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Extending the Reach of an Evidence Based Theatrical Intervention

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Abstract

Background/Study Context—In Experiment 1, the authors investigated whether they could train retirement home activity directors with no previous experience in theatre to successfully execute an evidence-based four week theatre-arts intervention. In Experiment 2, they investigated whether an outside professional acting teacher who received only minimal training via email and telephone could successfully execute the same intervention heretofore only carried out by the actor/director/professor who devised it.

Methods—A total of 115 participants (ages 68–94) in four different retirement homes were taught theatre-arts either by their in-house activity director who had no formal training in theatre or a professional acting teacher recruited through a local community college. The intervention consisted of twice-weekly 70-minute lessons for four weeks. After random assignment to experimental or waiting-list control groups, participants were given pre- and post-tests on both functional and cognitive measures.

Results—Experiment 1 showed that activity directors were able to run this intervention and achieve significant results on the 28-item functional measure (OTDL-R) as measured by a mixed design ANOVA and paired sample t-tests (p<.001), and on one cognitive measure, Means—End Problem Solving (MEPS), as measured by a MANCOVA and follow-up univariate ANOVAs. Experiment 2 (outside acting teacher) used the identical measures and revealed significant results on the OTDL-R (p = .002), Word Recall, MEPS, and Verbal Fluency (η_p^2 ranging from .28 to .59).

Conclusions—This study addressed the feasibility of training multiple instructors of varying experience to administer this theatre arts intervention. Previous iterations had all been administered by the professional actor/director/theatre-professor who devised the program. These current results demonstrate that widespread administration of this short-term (four-week) evidence-based intervention is feasible.

For almost 25 years, the authors have been investigating the cognitive, affective, and physiological processes of professional actors (e.g., Noice & Noice, 2001). For the past 15 years, they have been reporting the results of a series of theatre-acting interventions to enhance healthy cognitive aging (e.g., Noice & Noice, 2011). However, these interventions were always administered by the professional actor/director/theatre-professor who devised the program leaving open the question of individual instructor impact on the results. In the current study, retirement home activity directors without any background or experience in

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theatre were taught to administer the program. In addition, one newly recruited professional actor/director/acting teacher was engaged to administer the same program. She received minimal instruction (mainly emailed activity descriptions and short follow-up phone conversations).

To put this intervention into perspective, a very brief review of the literature on enhancing healthy cognitive aging would seem appropriate. One promising approach concerns the correlation between performance of stimulating mental activities and healthy aging (e.g., Friedland et al., 2001; Glass, Mendes de Leon, Marotolli, & Berkman, 1999; Scarmeas & Stern, 2003; Schooler & Mulatu, 2001; Stones, Dornan, & Kozma, 1989; Wilson et al., 2002; for a review see Hertzog, Kramer, Wilson & Lindenberger, 2008). However, many of the above studies involved the tracking of mentally stimulating activities in general and did not attempt to investigate the advantages of specific ones. Moreover, much of this research examined the relationships seen after years of performing stimulating activities, as opposed to short-term interventions. In one ingenious prospective study, Wilson et al. (2002) recruited 801 Catholic nuns, priests, and brothers who were over 65 years of age. They were assessed at recruitment and every year thereafter using a battery of cognitive tests. Before starting, each participant recorded the amount of time spent daily in intellectually stimulating leisure pursuits (e.g., reading, doing crossword puzzles). Frequency of participation was rated on a 5-point scale with 5 being highest. After five years, it was found that for every one-point increase on the stimulating activity scale, there was a 33% decrease in the risk of developing Alzheimer's disease. In a longitudinal study, Hultsch, Hertzog, Small, and Dixon (1999) presented evidence that the performance of *novel* endeavors which demanded high cognitive engagement (e.g., learning a foreign language or playing a musical instrument) was associated with improved performance on such tasks as fact recall, word recall, and story comprehension. Other correlational studies have shown connections between activity level and survival (Stones, et al., 1989; Glass et al., 1999; Lennartsson & Silverstein, 2001); and between activity level and lower risk of dementia (Karp et al., 2009; Scarmeas, Levy, Tang, Manly & Stern, 2001; Verghese et al., 2006; Wang et al, 2006).

