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Memory: Training Methods and Benefits

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Without Abstract

Synonyms

Intervention; Memory Rehabilitation; Cognitive Training; Cognitive Rehabilitation; Maintenance of Training; Mnemonics Training; Training Impact; Transfer Effects

Definition

Memory training programs are cognitive interventions that aim to enhance or maintain memory performance via methods such as strategy instruction or engagement; training benefits may be evidenced immediately following training or over time and include improvements for trainees, relative to controls, in performance on tasks targeted in training (e.g., episodic memory), beliefs, or untrained memory or cognitive tasks or other broad outcomes (e.g., indicators of well-being).

As a practical matter, one of the most important questions facing geropsychologists is this one: Are memory training programs effective in optimizing the memory performance of older adults? The simple answer is yes: *memory training results in immediate improvement in the tasks that are trained* (Gross et al. *2012*; Hertzog et al. *2009*; West and Strickland-Hughes *2015*). However, excitement about this definitive response is tempered by concerns regarding the practical impact of these programs. When older adults ask if memory training is effective, they are really asking about more than immediate improvement on the trained tasks. They want to know if the impact of training is lasting and how challenging it might be to improve "memory in general," so that training will help them to succeed over time on most practical memory tasks. These more complicated questions about the impact of training are addressed in this overview, which focuses on behavioral memory interventions.

This article documents the extent to which memory training improves memory for healthy older individuals, with a focus on episodic memory and memory strategies. This review excludes physical and pharmaceutical interventions for memory gain as well as interventions designed to improve particular cognitive skills (e.g., reasoning). Issues of practical impact are considered, specifically the long-term maintenance of training gains and transfer of benefit to non-trained tasks. The paper also addresses nonability factors that may moderate gains from training (e.g., beliefs about ability, chronological age) and novel methods for intervention that show promise.

Approaches to Training

A primary aim of cognitive interventions for the aged is memory improvement. This section reviews the types of memory training programs that are typically offered, starting with a general overview, and then describes three exemplar interventions that reflect the variance in focus, duration, and scope among training paradigms.

Memory training programs for older adults range from intensive practice of core processes to extensive interventions aimed at enhancing overall cognitive engagement, and they vary from training single memory techniques to comprehensive, multifactorial programs, which employ varied activities, including relaxation, attentional exercises, or basic education on aging or memory (Charness *2007*; Schubert et al. *2014*; Zehnder et al. *2009*).

Training gains are typically assessed with a comparison of performance at pretest with performance at posttest (following the intervention), but it is also critical to include a control group. Control groups may be inactive/waitlist groups or active groups (placebo or non-placebo). Comparison to inactive/waitlist groups (who complete only the memory assessments) controls for the effects of practice from repeated testing (Stine-Morrow and Basak *2011*). Some investigators use active control groups that serve a placebo function. Such groups are matched to the intervention in terms of meeting frequency, duration of activity, and degree of social engagement, but participate in activities which should not change the outcomes of interest. That is, the placebo controls for the level or type of activity, social experience, expectations, motivation, and other aspects of participation. Other active control groups are non-placebo: such groups may be utilized to compare different versions of training programs, such as group classes versus self-help via a workbook (Bailey et al. *2010*; Hastings and West *2009*) or novel versus traditional approaches (Rebok *2010*; Stine-Morrow et al. *2014*). Random assignment of participants to training or control conditions, such as in randomized control trials, establishes comparable groups representing the population of interest. Whether waitlist or active, an appropriate control group must be included for the results of a cognitive intervention to be credible. Thus, intervention programs lacking an appropriate control group are not considered in the present review, and the three exemplar programs, described next, each utilized appropriate control groups.

Everyday Memory Clinic (EMC)

The Everyday Memory Clinic (EMC) was a 5-week-long, multifactorial program which supplemented strategy training with activities and lessons on other topics, such as attention and normal aging. In addition to training multiple strategies, EMC focused on improvement in memory beliefs. Three episodic memory tasks (name, list, and story recall) as well as related beliefs (locus of control, self-efficacy, and memory anxiety) were assessed at pretest, immediately after training, and 1 month following training.

