasks	
Session 2	Week 4 Day 25	Grocery list learning, word list learning, face–name learning, EPT, and PBMI tasks	
Follow-up	Week 28		
Session 1	Day 189	Associative learning, figure–word pairing, object list learning, and text learning tasks	
Session 2	Day 191	Grocery list learning, word list learning, face–name learning, EPT, and PBMI tasks	

MMSE, Mini-Mental State Examination; EPT, Everyday Problem Test; PBMI, Personal Beliefs about Memory. Both the trained group and the controls met individually with the experimenter once a week to (a) make sure that their activities had been completed (both groups) and (b) give materials and discuss the activities that they had to do during the week (control group only).

Memory beliefs. ***Personal beliefs about memory.*** Participants were shown a subset of items from the Personal Beliefs about Memory Instrument (PBMI; Lineweaver and Hertzog, 1998) assessing their convictions about their global memory efficacy (three items; $\alpha = 0.81$) and control (four items; $\alpha = 0.71$). A visual analog scale was used to record their opinions. They rated their answers with a mark along a line 100 mm long with the ends marked 0 (lowest) to 100 (highest). The distance from the midpoint on the scale was subtracted from all ratings, generating scores ranging from −50 to +50.

Parallel versions were used at the pretest, posttest, and follow-up stages for all tasks except the PBMI.

Procedure. Participants attended six 1-h test sessions, two at the pretest (week 1), two at the posttest (week 4), and two at the follow-up stage 6 months later (Table 2).

After administering practice tasks at a 1-h pretraining session, a trainer met participants individually and briefly explained how to use the training manual and practice with it over the next 3 weeks. The manual contained five lessons (Table 2) explaining the use of mnemonics (sentence generation and interactive imagery) and strategy adaptation (with three questions to prompt readers to adapt strategies to new materials), and six practice sessions. Participants brought their completed assignments to the posttest session for the experimenter to check.

Participants in the active control group took part in a 3-week period of other unstructured individual cognitive activities (such as newspaper reading). The rationale was to propose general cognitive stimulation activities so as to see whether a structured training,

Table 3 Descriptive data (means and standard deviations) for pretest, posttest, and follow-up by group

	Trained group						Control group					
	Pretest		Posttest		Follow-up		Pretest		Posttest		Follow-up	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Tasks that were practiced												
Associative learning	1.75	2.08	6.94	2.82	5.00	2.68	1.78	2.29	1.44	2.38	0.67	1.68
Object list learning	3.88	1.59	8.50	2.07	7.69	1.95	3.50	1.69	3.67	2.14	3.17	1.47
Tasks on which instructions were given												
Grocery list learning	4.75	2.32	9.37	2.19	8.31	2.09	4.22	2.34	3.94	2.53	4.06	1.66
Face–name learning	1.25	1.65	3.25	1.81	1.56	1.63	0.61	0.98	0.67	0.97	0.44	0.98
Transfer tasks												
Figure–word pairing	4.19	2.59	11.56	3.12	7.88	3.81	4.11	3.16	4.33	2.91	1.89	2.08
Word list learning	3.69	1.85	7.75	2.27	6.56	2.45	3.17	1.42	3.00	1.85	3.11	1.02
Text learning	9.44	5.06	13.13	6.07	8.88	4.95	7.44	4.13	9.61	5.60	5.67	3.75
EPT	6.69	2.18	9.00	1.59	7.31	1.99	6.78	1.87	6.50	1.95	6.28	1.81
Memory beliefs												
PBMI global memory efficacy	0.42	14.29	6.35	7.66	4.17	9.47	−0.46	10.48	−1.39	8.93	−5.37	12.82
PBMI memory control	6.72	12.08	15.16	5.08	6.48	9.14	1.73	11.28	−0.75	11.19	−2.57	10.88

EPT, Everyday Problem Test; PBMI, Personal Beliefs about Memory.

Table 4 Results of ANOVA for the pretest measures, with group (trained and control) as the between-subjects factor

	$F(1, 32)$	n_p^2	p
Tasks that were practiced			
Associative learning	<1	0.01	0.971
Object list learning	<1	0.01	0.511
Tasks for which instructions were given			
Grocery list learning	<1	0.01	0.515
Face–name learning	1.93	0.05	0.174
Transfer tasks			
Figure–word pairing	<1	0.01	0.939
Word list learning	< 1	0.03	0.362
Text learning	1.60	0.05	0.216
EPT	<1	0.01	0.897
Memory beliefs			
PBMI global memory efficacy	< 1	0.01	0.838
PBMI memory control	1.56	0.05	0.223

EPT, Everyday Problem Test; PBMI, Personal Beliefs about Memory.

even when self-administered alone, worked better than alternative cognitive activities.