An ever-increasing body of evidence indicates that social interaction correlates positively with healthy cognitive aging. For example, Litwin and Shiovitz-Ezra (2010) found that the more social ties older adults had, the greater the well-being and the less anxiety they experienced. Enhanced cognitive functioning was observed by Seeman, Lusignolo, Albert and Berkman (2001) in those who enjoyed greater social support among the 1,189 older adults in the MacArthur Studies of Successful Aging. Social interactions also appear to be associated with a reduction in the risk of Alzheimer's disease (e.g., Wilson et al., 2007, Wang, et al., 2006). In addition, Carlson et al. (2009) credit cognitive activity within a social setting for some of the observed effects in the Experience Corps program (see also Fried et al., 2004).

In contrast to such correlational studies, other inquiries, generally referred to as *training studies*, have focused on specific cognitive skills. In a large scale study known as ACTIVE (Advanced Cognitive Training for Independent and Vital Elderly, Ball et al. (2002) randomly assigned participants to one of three intervention groups or a no-contact control group. The experimental groups received training on one of three types of cognitive ability: verbal memory, reasoning, or speed of processing. Six weeks later, improvements were found in all three areas, improvements that persisted for two years. However, training gains did not transfer (i.e., those who improved after instruction on verbal memory did not improve on reasoning or speed of processing. The researchers had also administered the Observed Tasks of Daily Living, Revised (OTDL-R, Diehl et al., 1998, 2005) but reported that the benefits of the intervention did not extend to everyday tasks, possibly due to ceiling effects. Nevertheless, follow up studies showed that the cognitive improvements in the

trained areas were still present five years later, particularly in those participants who were given booster training one and three years after the original intervention (Willis et al., 2006).

Thus a search of both the correlational and training literatures suggests that an effective aging intervention would be novel, socially interactive, involve a high degree of multi-modal activity (mental, physical, emotional) and take a small fraction of the time necessary for learning a new language or becoming an instrumentalist in an amateur orchestra. It would be an added plus if the intervention was sufficiently pleasurable to provide motivation for continued engagement by participants for years to come. The program described in this article attempts to incorporate all these attributes. Our previous studies showed that this theatre intervention produced gains on standard measures of free and delayed recall, word generation, comprehension, and problem-solving ability. In one study (Noice et al., 2004), the participants were community-dwelling seniors (average age: 72 years); improvements were measured against both no-treatment controls and alternative-treatment controls (art appreciation). Another study (Noice & Noice, 2009) extended the findings to a population with a number of risk factors associated with dementia: They were even older (average age: 82 years), far less well educated, and no longer lived in their own homes but in low-income, continuing care facilities that were rarely able to offer specialized programs of mental stimulation. Once again, the benefits were demonstrated against no-treatment controls and an alternate intervention (vocal musical performance).

Thus, in a highly concentrated manner, this acting intervention combines the advantages of other successful interventions: the work is effortful, enjoyable, multi-modal and multifactorial, encourages bonding in a social situation, and is highly activating because the participants perform individually in front of their peers. Participants meet for eight sessions over a 4-week period. Each session is 70 minutes in length (60 minutes of instruction with a 10-minute coffee break halfway through). The current study duplicated these procedures precisely but, for the first time, a functional measure was added, the OTDL-R (Diehl et al, 1998, 2005), and the acting classes were given by newly-recruited instructors. Because previous studies had ruled out non-content-specific effects, alternate interventions were not included and only waiting-list controls were employed. If the program could be successfully administered by in-place activity directors, the intervention could be implemented at any time in any facility in which an activity director has been trained in the technique.. Furthermore, in situations where the activity directors are unwilling or incapable of running the program, positive results with a locally recruited outside-instructor could also make low-cost, widespread dissemination of this evidence-based intervention feasible. Thus the aim of Experiment 1 was to determine whether activity directors without theatrical experience could administer the intervention and the aim of Experiment 2 was to compare the activity directors' results with those achieved by an outside professional.

Experiment 1

Method

Participants—The sample consisted of 78 participants from three Continuing Care Communities in the Western Suburbs of Chicago. Most resided in the Independent-Living sections, but some were from Assisted-Living units. They ranged in age from 68 to 94; all exhibited sufficient everyday functioning to handle the intervention requirements. That is, they were able to hear the director's instructions, execute the limited movements called for, read the large type (16 point) scripts, and communicate the meaning of a scene by stressing obviously operative words in the dialogue. Most were able to move about unaided; a few used canes, wheelchairs or small motorized vehicles., but all were capable of standing and moving about for the few minutes it took to perform each acting exercise or scene. Participants were randomly assigned to either the theatre group or the waiting list control

group, but exceptions were made for a few married couples in both groups to allow them to be together. In terms of age, there were no significant differences between the experimental (theatre) group ($M = 84.10$, $SD = 4.42$) and the waiting-list controls ($M = 83.61$, $SD = 6.28$). Both groups also had very similar educational backgrounds; most of them had finished high school, and a small minority had graduated from college (average education: 14 years). They were also very similar on other relevant variables (see Table 1).