EMC trainees (aged 50+ years) showed improved name and story recall performance and used strategies more effectively than the control group (West et al. 2008). In addition, active trainees (e.g., high attendance, homework completion, and strong in-class participation) had higher memory scores than inactive trainees, and trainees using a self-help workbook demonstrated greater pretest-to-posttest gains in recall and locus of control, relative to a non-active control group (see Stine-Morrow and Basak 2011).

Advanced Cognitive Training for Independent and Vital Elderly (ACTIVE)

The ACTIVE study is the largest randomized clinical trial for memory intervention conducted with older adults. Participants (ages 65–94 at enrollment) were randomly assigned to one of three different training conditions (memory, reasoning, or speed of processing) or to an inactive control group. Memory trainees completed ten weekly sessions focused on multiple strategies designed to improve verbal episodic memory (e.g., mental association, visual imagery). Directly trained abilities, as well as a large number of cognitive tasks and other measures, were assessed repeatedly, up to 10 years following initial training (Rebok et al. 2013).

Overall, the ACTIVE trial enhanced verbal memory and locus of control for memory. At least one quarter of the memory trainees improved their performance by more than one standard error (see Stine-Morrow and Basak 2011). Verbatim recall of stories was also higher for trainees immediately following training, but not 1 year later (Sisco et al. 2013). One and two years after training, the memory trainees outperformed the other groups on a composite score for verbal episodic memory (Rebok et al. 2013).

Cohen-Mansfield and colleagues (2014) replicated the ACTIVE program using a smaller sample of older adults with memory complaints (ages 65–87). More particularly, they compared ACTIVE memory training to a health promotion program and to a memory "book club." All three programs were of equivalent duration and intensity. All groups improved pretest-to-posttest cognitive functioning on a comprehensive test battery that included tests of verbal and nonverbal episodic memory, but only the ACTIVE training group showed reduced memory complaints. Collectively, the large-scale ACTIVE trial and replication showed success in enhancing episodic memory and self-perceptions regarding ability and performance.

Theatric Arts Intervention

A collection of studies by Noice, Noice, and colleagues (Noice and Noice 2011) evaluated the efficacy of a theatric arts intervention for memory and cognition. The authors proposed that acting is a unique leisure activity for promoting cognitive gains because it is multimodal (i.e., involving emotional, social, cognitive, and physiological processes) and fosters engagement through novel experiences. Participants received 80-min acting lessons twice a week for 4 weeks. Lessons were focused on acting techniques and not memorization. The exercises increased in challenge and demand over the 4 weeks.

Across several studies, with participants ranging from 60 to 95 years old, the episodic memory gains for theatric arts trainees exceeded that of non-active control groups and groups trained in other arts programs (i.e., art appreciation or singing). The program demonstrated effectiveness in community-dwelling older adults, residents of long-term care facilities, and low-income seniors (Noice and Noice 2011). Memory gains were even replicated when the intervention was administered by an activity director and an acting teacher outside of the research team (see West and Strickland-Hughes 2015).

Clearly, memory interventions are conducted using many different approaches and techniques, and the data presented thus far has indicated that some programs are quite effective. The next two sections address the overall evidence for training-related changes in memory test performance and beliefs about memory.

Strategy Training: Impact on Memory

Episodic memory performance is a key focus of interventions because memory ability is perceived as highly important and is necessary for everyday activities, yet declines normatively with increasing age. Thus, the primary indication of success for a memory training intervention is memory gain. Importantly, a long-accepted body of work establishes that older adults can benefit from memory training programs, as indicated by pretest-to-posttest improvement in episodic memory performance, over and above any observed practice-related gains in a control group.