The procedure and the schedule adopted are shown in Table 2.

Results

Descriptive statistics are provided in Table 3.

The two groups did not differ significantly in any of the pretest measures, as assessed using an analysis of variance (ANOVA; see Table 4).

To assess the effects of training, the measures of interest were analyzed using a 2 (Group: trained vs control) by 3 (Session: pretest, posttest, follow-up) mixed design ANOVA.[†] Significant interactions were followed up using *post hoc* pairwise comparisons with the significance level adjusted using Bonferroni's correction to account for multiple comparisons ($p < 0.05$). The results of the ANOVA are summarized in Table 5.

Tasks that were practiced. For associative learning, the trained participants' performance improved from pretest to posttest ($p < 0.001$), and from pretest to follow-up ($p < 0.01$), but deteriorated from posttest to follow-up ($p < 0.001$). There were no significant differences across sessions for the control group. The trained group outperformed the control group at both posttest and follow-up.

For object list learning, the trained participants' performance increased from pretest to posttest and follow-up (for both $p < 0.001$), with no difference between posttest and follow-up. There were no significant differences across sessions for the control group. The trained group outperformed the control group at both posttest and follow-up.

Tasks for which transfer instructions were given during the training. For grocery list learning, the trained participants' performance improved from pretest to posttest and follow-up (for both $p < 0.001$), with no difference between posttest and follow-up. There were no significant differences across sessions in the control group. The trained group outperformed the control group at both posttest and follow-up.

Table 5 Results of mixed design 2 × 3 ANOVA for the measures of interest, with group (trained and control) as the between-subjects factor, and session (pretest, posttest, and follow-up) as a repeated measure

Specific effect			*F*	d.f.	MSE	n_p^2	*p*
Tasks that were practiced							
Associative learning	Between subjects	Group (G)	21.88	1/32	12.39	0.41	<0.001
	Within subjects	Session (S)	24.86	2/64	2.02	0.44	<0.001
		G × S	35.59	2/64	2.02	0.57	<0.001
Object list learning	Between subjects	Group (G)	47.78	1/32	5.59	0.60	<0.001
	Within subjects	Session (S)	23.21	2/64	2.24	0.42	<0.001
		G × S	23.45	2/64	2.24	0.42	<0.001
Tasks for which instructions were given							
Grocery list learning	Between subjects	Group (G)	31.74	1/32	9.28	0.50	<0.001
	Within subjects	Session (S)	16.64	2/64	2.66	0.34	<0.001
		G × S	20.88	2/64	2.66	0.40	<0.001
Face–name learning	Between subjects	Group (G)	13.21	1/32	4.03	0.29	0.001
	Within subjects	Session (S)	14.32	2/64	0.78	0.31	<0.001
		G × S	11.17	2/64	0.78	0.26	<0.001
Transfer tasks							
Figure–word pairing	Between subjects	Group (G)	26.99	1/32	18.47	0.46	<0.001
	Within subjects	Session (S)	33.81	2/64	4.07	0.51	<0.001
		G × S	30.40	2/64	4.07	0.49	<0.001
Word list learning	Between subjects	Group (G)	38.50	1/32	5.58	0.55	<0.001
	Within subjects	Session (S)	14.62	2/64	2.35	0.31	<0.001
		G × S	16.95	2/64	2.35	0.35	<0.001
Text learning	Between subjects	Group (G)	3.78	1/32	56.66	0.11	0.061
	Within subjects	Session (S)	17.47	2/64	8.64	0.35	<0.001
		G × S	0.64	2/64	8.64	0.53	0.53
EPT	Between subjects	Group (G)	5.70	1/32	5.88	0.15	0.023
	Within subjects	Session (S)	4.41	2/64	2.50	0.12	0.016
		G × S	5.72	2/64	2.50	0.15	0.005
Memory beliefs							
PBMI global memory efficacy	Between subjects	Group (G)	3.50	1/32	266.26	0.10	0.071
	Within subjects	Session (S)	2.10	2/64	43.46	0.06	0.131
		G × S	4.07	2/64	43.46	0.11	0.024
PBMI memory control	Between subjects	Group (G)	10.87	1/32	232.98	0.25	0.002
	Within subjects	Session (S)	5.61	2/64	41.82	0.15	0.006
		G × S	6.17	2/64	41.82	0.16	0.004

EPT, Everyday Problem Test; PBMI, Personal Beliefs about Memory.

For face–name learning, the trained participants' performance improved from pretest to posttest ($p < 0.001$) and deteriorated from posttest to follow-up ($p < 0.001$); there was no difference in performance between pretest and follow-up. There were no significant differences across sessions in the control group. The trained group outperformed the control group at both posttest and follow-up.