Attrition was low: 86% of the original 78 cases finished the intervention. Reasons for dropping out were unexpected surgeries, illnesses, or doctor's visits. To determine possible attrition bias, comparisons were made between the 11 dropouts (4 in the theatre group and 7 in the control group) and 67 completers on all pre-test study measures. No significant differences were found (all ps > .22). Of course, the analyses had very low power due to the small number of dropouts. However, even if those who felt that the training was too difficult had disproportionally dropped out (a common cause of attrition), this would have tended to inflate the scores of the control group, thus making the higher scores of the theatre group even more worthy of note.

Intervention Procedures—In order to assess generalizability across activity directors, this four-week, eight-session intervention was administered in three different retirement homes. Every effort was made to minimize threats to internal validity: residences were comparable in terms of cost, size, amount of activities offered, age-range of residents, and education. Random assignment in each residence insured that there was no self-selection to condition. The pre-intervention procedure consisted of contacting a retirement home and making an appointment with the CEO or other management official as well as the Senior Activity Director. If the facility was able to offer the necessary time, space, and personnel, a staff member (usually an assistant activity director who had experience running interactive programs for the residents) was assigned to learn and perform the intervention. Once these elements were in place, participants were sought by means of a recruitment talk by the authors.

After recruitment, all participants were screened via telephone with the Short Portable Mental Status Questionnaire (Pfeiffer, 1975) before being individually pre-tested. The next morning, the experimental group started the eight-session acting course; the day after the final session, post-tests were administered. Waiting-list controls were tested at the same times but had no intermediate contact. Participants received $40.00 at the end of the course if they had attended all sessions. This payment was made as an incentive to minimize attrition and defray incidental expenses. The waiting-list controls received exactly the same information as the other participants, except that they were told that the study involved taking two tests, four weeks apart, before training commenced. They were also promised $40.00 at the start of their training (i.e., after all data had been collected).

The theater course consisted of increasingly demanding theatrical exercises designed to have participants experience the essence of acting; that is, to become so engrossed in the drama that obvious situation-specific cognitive/affective/physiological alterations occurred in their demeanor. Other important aspects of acting, such as script memorization, were not required so that the entire intervention could be devoted to practicing the core process. (The participants held the scripts in their hands during rehearsal and performance. They eventually absorbed much of the dialogue, but were specifically told NOT to memorize the script by rote repetition.) It was constantly stressed that every individual is unique, so no one could be better at doing these acting exercises than another as long as he or she was honestly trying to obtain the goal inherent in the dramatic situation. As the instructors put it, "Nobody can be as good a *you* as *you*." In this way, a supportive, noncompetitive atmosphere was maintained.

Measures—Two considerations guided the choice of cognitive measures:

1. They had to be appropriate for this type of study. Acting is unitary and indivisible. For example, one could not instruct a participant to become totally involved in the act of complaining but to refrain from all concomitant facial expressions, tones of voice, and affect states. Such instruction would destroy the participant's total involvement in the ongoing moment, which is the whole point of acting. Therefore, the measures were not chosen to specify what particular aspect of acting was responsible for a particular type of cognitive gain; they were chosen to document cognitive improvements that could enhance older adults' quality of life.
2. The entire battery had to be administered within 90 minutes to avoid exhausting the participants.

The pre- and post-test measures were as follows:

The Functional Test

The Observed Tasks of Daily Living, Revised (*OTDL–R*, Diehl, et al., 1998, 2005): This instrument contains 28 tasks, and uses actual objects such as prescription bottles, utility bills, and pages from telephone directories; it requires participants to perform such tasks as comparing ingredient labels, paying bills by check, and looking up and dialing numbers. Three areas of functioning are included: medical matters (maximum score 32); telephone use (maximum score 18); and handling finances (maximum score 34). The maximum total score is 84.