A meta-analysis by Gross and colleagues (2012) evaluated training gains in objective memory performance for cognitively intact older adults (60+ years old at time of training) across 35 studies in which memory trainees were compared to appropriate control groups. This report replicated an earlier meta-analysis in that training-related gains in memory were greater for trainees than controls, and training gains were not directly linked to any specific trained strategy. Whereas the earlier review suggested that programs that included pretraining, such as relaxation training or other non-mnemonic instruction, showed higher gains than those without pretraining, this report suggested that programs training multiple strategies may be more effective than those training only one strategy. In effect, both meta-analyses showed that trainees benefit from interventions that go beyond training a single strategy. There is also evidence that group training is more effective than individual training, possibly due to social effects or due to the fact that group training programs tend to be longer (Berry et al. 2010).

In contrast to these promising findings, a review of cognitive intervention programs for both healthy older adults and adults with mild cognitive impairment found improved verbal recall and paired associate memory for trainees compared to inactive control groups, but not when compared to active control groups (Zehnder et al. 2009). These results might suggest that some training-related memory gains may not be specific to the intervention type or content; however, the authors very broadly defined active control groups (e.g., including exercise interventions). Thus, when comparing memory intervention results to active control group data, the authors may have been comparing multiple interventions expected to yield memory change.

To summarize, meta-analyses have systematically evaluated over 50 years of cognitive interventions for older adults’ episodic memory performance. The primary findings of the reports on mnemonic training suggest that older individuals do benefit from memory training, particularly when compared to individuals from inactive control groups. The collective data suggest a relatively greater benefit for training programs which are more comprehensive (e.g., those including pretraining and those training multiple rather than single strategies) and those with group-based exercises. Further, the data show that many different types of strategy training are effective, and no differences have been reported when comparing particular strategies. This suggests that episodic memory may benefit from some qualities of interventions unrelated to the specific strategies trained (e.g., changes in attentional factors). The meta-analyses reviewed here focused primarily on strategy training. Notable evidence on other approaches suggests that adults may also benefit from computerized and video game interventions, higher levels of daily cognitive activity, and repeated practice with attentional or working memory skills (Rebok *2010*; Schubert et al. *2014*; West and Strickland-Hughes *2015*).

Strategy Training: Impact on Beliefs

In addition to actual gains in memory test scores, researchers in the memory intervention area have long been interested in whether training has an impact on beliefs about memory. Self-evaluative beliefs correlate positively with memory performance. This association strengthens with age and is affected by the way in which beliefs are assessed (Beaudoin and Desrichard *2011*; Berry et al. *2010*). Beliefs also predict performance over short-term goal and feedback manipulations and predict long-term change (West and Strickland-Hughes *2015*). Thus, beliefs might influence the maintenance of intervention effects (Hastings and West *2009*). One complicating factor in reviewing the literature on beliefs and intervention is that the assessments of beliefs vary dramatically from study to study (Beaudoin and Desrichard *2011*). Nevertheless, there are some reasonable conclusions that can be drawn.

Floyd and Scogin (*1997*) systemically reviewed the memory training literature on subjective measures, including a wide variety of assessments for beliefs. Their meta-analysis of 27 studies revealed a significant effect size for the impact of training on subjective beliefs, but the effect was smaller than the magnitude of gains for memory performance. Not surprisingly, the greatest changes in beliefs appeared to be related to studies focused on improving aging attitudes. More recent evidence from experimental studies suggests that self-evaluative beliefs might not only be influenced by memory training, but may also predict performance gains through moderation or mediation of intervention effects.

Specifically, the ACTIVE study assessed personal control or the belief that performance outcomes can be determined by one's own influence. Five years after the ACTIVE program, participants who trained in reasoning and speed of processing were considerably more likely to improve their sense of personal control than was the no-contact control group (see West and Strickland-Hughes *2015*), even though the ACTIVE training program did not emphasize self-evaluative beliefs. Unfortunately, ACTIVE *memory* trainees did not demonstrate this training benefit. As mentioned earlier, however, ACTIVE memory trainees did show reduced subjective memory complaints in a replication study (Cohen-Mansfield et al. *2014*).