Transfer tasks (neither practiced nor discussed during the training). For figure–word pairing, the trained participants' performance improved from pretest to posttest ($p < 0.001$), whereas pretest and follow-up performance were much the same, that is, performance deteriorated again from posttest to follow-up ($p < 0.001$). There were no significant differences across sessions in the control group. The trained group outperformed the control group at both posttest and follow-up.

For word list learning, the trained participants' performance improved from pretest to posttest and follow-up (for both $p < 0.001$), but remaining the same between posttest and follow-up. There were no significant differences across sessions in the control group. The trained group outperformed the control group at both posttest and follow-up.

For text learning, participants' performance was better at posttest than at pretest or follow-up (for both $p < 0.001$), whereas at pretest and follow-up, it was much the same. The interaction was not significant.

In the Everyday Problem Test (EPT), the trained participants' performance improved from pretest to posttest ($p < 0.001$), whereas pretest and follow-up performance were much the same; performance deteriorated from posttest to follow-up ($p < 0.001$). There were no significant differences across sessions in the control group. The trained group outperformed the control group at both posttest and follow-up.

Memory beliefs. In the PBMI, trained participants' beliefs about the efficacy of their memory were better at posttest than at pretest ($p < 0.05$). The differences between posttest and follow-up or between pretest and follow-up were not significant. There were no significant differences across sessions in the control group. The trained group's beliefs were more positive than the control group's at both posttest and follow-up.

In terms of memory control, trained participants judged their memory control better at posttest than at pretest ($p < 0.005$) or follow-up ($p < 0.005$), with no differences between pretest and follow-up. There were no significant differences across sessions in the control group. The trained group reported more positive beliefs than the control group at both posttest and follow-up.

To better illustrate the range of training gains and transfer effects between pretest and posttest, Cohen's *d* (1988) was calculated, expressing the effect size of the comparisons and corrected using the Hedges and Olkin (1985) correction factor to avoid the small sample bias. Comparisons of the gains from pretest to posttest within each group revealed generally large effect sizes (greater than 0.80) in the trained group (Figure 1), except for text learning ($d = 0.64$) and the participants' rating of the efficacy of their memory ($d = 0.49$). Small effect sizes were found for the control group.

For the pretest and follow-up (maintenance of the gains), effect sizes remained large in the trained group for associative learning ($d = 1.32$), object list learning ($d = 2.09$), grocery list learning ($d = 1.57$), figure–word pairing ($d = 1.10$), and word list learning ($d = 1.29$). For the other tasks, the effect sizes were small (lower than 0.29).

In the control group, the short-term and maintenance gains were in the range of small effect sizes.

Discussion

Consistent with our expectations, the self-help training that we proposed to a sample of older adults living in a residential care center yielded performance gains in tasks they had practiced (associative and object list learning) and also in tasks for which they had received transfer instructions during the training (grocery list and face–name learning). These gains also extended to new tasks for which they had neither practiced nor received any instructions, such as figure–word pairing and word list learning. These findings confirm the effectiveness of a learner-oriented approach in promoting memory performance and transfer effects (Bottiroli *et al.*, 2013), even in residential care center residents. The benefits of this intervention can thus be associated with the approach used in the training manual: After presenting memory strategies in the first part, it contained questions to induce participants to analyze a task and to consider how they might apply the strategies they had learned to other tasks with the aid of instructions (assisted strategy transfer) and even to new memory tasks (unassisted strategy transfer; Bottiroli *et al.*, 2013). Strategy transfer was thus promoted by sharing the goal of transfer and generalization with our older adult participants, who were explicitly trained to think about how the newly learned strategies