The Cognitive Performance Battery

Word List Recall: This measure consists of 10 words, each belonging to a different category (Morris et al., 1989). The experimenter read each word out aloud at the rate of two seconds per word; after the full list was read, participants performed an immediate recall test. The identical procedure was repeated two more times for a total of three trials, each followed by an immediate recall test. The total number of words correctly recalled on all three trials was the dependent measure.

Delayed Word List Recall: After a time lapse of four minutes during which another test was performed, a surprise recall test of the previous word list was given.

Category Fluency: The participant was asked to generate as many exemplars as possible of a given category (e.g., animals or fruits/vegetables) in a 60 second time limit (Morris et al., 1989). The total number of unique words was the dependent measure.

Story Recall Task: The East Boston Memory Test (Albert, Smith, Scherr, Taylor, Evans, & Funkenstein, 1991) is a measure of episodic memory. A short story was read containing 12 key elements. An immediate recall test was given plus a surprise delayed test after four minutes.

Problem solving: The instrument used was the Means-End Problem-Solving Procedure (MEPS) by Platt and Spivack (1975). Participants read a series of story stems in which a problem was stated at the beginning and an outcome at the end. The participant's task was to fill in events that might have taken place between the discovery of the problem and its eventual solution. Participants were given two stories during each untimed test, with order being counterbalanced.

Non-Cognitive (Self-Report) Measure

Lifestyle Activities Questionnaire: This instrument allowed the researchers to examine the current amount and frequency of stimulating activities engaged in by the participants (Schinka, McBride, Vanderploeg, Tennyson, Borenstein, & Mortimer, 2005). The scale consists of 25 items; responses range from *every day* (4 points) to *never did this activity* (0 points).

Results and Discussion

Table 1 summarizes the characteristics of the study population. As can be seen, the experimental and control groups were comparable in terms of age, education, health and marital status. However, as is usually the case, there were significantly more female than male residents in each retirement home to draw upon for the study. Also, to rule out the possibility that any positive results could be due to a very strong performance in one specific residence, we conducted a MANOVA with site as one of the independent variables; however, no significant effect was observed, Wilks' $\Lambda = .70$, $F(12, 98) = 1.53$, $p = .11$. Therefore, we collapsed the data across that variable in subsequent analyses.

No significant pre-test differences were seen between the theatre group and the controls on the 28-task functional test, or on the six cognitive measures. The only exceptions were on immediate and delayed word recall; the experimental group remembered more words at pre-test ($M = 19.36$ vs. 17.36 for immediate and $M = 6.43$ vs. 5.28 for delayed, $p < .05$).

Functional Measure—To address the question of whether the theatre intervention could improve functional performance, we computed means and standard deviations on the OTDL-R scores of the groups taught by activity directors. Performance on the OTDL-R was assessed by a 2 occasion (pre-test, post-test) × 2 group membership (acting, waiting-list) × 3 task-areas (medicine, telephone, finances) mixed-design ANOVA. The group by occasion interaction was significant, $F(1, 66) = 11.93$, $p = .001$, $\eta_p^2 = .16$, as was the interaction between occasion by task, $F(2, 65) = 4.70$, $p = .01$, $\eta_p^2 = .07$. Paired sample t-tests indicated that participants in the acting group improved significantly from pre- to post-test, while those in the control group did not, and that higher pre- to post-test scores were observed on the managing finances tasks ($p < .001$) and the taking medication tasks ($p < .001$) but not on the telephone usage tasks. The ODTL-R data, broken down by task area and totals, are displayed in Table 2. As can be seen, while the experimental group's total scores increased from 64.63 (SD = 10.98) to 73.03 (SD = 7.05), the control group's scores slightly decreased from 63.49 (SD = 12.39) to 62.73 (SD = 14.58). However this slight decrease only existed with the OTDL results. Small improvements (but not as large as the experimental group's) were seen in the cognitive tests in this study and also in our previous investigations (e.g., Noice & Noice, 2009).