The EMC project was designed to enhance memory self-efficacy or confidence in one's memory ability. It did so by fostering enactive mastery (e.g., easier exercises first) and reducing anxiety (e.g., emphasis on self-set goals rather than high performance for all), among other techniques (West et al. *2008*). In contrast to the minimal changes in beliefs observed for ACTIVE memory trainees, EMC trainees reported increased personal control and enhanced memory self-efficacy 1 month following the intervention, while the control group experienced some declines in these beliefs. Self-taught trainees showed significant improvements in personal control, but not in self-efficacy (Hastings and West 2009).

Thus, modest evidence suggests that intervention may promote enhanced self-evaluative beliefs. More interestingly, in an inductive reasoning intervention, trainees with higher initial levels of memory self-efficacy allocated more time to training and benefited more from the intervention (see West and Strickland-Hughes 2015). Do self-evaluative beliefs lead to more effort or greater benefit from training? In the EMC study, the initial level of memory self-efficacy, along with education and self-reported health, predicted the degree of active effort by trainees, which in turn predicted training-related gains. Further, memory self-efficacy was a significant predictor of episodic memory performance at follow-up, and training-related change in memory self-efficacy was a mediator of memory gains from the intervention (West and Strickland-Hughes 2015). Considering this collective evidence, beliefs may be related in important ways to the benefits that come from memory intervention.

Strategy Training: Impact over Time

Given what we know about gains in performance and subjective memory, training clearly holds great promise for episodic memory. This promise will be realized if and when it is established that post-training episodic memory gains are lasting. Unfortunately, the majority of intervention studies examine gains cross-sectionally, immediately after training, and do not assess training effects over time (Gross et al. 2012). Consequently, there are no available systematic meta-analyses on long-term maintenance of benefits from training interventions, and relatively little is known about this topic. When training gains are significant, maintenance can still vary (Rebok et al. 2013). Evidence from past research suggests that maintenance is possible over a period of 1–6 months. However, when looking at maintenance for periods longer than 6 months, regression to baseline performance is commonly found (Berry et al. 2010), or maintenance is limited (Rebok 2010).

In promising studies of multifactorial memory training (focused on encoding strategies, attention, and relaxation), 6-month maintenance was reported, and over 3 years later, maintenance or improvement of performance was still evident for the multifactorial trainees (see Berry et al. 2010). The ACTIVE trial was the first to assess long-term outcomes with a large sample. ACTIVE trainees were assessed immediately 1, 2, 3, 5, and 10 years following training. A subset of trainees completed four booster sessions about a year after training. Participants from all training conditions (with and without booster sessions), but not inactive controls, demonstrated improved memory when comparing performance at pretest with performance 5 years following the study. For memory trainees, these results were not affected by booster session participation (Rebok et al. 2013). However, no training or booster effects were significant for memory trainees 10 years following the program (see West and Strickland-Hughes 2015).

Hertzog and colleagues (2009) propose that our view of cognitive interventions may need to change. Interventions probably do not function like vaccines, that is, providing immediate protection against decline and requiring periodic boosters. Instead, perhaps memory interventions should be viewed like physical activity interventions, wherein continuing exercise is necessary for maintenance of performance. If so, maintenance of specific training lessons may be less of an issue. The focus, instead, should be on ways to encourage and motivate older adults to continue working on their memory. While the evidence thus far is hopeful, additional longitudinal analyses are needed to better understand the long-term benefits of cognitive activity.

