Review of Exemplar Programs for Adults with Early-Stage Alzheimer's Disease

By: Sandra C. Burgener, PhD, APRN-BC, FAAN; Linda Buettner, PhD, CTRS, FGSA; Kathleen C. Buckwalter, PhD, RN, FAAN; Elizabeth Beattie, PhD, RN, FGSA; Ann L. Bossen, MSN, RN; Donna Fick, PhD, APRN-BC, FGSA; Suzanne Fitzsimmons, MS, APRN-BC; Ann Kolanowski, PhD, RN, FGSA, FAAN; Nancy E. Richeson, PhD, CTRS; Karen M. Rose, PhD, RN; Andrea Schreiner, PhD; Janet K. Pringle Specht, PhD, RN, FAAN; Marianne Smith, PhD, APRN, BC; Ingelin Testad, MS, RN; Fang Yu, PhD, MSN, RN; Marcena Gabrielson, MSN, RN; and Sharon McKenzie, PhD, CTRS

Abstract:
In response to the need to develop evidence-based best practices interventions and services for individuals in the early stages of Alzheimer's disease (AD), the authors conducted an interdisciplinary literature review of exemplar programs, defined as those including multimodal or unimodal interventions; shown to be appropriate for individuals in the early stages of AD; demonstrating promise to support, maintain, and improve independent functioning; and shown to have positive effects for a variety of outcomes, including quality of life. This article examines evidence from five kinds of programs: (a) multimodal interventions, (b) programs developed by the Southwest Florida Interdisciplinary Center for Positive Aging, (c) sleep enhancement interventions, (d) managed care programs, and (e) technology-based interventions. Evidence from the review suggests that a number of programs can support functioning and improve quality of life for adults living with the early stages of memory loss. The article concludes with recommendations to advance a national research agenda in this area.

Article:
Currently, in the United States alone, more than 4.5 million people have Alzheimer's disease (AD), making it a significant and increasing public health concern. Projections are even more alarming, indicating that prevalence will be closer to 8 million by the year 2030 and will exceed more than 13 million by 2050 (Hebert, Scherr, Bienias, Bennett, & Evans, 2003). According to the National Institute on Aging (2006), overall prevalence of AD doubles with every 5-year increase in adults older than age 65 in the population. Although the precise prevalence of early-stage AD is unknown, our Dementia Day Camp (DDC) Dementia Research Group observed that there is often a substantial lag in the involvement of adults with AD in therapeutic programs following diagnosis. Correspondingly, our DDC group noted the obvious need for adults in the early stages of the disease to receive evidence-based best practices interventions and services.

As a background, for approximately 10 years, we have taken turns coordinating meetings of an international group of dementia-care researchers called "Dementia Day Camp." This group meets annually to formulate collaborative efforts to improve the quality and outcomes of studies addressing the care needs of individuals with dementia. The members of this group are nurse researchers, recreation therapists, and other psychosocial researchers with an extensive body of research regarding dementia care. The first meeting was held in 2001 as a consensus meeting for the Dementia Practice Guidelines. The group has produced numerous articles and grant proposals, an evidence-based document for early-stage dementia, and several community outreach events. The need for research testing- intensive programming for adults in the early stages of AD, as set forth in this article, was also examined by Zarit and Leitsch (2001), with recommendations for mechanisms to demonstrate efficacy.

In response to the need for evidence-based best practices for adults with early-stage AD, and at the invitation of the Alzheimer's Association, our DDC group conducted a large-scale interdisciplinary literature review of physical, cognitive, and health promotion programs, in addition to the exemplar programs that are the focus of this article. For this review, we defined exemplar programs as those:

- Including multimodal or unimodal interventions.
- Shown to be appropriate for adults in the early stages of AD.
- Demonstrating promise to support, maintain, and improve independent functioning.
- Shown to have positive effects for a variety of outcomes, including quality of life.
- Evidence from our review suggests that a number of programs, described in this article, can support functioning and improve quality of life for adults living with the early stages of memory loss.

SEARCH METHOD

The search for evidence supporting exemplar programs took place between December 26, 2006, and January 21, 2007, using PubMed, Cochrane, and CINAHL databases. The following search terms were used: *Alzheimer's disease therapy, Alzheimer's disease prevention and control, psychosocial factors, programs for AD, and behavioral interventions in AD.*

When a citation was found, links to related studies were explored. Further searches were performed on the names of authors of research articles found in the initial search, as well as on the names of their projects. Additional searches were performed on the names of researchers known for their work with people with early-stage dementia. Lists of references on early-stage AD interventions were also contributed by professionals working in the field.