Cognitive Measures—Table 3 displays the means and standard deviations for the six cognitive measures for the theatre and waiting list control groups. To assess treatment effects, we conducted a multivariate analysis of covariance (MANCOVA), with group membership as the independent variable (acting, waiting list), the six cognitive variables at post-test as the dependent variables, and age, education and pre-test scores as covariates. MANCOVA results revealed significant differences between the treatment conditions, Wilks' $\Lambda = .78$, $F(6, 53) = 2.44$, $p < .05$, $\eta_p^2 = .22$. The covariates of age or education were not significant. Follow-up univariate ANOVAs on each of the dependent measures yielded one significant effect: problem solving, $F(1, 58) = 5.91$, $p = .018$, $\eta_p^2 = .09$; and one marginally significant effect: verbal fluency, $F(1, 58) = 3.56$, $p = .064$, $\eta_p^2 = .06$. Probability values for the remaining measures ranged from .13 to .66.

Analysis of the Lifestyle Activities Questionnaire showed that, prior to the intervention, the majority of these participants did not report strong engagement in stimulating mental activities. For example, fewer than 37% read any type of book on a daily basis. This suggests that at least one prime area of mental enrichment is missing from the majority of these residents' everyday lives

Predictors of Cognitive Performance at Post-test—Bivariate correlation and multiple regression were both used to investigate four individual-difference factors that were measured at pre-test as possible predictors of post-test performance. For the Observed Tasks of Daily Living (OTDL), we used the mean score of all 28 items for an OTDL index. The remaining three factors (education, physical exercise, health status) were dealt with as single items. Rather than treat number of years in school at a continuous variable, level of education attained was recoded into a dichotomy (i.e., whether or not the participant graduated from a four-year college) to capture the key contrast in the variable's distribution. Exercise habits were measured in terms of the number of times the participant exercised in a typical week (i.e., three levels: less than once, one to three times, more than three times). Health status was assessed with a three-category rating of one's self-rated health compared to peers (better, same, worse). The multiple regression analysis was designed to identify individual-difference factors that predict improvement in cognitive test performance at post-test—that is, factors that predict post-test cognitive outcomes when controlling for pre-test cognitive performance and group membership (experimental versus control condition). The outcome measure used in the regressions was the mean of the six post-test scores of cognitive performance. In addition to the four individual-difference predictors, the regression analysis included two controls: the mean pre-test score on cognitive performance, and group membership. Based on the analyses using the full sample (i.e., experimental and control groups combined), none of the key predictors were significant. At the multivariate level, similarly, when cognitive performance at post-test was regressed on education, exercise, health, and OTDL as well as the two controls, again none of the four individual-difference predictors achieved statistical significance (Table 4).

Performing the intervention with these activity directors was not without problems. The management of the various facilities that hosted the program promised complete cooperation, which they seemed to give to the best of their abilities. The spaces for the classes and the testing were always suitable, available, and set up in accordance with our guidelines. However, it appeared that, especially in these difficult economic times, the activity directors were extremely busy and performed this intervention as an extra duty along with the myriad tasks they handled each day. They were all intelligent and capable of learning to execute the activities but, in a number of cases, the directors were called away during a class, arrived late, and even missed classes. (Of course, the authors attended every session, and took over the instruction when necessary so that all participants engaged in all scheduled activities.) Therefore, to further rule out the notion that the individual qualities of the original instructor who devised the technique were necessary for its successful implementation, we performed an extra intervention in another retirement home with an outside professional who could be depended upon to execute all eight sessions without fail

Experiment 2 (Outside Acting Teacher)

To recruit a professional actor/director/acting teacher, we asked the director of a nearby community college theatre program to recommend teachers or former teachers. The one we engaged was unacquainted with any details of our program, but she proved to be capable of conducting it simply by receiving emailed descriptions prior to each session, follow-up phone calls, and a brief in-person conversation at the retirement home prior to each class. If this instructor could achieve results similar to those obtained by the originator of the

program, such a finding would supply further evidence that the intervention is not only implementable by others but could be performed with relatively little personal instruction, providing the instructor already had a strong theatre background. This teacher had over 20 years of experience as both an actor-director and a theatre instructor in the Chicago area.

Method

Participants—Thirty-seven participants who resided in a continuing care facility in the Western Suburbs of Chicago were randomly assigned to either the experimental condition (N = 19) or waiting-list control (N = 18). Due to accidents or illnesses, a total of 6 participants did not take the post-test (2 in the experimental group and 4 in the control group), leaving 31 participants who completed the pre- and post-tests. In terms of age, there were no significant differences between the experimental (theatre) group (M = 80.8, SD = 7.1) and the waiting-list controls (M = 81.0, SD = 5.6). Both groups also had similar educational backgrounds (14.4 years, SD = 2.2 vs. 14.8 years, SD = 3.4), and were similar in gender composition (76% females in the experimental group vs. 79% females in the control group).