Strategy Training: Impact on Transfer and Generalization

Researchers agree that it is desirable for intervention programs to have broad practical impact. This might include transfer of performance gains to new, untrained memory tasks or extension of learned memory strategies to tasks not targeted in training. These outcomes would increase the value of training and possibly even stave off age-related attenuation in cognition (Hertzog et al. *2009*; Rebok *2010*). One could also look for broader generalization effects: if training improved social-emotional functioning, promoted neural activation, or encouraged a more engaged physical or mental lifestyle (Hertzog et al. *2009*; Rebok *2010*; Schubert et al. *2014*), it would enhance the daily lives of trainees. Although everyone agrees that transfer and/or generalization represent a value added from memory interventions, there is considerable controversy about how to define transfer and about what kind of transfer should be expected in conjunction with a memory intervention (Fisher *2012*; Schubert et al. *2014*). If transfer is defined strictly as a change in performance on memory tasks that are not part of training, past research clearly shows that transfer rarely happens (Berry et al. *2010*; Fisher *2012*; Hertzog et al. *2009*; Rebok *2010*). Thus, clarifying the *how* and *when* of transfer is imperative, especially for those target skills that are most relevant for everyday experience. Alternatively, researchers could focus on the generalization of training effects to better strategy usage overall, neurogenesis, reduced depression, improved activities of daily living, or more mental or physical activity, and these results are more promising (Hertzog et al. *2009*; Rebok *2010*; Schubert et al. *2014*; West and Strickland-Hughes *2015*). Some of these topics are considered here.

Strategy Usage

Older adults are less likely than younger adults to spontaneously employ memory strategies, and they may overly rely on external aids or familiar mnemonics (Fisher *2012*). Thus, strategy training is a common focus of intervention programs, and this approach has been quite successful overall (Rebok *2010*; Stine-Morrow and Basak *2011*). Increased strategy use is often assumed to explain training-related performance gains. Yet, this effect is often unexamined as strategy use can be difficult to assess directly.

More often, strategy use is assessed subjectively, via open-ended or multiple-choice self-report questionnaires after testing. Gross and Rebok (*2011*) compared the standardized pretest to posttest gain in use of strategies between training and control participants from twelve reports of cognitive interventions. They found that nearly all trainees exceeded control participants in strategy improvement and that this improvement was larger than the improvement in scores, per se (Gross and Rebok *2011*). For example, strategy checklists completed in the EMC intervention showed that trainees and control participants both reported increased strategy usage over time. Although trainees often chose to use simpler versions of the complex techniques they were taught, trainees clearly shifted to using more effective strategies than the control group over time (West et al. 2008).

Evaluation of clustering techniques, using categorizable lists, is a more objective method of assessing strategy use because it does not require post hoc reporting of strategic behavior (Gross and Rebok 2011). Researchers can report items recalled in the order of the study list (serial clustering, suggesting use of association), items recalled contiguously from one category (semantic clustering or use of categorization), or other signs of item grouping. In the ACTIVE intervention, trainees showed immediate gains on several types of clustering and maintained these gains over 5 years (Gross and Rebok 2011).

Self-Monitoring

A self-monitoring approach to memory training involves guiding trainees to evaluate their learning (i.e., test their memory), identify what needs additional study, and adapt attention and strategy usage accordingly. A focus on self-monitoring techniques in training could be quite valuable because it allows older adults to make use of techniques – such as self-testing and allocating additional study time to unlearned items – which are relatively easy for them to apply (see Charness 2007). Also, successful self-monitoring may guide adults to allocate more learning resources to difficult items or discontinue study of well-learned items, thus helping them to meet their learning goals (see Fisher 2012). If self-monitoring can be successfully taught, it could easily be included in any kind of strategy training, and the technique can be generalized to other, more practical learning situations (see Charness 2007).

Results are currently mixed for interventions based on self-monitoring. In an early study, gains were significantly greater for trainees in a program focused on strategies plus self-monitoring as compared to a strategies-only group. In addition, the effectiveness of this training approach was promising when administered via self-help workbooks (Bailey et al. 2010). However, two similar intervention programs failed to demonstrate greater gains for the self-monitoring groups above-and-beyond the benefits from traditional strategy training (see Charness 2007). Further intervention-based research is warranted to explore the benefits from self-monitoring approaches to memory training, as well as their potential for generalization in real-world settings.