After articles were analyzed for the review, additional studies were identified using the ancestry method, a search strategy that includes the systematic review of citations from studies included in the review and from review articles. Web sites were also searched for studies testing the efficacy of programs. Finally, one researcher was contacted for information yet to be published on one intervention program.

Criteria for Inclusion

All research articles written after 1984 examining broad-based outcomes were included in the review, which focused primarily on early-stage AD. Early-stage AD was defined as having a diagnosis of early-stage AD with either a Mini-Mental State Examination (MMSE) (Folstein,

TABLE 1

Summary of Study Topics and Percentages of Evidence Grade Ratings

Study Topic	Grade			
	A	B	C	D
Multimodal interventions (n = 6)	50%	50%	0	0
Programs developed by the Southwest Florida Interdisciplinary Center for Positive Aging (n = 2)	0	50%	50%	0
Sleep enhancement interventions (n = 1)	100%	0	0	0
Managed care programs (n = 1)	100%	0	0	0
Technology-based interventions (n = 4)	0	0	100%	0
Total (N = 14)	n = 5	n = 4	n = 5	n = 0

Folstein, & McHugh, 1975) score of 18 or higher, a Clinical Dementia Rating (Hughes, Berg, Danzinger, Coben, & Martin, 1982) score of 2 or less, or a Global Deterioration Scale score (GDS) (Reisberg, Ferris, de Leon, & Crook, 1982) of 2 or less. Research studies that evaluated interventions related to outcomes of adults with early-stage AD were included, and only articles written in English were reviewed. Reports based on undocumented opinion or solely descriptive in nature were excluded.

Criteria for Grading the Strength and consistency of Evidence
The exemplar programs described in this article were a result of a systematic review and synthesis of current evidence. Research findings and other evidence, such as guidelines and standards from professional organizations, case reports, and expert opinion, were critiqued, analyzed, and used as supporting evidence. The practice recommendations were assigned an evidence grade on the basis of the type and strength of evidence from research and other literature (Table 1). The following grading schema was used to make evidence-based recommendations:

- A1 = Evidence from well-designed meta-analyses or rigorous systematic reviews with results that consistently support a specific action (e.g., assessment, intervention, treatment).
- A2 = Evidence from randomized controlled trials with consistent results.
- B1 = Evidence from high-quality evidence-based practice guidelines.
- B2 = Evidence from one or more quasi-experimental studies with consistent results.
- C1 = Evidence from observational studies with consistent results (e.g., correlational, descriptive studies).
- C2 = Inconsistent evidence from observational studies or controlled trials.
- D = Evidence from expert opinion, multiple case reports, or national consensus reports.

Definitions of and Used Within Exemplar Programs
Exemplar programs represent those studies that have the potential to substantially advance the science of interventions appropriate for adults in the early stages of AD. Exemplar programs do not just address specific symptoms, but instead have broad effects and advance the science of intervention research for those in the early

stages of the disease. For consistency in comparing and describing research reports, the definitions found in Table 2 were used by the reviewers.

EVIDENCE SUPPORT FOR EXEMPLAR PROGRAMS

Our review revealed several excellent studies and kinds of evidence-based programs that improve the lives of adults with early-stage AD. Five kinds of exemplar programs are described below, including:

- Multimodal interventions, including exercise interventions combined with other therapies.
- Programs developed by the Southwest Florida Interdisciplinary Center for Positive Aging.
- Sleep enhancement interventions.
- Managed care programs.
- Technology-based interventions.

Multimodal Interventions

Multimodal interventions are one category of exemplar programs. For the purposes of this article, multimodal interventions are composed of at least two techniques, tested within the same study, and aimed at improving one or more aspect of life of the person with AD. In addition, exemplar multimodal interventions are distinguished from other interventions by their effects on a variety of outcomes.