As with Experiment 1, there were no significant pre-test differences on the cognitive tests, the functional test, or the activity scores between completers and the non-completers. Also, the intervention and testing procedures were the same as in Experiment 1.

Results and Discussion

OTDL measure—Table 5 presents group means and standard deviations for the functional outcome measure (OTDL-R) across the two testing occasions. Performance was assessed by a 2 occasion (pre-test, post-test) x 3 task-areas (medicine, telephone, finances) x 2 group membership (acting, waiting-list control) mixed-design ANOVA. The group by occasion interaction was significant, $F(1, 29) = 6.46$, $p < .05$, $\eta^2 = .18$, as was the interaction between occasion by task-area. Two paired sample t-tests indicated that participants in the acting group showed higher pre- to post-test scores on the managing finances tasks ($p = .002$) and the taking medication tasks ($p = .03$) compared to the waiting-list controls.

Cognitive measures—The mean values and standard deviations for the dependent measures are presented in Table 6. We conducted a multivariate analysis of covariance with pre-test scores as covariates and group membership as the independent variable. In order to hold the influence of age and education constant, we also included them as covariates. Because the MANCOVA was significant, Wilks' $\Lambda = .16$, $F(6, 16) = 14.28$, $p < .001$, $\eta_p^2 = .84$, it was followed by univariate ANOVAs on each of the dependent measures. Significant differences = were obtained on recall scores, $F(1, 21) = 30.63$, $p < .001$, $\eta_p^2 = .59$, on problem solving, $F(1,21) = 28.99$, $p < .001$, $\eta_p^2 = .58$, and on verbal fluency, $F(1, 21) = 8.05$, $p = .01$, $\eta_p^2 = .28$. Performance on the delayed East Boston Memory test was only marginally significant, p = .07. Probability values for the delayed memory recall and the immediate East Boston measures ranged from .11 to .15 respectively. As in Experiment 1, the covariates of age and education were not significant. The statistical tests confirmed that our theatre intervention conducted by an outside professional resulted in improved mental functioning in older adults.

Predictors of Cognitive Performance at Post-test—As with Experiment 1, bivariate correlation and multiple regression were both used to investigate four individual-difference factors that were measured at pre-test as possible predictors of post-test performance. Once again, none of the predictors achieved statistical significance (see Table 7).

General Discussion

This study was performed to address the vital question of possible implementation by a variety of teachers. The instructor who designed the intervention had over 40 years of experience in professional theatre in addition to his academic background. Therefore, there is a possibility that the strong results found over the years were based on factors unique to this one investigator. However, Experiment 1 showed that some significant results can be achieved (including improvement on the important ODTL-R measure) even by activity directors who had to learn and execute this intervention as an extra duty in addition to their already crowded daily schedules. Moreover, Experiment 2 demonstrated that an outside professional acting teacher can produce results comparable to the original instructor with far less instruction than the activity directors. Thus we can say confidentially that widespread implementation of this intervention is certainly feasible although the results indicate stronger outcomes from the professional theatre instructor. As can be seen from the MANCOVA results in the two experiments, the effect sizes are significantly larger for the outside professional (Experiment 2) than for the activity directors (Experiment 1). These disparate results would appear to be either due to different participants and/or different instructors. However the latter seems far more likely than the former. If one compares the two experiments' baseline samples for participants' scores on outcome measures, the differences are negligible, suggesting that the instructor variable is responsible for the larger effect sizes. This would be consistent with evidence in the human services field that the choice of the human service professional (e.g., teacher, therapist) has a large effect on outcomes (e.g., Luborsky, McLellan, Woody, & O'Brian, 1985; Miller, Taylor, & West, 1980.

Despite the advantages of engaging theatre professionals, using in-house personnel would obviously be preferable for budgetary reasons but would require finding retirement homes that wish to offer these activities to their residents on an ongoing rather than a one-time basis. Moreover, a strong commitment on the part of the facility directors and the activity directors to the faithful implementation of the program would be essential to success. One approach we are currently exploring is to set up a workshop program in conjunction with large organizations such as The Gerontological Society of America (GSA) or American Society of Aging (ASA). Obviously, those retirement home administrators who are interested enough to register and send their activity directors to participate in the training will be more likely to include this evidence-based intervention as an important component of their activity programs, and not just as an additional duty.