Engagement

One alternative approach to training is to set up an environment for older adults that leads to broad engagement in cognitive activities (Charness 2007; Hertzog et al. 2009; Stine-Morrow et al. 2014). In essence, this approach builds generalization into the training regimen itself because individuals are practicing cognition and memory in the context of real-world activities. While these approaches may have great potential for improving memory, this potential has been realized in only some cases.

For example, the Experience Corps (Carlson et al. 2008) aimed to improve cognitive and health outcomes for older adults through intensive volunteer training and participation. Participants had approximately 32 h of volunteer training followed by a full year of literacy-related volunteer service in schools (e.g., reading to children). Later, Experience Corps volunteers, and not waitlist control participants, demonstrated improved working memory and executive functioning (see Rebok 2010). Although there were also social and physical gains, the improvements in episodic memory were marginal. The Senior Odyssey program, which encouraged complex problem solving in a social, intellectual, and competitive context, seems to have led to gains in fluid reasoning and problem solving, but not in episodic memory, at least thus far (Stine-Morrow et al. 2014). More promising is evidence from the theatric arts intervention, described earlier, which showed clear episodic memory benefits, even though the overall focus was on acting rather than specific memory strategies (Noice and Noice 2011). Similarly, Park and colleagues (2014) found that involvement with everyday activities that have high cognitive demands (quilting and digital photography) led to episodic memory change that was not evident in more passive social activities or less demanding mental activities.

The evidence thus far suggests that an engagement-focused intervention may need to include particular kinds of cognitive activities in order to successfully enhance memory, but the exact nature of these cognitive activities remains to be clarified in future investigations.

Strategy Training: Individual Differences in Outcomes

The final issue to address is who benefits from training. Individual differences are person-level factors, such as age or baseline cognitive capacity, which may explain variance in the gains made by trainees. The current review focuses on cognitively intact older adults, who may have experienced normative aging-related memory loss but are free from dementia. However, diagnosis of dementia and level or stage of cognitive impairment are likely individual differences which influence one's ability to benefit from cognitive training. Cognitively impaired individuals may be able to profit from training, if to a lesser extent (e.g., for simple but not complex tasks) than healthy older adults (Zehnder et al. 2009). Further, specific mnemonics (e.g., spaced retrieval) or intervention techniques might be relatively more effective for certain populations (Berry et al. 2010).

Aligned with the idea of muted training gains for cognitively impaired individuals, some research evidence suggests a *Matthew effect* (i.e., the rich get richer) for training benefit (Stine-Morrow et al. 2014). In the ACTIVE trial, gains immediately following training were greater for trainees with higher levels of education and better self-reported health (Rebok et al. 2013). However, other training programs demonstrated greater improvement for those who had the most to gain (i.e., individuals with lower baseline cognitive performance). For example, Experience Corps volunteers with impaired executive functioning at pretest demonstrated the greatest gains in memory and executive functioning following the program (Carlson et al. 2008). For the theatric arts training program developed by Noice and Noice (2011), training benefits were demonstrated across diverse populations with no indication that levels of independence, education, or income were a factor controlling the degree of benefit from training.

If there is a *Matthew effect* in cognitive training, it may be explained by a relationship between age and level of plasticity, wherein greater plasticity enables adults to benefit more broadly from the cognitive and social engagement provided in a training program (Stine-Morrow et al. 2014). However, evidence for this is mixed. Meta-analyses of memory training programs for older adults have shown mixed results for the relationship between participant age and training-related gains (Gross et al. 2012). Data from the ACTIVE trial suggested that age is negatively related to memory performance over time, but this effect was independent of training

(Rebok et al. 2013). Additionally, younger ACTIVE trainees used more memory strategies at baseline, but age did not predict training-related changes in strategy use (Gross and Rebok 2011).