The most common approach in the nonpharmacological treatment of early-stage AD is to use a variety of interventions to improve quality of life, enhance cognition, and promote functional independence. The strength of these interventions is that they are based on one of the strongest

TABLE 2

Definitions of and Used Within Exemplar Programs

Intervention	Definition
Cognitive-linguistic stimulation	Typically involves different aspects of cognition, including language, problem solving, memory, and reasoning to keep patients engaged in using skills that can deteriorate if not used (Mahendra, 2001).
Cognitive training (CT)	Any nonpharmacological intervention designed to improve cognitive functioning, regardless of mechanism of action. Typically, CT interventions focus on specific domains of cognitive functioning (e.g., memory, attention, problem solving), but more general, cognitively mediated domains of functioning, such as basic and instrumental activities of daily living, social skills, and behavioral disturbances can also be targeted (Sitzer, Twambley, & Jeste, 2006). CT strategies can be divided into two subcategories: (a) compensatory strategies and (b) restorative techniques. Compensatory strategies teach new ways of performing tasks by "working around" cognitive deficits. Examples of compensatory strategies include internal strategies, such as organizing information by visualization or categorizing, encoding through multiple sensory channels, asking questions during learning, and focusing on a single task. Compensatory interventions also use external strategies, such as memory notebooks, environmental cues, and calendars. Restorative strategies are used to retrain people with Alzheimer's disease to perform tasks.
Cognitive rehabilitation	This term is used mostly in Europe to describe the same interventions used in cognitive training.
Cognitive stimulation	Nonregimented involvement in activities that require mental functioning. Cognitive stimulation is either active (e.g., a group discussion of current events, solving a crossword puzzle) or passive (i.e., engaging but observational in nature, such as listening to a poetry reading, watching a play, or listening to music). Cognitive stimulation is much less formal than cognitive training/cognitive rehabilitation.
Managed care	The use of health information and support services as a means of preventing crisis episodes and helping patients emotionally cope with their illnesses, as well as reducing excessive use of health care services (Clark, Bass, Looman, McCarthy, & Eckert, 2004).
Memory rehabilitation	A variety of learning techniques that are applied to improve the memory skills of participants. Memory rehabilitation is based on the hypothesis that memory loss in Alzheimer's disease results from defective encoding and storage of information rather than from forgetting information (Metzler-Baddeley & Snowden, 2005). It focuses on encoding information in areas of the brain that are less impaired by Alzheimer's disease. Cognitive training/cognitive rehabilitation differs from memory training/memory rehabilitation in three ways. First, memory interventions specifically target encoding of memory and recall, whereas cognitive therapies target many different areas of cognition, sometimes within the same therapy. Second, the cognitive approaches usually offer a milieu of therapies within a study, whereas the reviewed studies in memory rehabilitation typically looked at one method per study. Third, current memory research is based on the location of active pathology within the brains of people with Alzheimer's disease, targeting therapies to the functions coordinated in the parts of the brain with the least impairment.

theories supporting interventions with individuals with dementia: the theory of the effects of enriched environments on neuronal regeneration (Bach-y-Rita, 2003; Robertson & Murre, 1999). Multimodal interventions are designed to provide a variety of stimuli, affecting neuronal activity and responses through varying mechanisms. Six exemplar multimodal programs are highlighted below, including research by Teri et al. (2003); Olazarán et al. (2004); Burgener, Yang, Gilbert, and Marsh-Yant (2008); Rosendahl et al. (2006); Arkin (2003); and Mahendra and Arkin (2003).

Teri et al. (2003) (evidence grade = A2) completed a multimodal intervention study testing the effects of home-based exercises and caregiver training on behavior management. Using a randomized, experimental design, the

study was conducted in the home setting with adults (N = 140) in the early to early-middle stages of AD (mean MMSE score = 17.6) and their family caregivers. Dyads composed of caregivers and adults with AD in the treatment group received 12 hours of instruction in the home, followed by follow-up visits to answer questions and assess outcomes. Exercises included aerobic/endurance activities and training in strength, balance, and flexibility, with a goal of maintaining 30 minutes daily of moderate intensity exercise. Postintervention outcomes included significantly improved physical role functioning scores (mean difference = 19.29; 95% confidence interval [CI] = 8.75 to 29.83; $p < 0.001$) and depression scores (mean difference = -1.13; 95% CI = -0.17 to 1.91; $p = 0.02$), and fewer days of restricted activity for the treatment group (odds ratio [OR] = 3.1; 95% CI = 1.08 to 8.95; $p < 0.001$). Outcomes were maintained at 2 years postintervention, with a trend toward lower institutionalization rates for treatment group participants. The strength of this multimodal intervention is the long-term positive outcomes, in addition to immediate gains.