The other, and possibly more viable option in view of the superior results, is to use a locally acquired acting instructor for each intervention. These professionals already have the skills and need only to become acquainted with the particular procedures that have proven so effective. Furthermore, due to the sadly endemic underemployment in the arts, we have found that these qualified specialists can be acquired through local community colleges fairly easily at a relatively low cost ($800.00 for the entire 8-session intervention).

Our demographic analysis in Experiment 1 produced one quite atypical result: amount of education was not correlated with the observed gains. This unusual finding suggests that, unlike other training or correlation studies (e.g., Van Hooren, Valentijn, Bosma, Pongs, Boxtel & Jolles, 2007; Tun & Lachman, 2008), improvements from this program are independent of prior education.

Of course, researchers have examined various other approaches for enhancing healthy cognitive aging. For example, Basak, Boot, Voss and Kramer (2008) investigated commercially produced computer games and found improved executive function in participants who played for 23.5 hours; other positive results were found by Smith et al.

(2009) and Nouchi et al. (2012). However, as pointed out in a review article on aging and technology, "objective evidence that a particular game or computer intervention can improve an individual's quality of life outside of the laboratory is sparse" (Charnesss & Boot, 2009, p. 256). Moreover, such games are obviously solitary endeavors and necessarily lack the strong advantages associated with social interaction as described in the introduction to this article.

One very promising approach to healthy cognitive aging is known as the Senior Odyssey Program (Stine-Morrow & Parisi, 2011). Adapted from an existing program for children and young adults called Odyssey of the Mind (OOTM), this intervention requires participants to create a solution to an ill-defined problem, eventually producing a formal presentation, complete with a written and memorized script.

Our theatre intervention has many elements in common with Senior Odyssey. Every theatrical script requires that the participants probe the dramatic situation underneath the literal words and come up with the character's motivation; there is no one correct answer as long as it is contextually appropriate. This seems comparable to OOTM's ill-defined problems. One major difference between the programs is the length: The formal part of the theatre intervention takes but four weeks to achieve gains on both the OTDL-R and the cognitive measures, greatly reducing the cost of administration (compared to the approximately six months needed by OOTM). Moreover, our policy with this intervention (and all previous iterations of it) is that written instructions be left with the activity directors so they might run all or part of the program in the future. Indeed, some directors have already reported integrating some of the elements into their regular scheduled activities. Also, copies of short, age-appropriate plays, scenes, and sketches are left in the libraries for the residents' use. This has proven to be very successful in some retirement homes. In one facility, six productions have already been staged, complete with costumes and sets made by the residents. Furthermore, in the majority of the retirement homes, some participants performed scenes or sketches in the facility's subsequent talent shows. Thus, this intervention sets up the possibility of lifelong learning for many of the older adults who partake in it.

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Table 1

Sociodemographic Characteristics by Group

Variables	Theatre N = 38	Control N = 28	p-value
Age, y, mean (SD)	84.11 (4.39)	83.25 (6.54)	.53
Education, y, mean (SD)			
Years in School	13.93 (1.89)	14.14 (2.75)	.72
Health, mean (SD)			
Number of Prescription Drugs Taken Daily	4.95 (3.01)	4.99 (3.13)	.96
Marital Status			.57
Married %	34.2	35.7	
Widowed %	55.3	60.7	
Single/Divorced %	10.5	3.6	
Gender			.70
Females %	78.9	85.7	

Table 2

Pre- and Post-test Scores on Observed Tasks of Daily Living (OTDL)

		Pre-test		Post-test	
Group	**Task**	**M**	**SD**	**M**	**SD**
Theatre (N = 38)	Medicine[a]	24.18	5.98	26.76	3.56
	Telephone[b]	13.40	3.53	14.00	3.20
	Finances[c]	27.05	5.63	30.37	3.17
	Total	64.63	10.98	73.13	7.05
Control (N = 29)	Medicine[a]	23.97	5.93	24.47	5.86
	Telephone[b]	12.52	4.49	11.87	4.45
	Finances[c]	26.79	5.63	26.77	5.76
	Total	63.49	12.39	62.73	14.58

Note:

[a]Maximum Score = 32;

[b]Maximum Score = 18;

[c]Maximum Score = 34

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Table 3

Pre- and Post-test Results for Activity Directors for Cognitive Measures by Treatment Condition