As an alternative explanation for training responsiveness, individual differences in motivation or other psychological factors may be important (Rebok 2010). For example, training gains from working memory capacity training were greater for individuals who were more engaged and implicitly motivated to train, rather than externally motivated by payment. Further, gains were larger for adults with a growth mindset (i.e., believing gains are possible with effort) than for adults who believed their level of intelligence was fixed (Jaeggi et al. 2014). Higher levels of openness to new experience and larger social network size were positively related to gains in divergent thinking from an engagement-focused intervention where trainees worked in groups to solve ill-defined problems (Stine-Morrow et al. 2014). However, these factors did not explain the level of training-related gain for a traditional reasoning training group, which served as an active non-placebo control group. Therefore, the influence of different individual difference factors may interact with the specific intervention approach.

Realistically, the *interaction* between cognitive factors (e.g., initial cognitive capacity, degree of plasticity, and years of education) and motivational influences likely predict training gains, rather than any one factor acting alone. For example, in the ACTIVE trial, trainees who were adherent to the training protocols (e.g., attended all sessions) had significantly better baseline memory performance than those who were non-adherent (Rebok et al. 2013). In turn, these adherent trainees benefitted from memory training, whereas the non-adherent ones did not. Similarly, EMC trainees who were relatively more educated and healthy and had higher levels of memory self-efficacy were more likely to be actively engaged in training and more compliant with homework (see Rebok 2010). In turn, more compliant trainees demonstrated more profound recall and self-evaluative beliefs change than less involved trainees (see Berry et al. 2010).

Further explaining individual differences in training benefit, the relationship between baseline ability and training outcomes may be quadratic, rather than linear, whereby persons with either relatively higher or lower initial cognitive performance gain more from interventions than those functioning in the middle (Stine-Morrow et al. 2014). Thus, the impact of individual differences on training gain is not straightforward. Individual benefits from training are likely explained by complex interactions among those factors that affect performance and adherence to training regimens. Considering this evidence, it would be valuable to pursue additional research in this area, particularly studies focused on who is more likely to achieve long-term training benefits.

Conclusions

Memory is an integral process involved in many everyday experiences. Adults of all ages value their memory ability and fear memory loss (West and Strickland-Hughes 2015). Intact memory capacity is a prerequisite for older individuals' ability to live independently and perform other important activities (Berry et al. 2010; Schubert et al. 2014; Stine-Morrow and Basak 2011). Yet, the evidence is clear that declines in episodic encoding and retrieval are pervasive in both cross-sectional and longitudinal research (Berry et al. 2010).

Because memory is valued by older adults, essential for independent living and at risk for decline, geropsychologists need to address the key memory concerns of older adults.

As evidenced by half a century of research, memory interventions are effective in enhancing the memory performance of healthy, older adults. Multiple meta-analyses confirm this benefit. Experimental paradigms for memory training programs vary greatly, and several different approaches have been successful. Programs which train multiple strategies seem to be more effective than those which train only one technique, and multifactorial programs may promote more lasting training benefits than traditional programs that train strategies only. Programs which encourage social interaction in group training or focus on beliefs or motivation may yield greater benefits.

Returning to older adult concerns about the practical impact of training, it is clear that training, strategy use, and memory practice can all lead to improvement. Thus, older individuals should be encouraged to practice those memory tasks that they want to improve and to learn more about strategic techniques that will enhance their skills. Whether achieved gains will be lasting likely depends upon the individuals' cognitive capacity and their continued motivated effort to work on everyday memory activities. As scholarship continues in this field, additional intervention-based research should further examine how to promote sustained gains from training, which conditions best lead to direct transfer and/or generalization, and how to maximize the gains of particular individuals during and after training.

Cross-References

- Attitudes and Self-Perceptions of Aging
- Interventions for Late-Life Cognitive Health
- Memory: Episodic
- Plasticity of Aging
- Process and Systems Views of Aging and Memory
- Social Group Interventions for Older Adults
- Subjective Memory
- Working Memory in Older Age

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