Olazarán et al. (2004) (evidence grade = A2) implemented a 12-month, multicenter, single-blind, randomized controlled study of a nonpharmacological, cognitive- motor intervention in 84 adults already being treated with a cholinesterase inhibitor (ChEI). Patients were randomized to either the psychosocial support plus cognitive-motor intervention (CMI, the experimental group) or to a control group consisting of psychosocial support alone. The CMI intervention was delivered in 103 sessions (twice weekly) to groups of 7 to 10 patients over a year-long period and included cognitive exercise plus social and psychomotor activities. The sessions averaged 3.5 hours and were composed of reality orientation techniques, cognitive exercises (stimulating one specific cognitive function each session), training in activities of daily living, a coffee break, and psychomotor exercises. Outcome measures included the cognitive subscale of the Alzheimer's Disease Assessment Scale, the MMSE, the Functional Activities Questionnaire, and the GDS. Reviewers blind to treatment condition collected data at 1, 3, 6, and 12 months. Results supported the effectiveness of the CMI intervention in ChEI-treated adults with early dementia. The cognitive response was higher in those with less formal education. Findings revealed that patients in the CMI group were able to maintain their cognitive status at the 6-month time point, whereas the cognitive status of patients in the control group significantly declined ($p = 0.02$). In addition, more patients in the treatment group maintained or improved their mood at the end of the study (75% versus 47% for the control group, $p = 0.017$).

Burgener et al. (2008) (evidence grade = A2) examined the effects of a multimodal intervention on a variety of outcomes in adults in early-stage AD. Using brain plasticity theory as a basis for the intervention, an experimental design was used to test the multimodal intervention. Participants were randomly assigned to either a treatment (n = 24) or control (n = 19, delayed treatment) group. The baseline mean MMSE score was 22.5 across groups. The 20- week intervention, adapted for individuals with dementia, consisted of tai chi exercises (emphasizing strength, balance, mind-body connection, mobility, flexibility, and agility), cognitive-behavioral therapies, and a support group offered to the treatment group. The control group received an attention-control intervention of monthly educational programs and supportive telephone contacts. Postintervention MMSE scores varied significantly between the groups and increased for the treatment group ($p = 0.05$), whereas baseline scores did not differ ($p = 0.17$), indicating a treatment effect. Improvements in measures of executive function (Executive Interview [Exit 25] scores) were also evident in the treatment group after 20 weeks. Treatment group participants demonstrated improved balance, whereas a decline in balance was seen in the control group. Between-group differences were also evident for self-esteem, as measured by the Rosenberg Self-Esteem Scale at 20 weeks ($p = 0.01$), although no baseline differences were found. A stabilization effect was found for depression (GDS) and illness (Cumulative Illness Rating Scale), with treatment group participants increasing by only 0.4 points, and the control group increasing by 1.7 points on illness ratings.

An exercise and nutritional supplement multimodal intervention was tested using a randomized controlled trial in a residential care facility with adults (N = 191) in early to middle stages of AD (mean MMSE score = 17.8) (Rosendahl et al., 2006) (evidence grade = B2). The exercise intervention was conducted by physiotherapists and included high-intensity functional exercises consisting of tasks to improve leg strength, postural stability, and gait ability. Exercises were based on identified functional deficits and individualized for each participant. The nutritional intervention consisted of a high-protein energy supplement. It was hypothesized that the energy

supplement would increase the training effects if consumed immediately after exercising. The intervention included 29 sessions over a 3-month period. Positive effects among participants in the exercise group included improvements in physical functioning, such as improved self-paced gait ($p = 0.009$); balance, as measured by the Berg Balance Scale ($p = 0.05$); and lower- leg strength ($p = 0.03$). No significant effects were found for the addition of the nutritional supplement.

The combined effects of exercise and cognitive and social stimulation were tested by Arkin (2003) (evidence grade = B2) in a small (N = 24) community-based study. Adults in the early stages of AD (MMSE scores range = 15 to 29) participated in 16 to 20 exercise sessions and 10 activity sessions for 2 to 8 semesters. Students supervised the exercise sessions with the assistance of informal caregivers. Exercises included stretching and balance, approximately 30 minutes of aerobic activity, and 30 minutes of upper body and lower body strength training using resistance machines. In addition, 50% of the weekly sessions also included memory and language-stimulating activities. Cognitive stimulation activities were varied and included tasks such as story recall, word associations, traveling bingo, and object descriptions (selected from approximately 14 activities). Compared with age-matched healthy older adults, the treatment group participants evidenced highly significant physical fitness gains (all $p < 0.001$) in the 6-minute walk test, upper and lower body strength, and duration of aerobic exercise. Participants' mood improved, and a slowing in cognitive decline was documented. The positive benefits of using students to supervise the intervention, including motivation and cost effectiveness, are described.