	Pre-test				Post-test			
	Theatre N = 38		Control N = 28		Theatre N = 38		Control N = 28	
Tests	**M**	**(SD)**	**M**	**(SD)**	**M**	**(SD)**	**M**	**(SD)**
EBM (immediate)	8.84	(2.14)	8.18	(2.31)	9.82	(1.64)	9.25	(1.90)
EBM (delayed)	8.71	(1.87)	8.16	(2.75)	9.61	(1.79)	8.86	(2.10)
Problem Solving	5.47	(2.32)	4.59	(2.06)	8.42**	(3.17)	6.25	(3.00)
Verbal Fluency	32.82	(9.27)	29.68	(9.16)	36.29*	(10.02)	30.39	(8.06)
Word Recall (immediate)	19.34	(3.83)	17.82	(3.74)	22.68	(4.34)	20.86	(3.70)
Word Recall (delayed)	6.50	(1.72)	5.71	(2.00)	7.53	(2.19)	6.64	(2.09)

Note:

* $p < .05$;

** $p < .01$

Table 4

Regression of Mean Cognitive Performance at Follow-up on Individual-Difference Predictors Assessed at Pre-test (N = 67)

	Regression Coefficient	Standard Error	P-value
DV: Post-test Performance			
Mean Pre-test Cognitive Performance	.679	.088	.000***
Group Membership	−.259	.113	.02
Education (whether 4-year college graduate)	.063	.117	.591
Exercise Habits (frequency)	.067	.087	.443
Health Status	.006	.108	.953
OTDL Total Score	.001	.005	. 792

Note: Significance level:

*** p<.001.

R square (unadjusted)=.646*** and R square (adjusted)=.611.

Table 5

Pre- and Post-test Scores on Observed Tasks of Daily Living for Acting Teacher (OTDL)

		Pre-test		Post-test	
Group	**Task**	**M**	**SD**	**M**	**SD**
Theatre	Medicine[a]	26.12	3.57	29.12	3.82
	Telephone[b]	12.65	3.12	13.53	3.39
	Finances[c]	28.59	3.43	31.47	2.85
	Total	67.35	7.07	74.12	7.59
Control	Medicine[a]	24.71	5.93	24.29	6.35
	Telephone[b]	13.43	2.90	11.71	3.75
	Finances[c]	27.43	5.32	27.71	5.18
	Total	65.57	13.22	63.71	11.55

Note:

[a]Maximum Score = 32;

[b]Maximum Score = 18;

[c]Maximum Score = 34

Table 6

Pre- and Post-test Results for Acting Teacher for Cognitive Measures by Treatment Condition

	Pre-test				Post-test			
	Theatre N = 17		Control N = 14		Theatre N = 17		Control N = 14	
Tests	**M**	**(SD)**	**M**	**(SD)**	**M**	**(SD)**	**M**	**(SD)**
EBM (immediate)	8.56	(1.80)	8.21	(1.53)	9.47	(2.53)	8.29	(1.73)
EBM (delayed)	6.29	(1.31)	6.86	(1.75)	10.00~	(2.21)	8.50	(1.83)
Problem Solving	5.12	(1.73)	5.00	(2.22)	10.69**	(2.36)	6.29	(1.90)
Verbal Fluency	33.94	(9.13)	32.21	(9.33)	39.59*	(10.85)	32.14	(7.57)
Word Recall (immediate)	20.24	(3.75)	20.64	(2.98)	24.59**	(3.20)	20.86	(4.06)
Word Recall (delayed)	6.50	(1.72)	5.38	(2.38)	8.06	(1.64	7.21	(2.69)

Note: Significance levels

** p < .001,

* p = .01

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Table 7

Regression of Mean Cognitive Performance at Follow-up on Individual-Difference Predictors Assessed at Pre-test for the Acting Teacher (N = 31)

	Regression Coefficient	Standard Error	P-value
DV: Post-test Performance			
Mean Pre-test Cognitive Performance	925	.263	.002***
Group Membership	−.719	.172	.000***
Education (whether 4-year college graduate)	.076	.183	.681
Exercise Habits (frequency)	.119	.125	.350
Health Status	.075	.180	.680
OTDL Total Score	−.008	.012	. 474

Note: Significance level

** p < .01;

*** p<.001.

R square (unadjusted)=.612*** R square (adjusted) = .515

Even when the regression was run using only one predictor at a time, no significant results were found (data not shown)