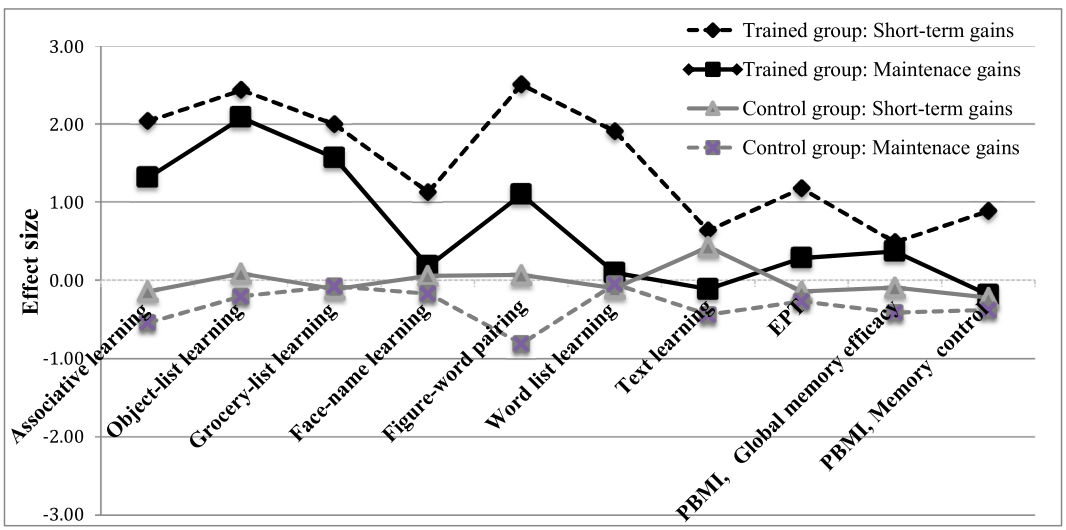

Figure 1 Effect sizes (Cohen's *d*) for pretest and posttest comparisons for specific and transfer effects as a function of task and group (trained and control).

could be applied to other tasks (Hertzog and Dunlosky, 2012; McDaniel and Bugg, 2012). Our results confirm that when older adults are given instructions, they understand that the strategies learned to deal with a given task can be adapted and applied to other kinds of material in different memory tasks (Hertzog and Dunlosky, 2012). Inducing participants to analyze the characteristics of a task helps older adults to realize that different tasks may require different approaches according to their specific nature and characteristics (Lemaire, 2010). It was only in the text learning task that both groups' performance improved across sessions, probably because of the demands of the task itself (text learning requires memory and strategies, but also comprehension skills). It may be, however, that participants in the control group improved in this task because their training included several activities involving verbal materials, such as newspaper reading, crossword puzzles, and text writing.

In the memory tasks, most of the gains were maintained, confirming the effectiveness of our intervention and the use of the strategies the participants had learned, as also shown by the effect sizes. The only task in which performance returned to the baseline was face–name learning, probably because older people in residential care centers have few opportunities to meet new people and learn new names.

Our approach seemed to maximize the transfer effects to tasks related to everyday life as well. Gains found in the EPT suggest that self-help training, based on practicing with strategies and adapting them to other situations makes older adults better able to deal with everyday problems. Our training involved metacognition, in terms of knowing and using strategies, and the transfer effect to the EPT confirms that metacognition is a core contributor to many aspects of cognition (i.e., Brown, 1987), such as problem solving. Unfortunately, the benefits seen in our sample were not maintained at follow-up. This may be because our residential care center residents were not able to solve all of the daily problems presented in the EPT (e.g., they did not need to cook or keep house). However, this task presents situations more meaningful for older people, even for those living in a residential care center than other cognitive problem-solving tests. As a short-term gain was found, to encourage longer-term effects, older adults would probably need to attend booster sessions across time (Ball *et al.*, 2002; Hertzog *et al.*, 2008).

As for metacognition, participants reported significant positive changes in how they judged their memory. Our training intervention gave participants evidence of an improvement in their memory performance in terms of their mastery of experiences (Bandura, 1997), and this may explain their positive impressions. This result is in contrast with the findings of a previous study using self-help training (Hastings and West, 2009), but the success of our training in making participants feel more confident in their memory probably stems from our learner-oriented approach, which actively involved participants in a memory improvement process and convinced them of their ability to control their memory. These positive changes were not maintained, however, probably because of the paucity of experiences and feedback influencing our participants' beliefs about the efficacy of their memory (Welch and West, 1995). Maintaining such benefits may require more opportunities for older adults to assess and control their memory in everyday life.

Some limitations of this study should be mentioned. First, because it is the first study on self-help training administered to healthy (not impaired) older adults living in a residential care center, our results need to be replicated by other studies (i) on larger samples that also (ii) assess training-related benefits in different age groups (i.e., young-old vs old-old). The large effect sizes found may be attributable not only to the procedure used but also to the fact that our older adults, although healthy, were generally only involved in routine and unstructured activities. It should be noted, however, that large effect sizes were also found recently by Vranic *et al.* (2013) using a metacognitive training with institutionalized older adults. Finally, because we mainly used memory tasks to measure transfer effects, future studies should include other aspects, such as decision-making, to replicate the success of our new approach in influencing everyday life.

In conclusion, our results suggest that memory interventions can produce benefits and that these benefits can be maintained over time, even for people of different age range living in residential care centers. Such interventions can help to preserve their cognitive functioning with the fundamental goal of postponing or preventing their future cognitive decline (e.g., Acevedo and Loewenstein, 2007). Here, for the first time, self-help training was used with older adults in a residential care center with promising results.

Conflict of interest

None declared.

Key points

- Using a strategy-adaptation component may represent the innovative and successful key for memory interventions.
- The learner-oriented approach treats older adults as partners in attempting to achieve a generalized effect of training on tasks not used during training
- The learner-oriented approach promotes better memory performance and transfer effects in both community-dwelling older adults and residential care center residents

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