The Elder Rehab program was developed at the University of Arizona's Department of Speech and Hearing Sciences and used students to work with adults in early-stage AD in an outpatient setting (Mahendra & Arkin, 2003) (evidence grade = B2). Programs offered included physical exercise and the pairing of students on a one-to-one basis with participants to supervise them in 10 weekly, 2-hour sessions consisting of either volunteer service or other meaningful community activity. Students also administered structured verbal fluency and conversational stimulation. The students used their own motor vehicle to transport themselves and their participant partner to and from the center and to all volunteer and community service projects. Twenty-four adults in early-stage AD (baseline MMSE scores range = 15 to 29) started the 4-year program, but only 4 participants actually completed the program and were assessed throughout the project. All 4 remained stable in most measures throughout the study, contrary to the expected decline seen in AD. Because of the high attrition rate and small final sample, no statistical tests were performed on outcome measures such as discourse, proverb interpretation, and picture description. Nevertheless, the authors concluded that their study provided "preliminary evidence that long-term cognitive- linguistic interventions can maintain or improve aspects of language performance" (Mahendra & Arkin, 2003, p. 415) in this population.

Programs Developed by the Southwest Florida Interdisciplinary Center for Positive Aging
The mission of the Southwest Florida Interdisciplinary Center for Positive Aging is to provide interdisciplinary education, training, research, and service within a university environment and in diverse urban, rural, and Native American reservation community environments for the varied needs of older adults in Charlotte, Collier, Glades, Hendry, and Lee counties in Florida to enhance overall quality of life. Programs for people with memory loss were aimed at education, therapies, and psychosocial assistance for the entire family. Preventive cognitive and physical programs were offered for those worried about memory loss. Research at the Center for Positive Aging has focused on improving cognition, depression symptoms, quality of life, functional abilities, and disturbing behaviors found in AD through the use of therapeutic recreational interventions.

Buettner (2006) (evidence grade = B2) examined outcomes in 40 adults diagnosed with early AD who partici-pated in programs of their choice at the Center for Positive Aging. A control group consisted of 40 participants who also had a diagnosis of early AD but did not attend the Center programs. MMSE scores for the treatment group improved significantly ($p < 0.05$) from a mean score of 20.5 at baseline to a mean score of 21.52 after 6 months of participation. The score did decline somewhat (20.08) 12 months after baseline measurement. Depression scores improved for treatment group participants, with statistically significant improvements ($p < 0.05$) at both the 6- month and 12-month assessments. Depression improved somewhat for control group

participants but did not reach significant levels. Quality of life scores also improved significantly for the treatment group (p = 0.01), with significant declines (p = 0.05) noted in the control group. Trends were also found toward improved self-esteem and lower stress for treatment group participants, although these trends were not found in the control group. Collectively, these findings support the effectiveness of comprehensive community-based interventions on a variety of outcomes in adults in the early stages of AD.

A complementary report of the benefits of participation in community-based recreation clubs used interview data to assess benefits from participation (Buettner & Fitzsimmons, 2006) (evidence grade = C1). Participants and family members were interviewed at 6-month intervals to evaluate satisfaction and perceived stress. Findings included:

- Ninety percent of participants reported having experienced health benefits, which were measured in terms of variables such as hospitalization rates, new medications prescribed, number of falls, and changes in weight.
- Ninety-seven percent reported having made three or more close friends due to participation.
- Ninety-two percent developed new leisure activities and increased opportunities for community participation.
- Ninety-seven percent reported extremely high satisfaction levels with the program.

The multiple benefits of this comprehensive, community- based program are evident in both the positive qualitative and quantitative outcomes for adults in the early stages of AD.

Sleep Enhancement Interventions
Common problems in adults with AD, even in its early stages, are sleep disturbances, such as day/night confusion, frequent nighttime awakenings, and nightmares and hallucinations. One line of study is showing promise in treating this prevalent care issue. Although this study was conducted using participants in more advanced stages of AD, the fact that the study was conducted in the home setting, involved caregiver support and education, and represented translational research merits its inclusion as an exemplary line of research.

McCurry, Gibbons, Logsdon, Vitiello, and Teri (2005) (evidence grade = A2) developed a sleep program (NITE-AD) for adults in both the early to middle disease stages (mean MMSE score = 11.8) and their family caregivers. The program consists of sleep hygiene education, daily walking, and increased light exposure, all directed at improving sleep. Participants resided in their homes for this community-based study. This study was a 6-month randomized controlled trial of NITE-AD with 36 participants: 17 in the experimental group, and 19 in the control group. The control group received general dementia education and caregiver support, but no specific sleep interventions. At the end of the 3-month intervention, treatment group participants demonstrated significantly greater reductions in the number of nighttime awakenings (p = 0.01), total time awake at night (p = 0.03), and depression (p = 0.007), with increases in weekly exercise days for patients (p = 0.01) and caregivers (p = 0.07) as compared with the control group participants. Sleep outcomes were measured by actigraphy, the Pittsburgh Sleep Quality Index, and the Epworth Sleepiness Scale. The Revised Memory and Behavior Problems Checklist-Depression was used to rate caregivers' perceptions of mood-related outcomes in patients. At a 6-month follow-up evaluation, treatment gains were maintained, and additional significant improvements in the reduction of night awakenings were evident, primarily using descriptive data techniques. NITEAD participants also reported less sleepiness during the day and less time in bed during daytime hours than did those in the control group. The significant and continuing positive effects of this community-based study merit further investigation with larger samples.

Managed Care Programs
The primary purpose of managed care is to control health care costs; however, there can be some related ben-efits for participants as well. One study was found that examined outcomes in adults with AD.

Clark, Bass, Looman, McCarthy, and Eckert (2004) (evidence grade = A2) examined the effects of a partici-pant-based form of managed care. This study used a 12- month randomized controlled investigation of the effects of care consultation with the person with AD on his or her psychosocial well-being and appropriate use of health care resources. The care consultation process involved the person with AD in the assessment of all of the participants' strengths, including caregivers, and needs. After the assessment, the care consultant, together with the participant, devised a plan of care for treatment of their AD, referring the person to Alzheimer's Association services and traditional health care services. The control group did not receive care consultation but had access to all traditional resources of the Alzheimer's Association and the health care community; however, they had to seek these services themselves. Findings suggested that the treatment group participants felt less isolated (($3 = -0.17$, $p < 0.07$) because of their disease and experienced significantly less difficulty in coping with memory problems (($3 = -0.22$, $p < 0.05$) than did the control group. Regarding outcomes for the treatment group, participants with more severe impairment (yet still living in the community) had fewer physician visits, were less likely to have an emergency department visit or hospital admission, and experienced less depression and strain.

Technology-Based Interventions

Research has been conducted using a variety of technology-based interventions as a means to deliver care or

TABLE 3

Recommendations Comprising an Imperative for a Research Agenda to Rapidly Advance the Evidence Base

Recommendation 1	That a 5-year to 10-year priority-driven research agenda related to early dementia be developed, widely publicized, and presented by experts to leadership in major funding agencies.
Recommendation 2	That funding bodies be appraised of (recognize) the necessity for longer term funding to support continu-ity in priority programs.
Recommendation 3	That the scope and strength of interdisciplinary collaboration in research teams seeking funding for early dementia intervention projects be closely considered in decisions made by funding bodies.
Recommendation 4	That priority in research funding is given to studies with strong theoretical underpinnings that compare in-terventions head to head, including comparisons of nonpharmacological and pharmacological interventions.
Recommendation 5	That priority be given to studies that describe the prevalence of early-stage dementia and/or further expli-cate the trajectory, characteristics, and rates of conversion from mild cognitive impairment to early dementia.
Recommendation 6	That early technology-based interventions that show promise be promoted via special funding mecha-nisms, as they have the unique capacity to make a difference in the lives of individuals with early-stage dementia who are isolated from treatment options by distance or other factors.
Recommendation 7	That a Consortium of Intervention Researchers in Early Dementia be formed with the express purposes of extending and connecting the body of scholars committed to this endeavor and giving an organized voice to the research agenda.

provide assistance to adults with early-stage AD. These studies, although in their infancy, hold potential to in-crease the scope of available services in the community setting. Because technology-based interventions often minimize the need for professional support services, they can be used by family caregivers and often offered at minimal cost. The potential for widespread dissemination is also optimized as a method of delivering cognitive training to adults with AD.

In one study, computer-based training was used to instruct 4 participants with early-stage to middle-stage AD in functional tasks appropriate to their lifestyle (Hofman, Hock, & Müller-Spahn, 1996) (evidence grade = C1). Photographs of the steps in tasks to be learned were taken and scanned into a computer. The adults with AD then used the computer's touch screen to sequence the tasks. A facilitator was present to offer advice, but participants were encouraged to work as independently as possible. All 4 participants' training performance improved substantially (i.e., marked reduction in time, advice, and mistakes), and these improvements were

maintained over the 4-week study period, as reported descriptively and using bar graph comparisons. However, training did not result in statistically significant improvement in cognition, as measured by MMSE scores, or activities of daily living, on the basis of data from the Interview for Deterioration in Daily Living Activities in Dementia scale. In addition, Hofman et al. (1996) reported anecdotally that levels of motivation were high and that a positive acceptance of the training, as well as signs of emotional activation, were seen among study participants.

Oriani et al. (2003) (evidence grade = C1) examined the use of an electronic memory aid (EMA) to support prospective memory among adults in both the early to middle stages of AD. Five adults, 4 of whom had an MMSE score of 18 or greater, were trained in the use of the EMA, a device that uses vocal recordings for appointments or tasks. It can be programmed with dates and times for appointments, using an alarm system to alert the user about a message regarding an appointment or task. The user pushes a button and then receives the recorded message. For each of the 5 participants, the EMA was compared with two other conditions: recall using a written list and recall without any external memory aid. Results, analyzed using analysis of variance procedures, revealed that use of the EMA yielded significantly (p = 0.001) better results on recall than either of the other two methods (free recall mean = 0.8, [SD = 1.79]; recall with a written list mean = 3.1, [SD = 6.93]; EMA mean = 15.4; [SD = 6.66]). Further research using larger samples and in real-life (i.e., home) situations is warranted for this memory aid.

In a case study of a person with early-stage AD by Quittre, Olivier, and Salmon (2005) (evidence grade = C1), a digital clock and a memory book for daily life activities were used. The authors used a spaced retrieval method for teaching the use of these devices. All interventions were also reinforced at home by the person's caregiver. At the end of the 3-month training period—even though the participant's MMSE score declined (from 20 to 18)—her husband reported fewer cognitive deficits than in the initial assessment and slight improvement in recall of recent events, concentrating on a task, and retrieving the date. Observations and perceptions of the participant's spouse caregiver suggest the intervention also improved the participant's role in conversations and housework and led to fewer repetitious questions. Her husband also reported that she had a better functional relationship and family and social life.

Poon, Hui, Dai, Kwok, and Woo (2005) (evidence grade = C1) compared the administration of a community-based cognitive intervention composed of assessment training and psychosocial support, using videoconferencing and face-to-face methods. A total of 12 sessions were conducted via both methods. Twenty-two participants with early-stage AD were randomized into two equal groups of 11 each. Following the cognitive intervention, MMSE scores in both groups improved significantly from baseline (p < 0.001). Significant improvement of participants in both groups was also seen in the areas of attention, memory, and language, with no difference in outcomes in either group. However, in spatial construction ability, only the face-to-face group improved (p < .001). As outcomes were similar for both groups, support was evident for the efficacy of videoconferencing methods as an alternative to face-to-face interventions.

DISCUSSION AND LIMITATIONS
Despite a growing body of evidence that interventions can be effective in early-stage AD, the state of the science is still unsophisticated and characterized by too few large studies using rigorous methods. Indeed, many of the outcomes from intervention studies reported in this article are observational or anecdotal in nature and rely on descriptive rather than robust inferential statistics to measure improvement. They use nonprobability samples and nonexperimental designs and are carried out in a single setting, which limits internal validity, as well as the ability to generalize the findings. Many studies have samples too small to have sufficient power for hypothesis testing. Others (e.g., Mahendra & Arkin [2003]) have alarmingly high attrition rates (only 4 of the original 24 participants completed the study), which further limits confidence in the results.

It is clearly time to move beyond case study methodology and reliance on the anecdotal perceptions of spouses as outcome data. We also need a cadre of studies, versus one or two isolated investigations, within the most

prom ising intervention domains. Moreover, too few of the intervention studies reported pay adequate attention to important methodological issues, such as treatment integrity and fidelity.

Despite the limitations noted and the fact that some areas have received minimal testing (i.e., sleep enhancement interventions, managed care programs), the potential of these areas of study to effect broad outcomes merits their inclusion as exemplar programs. In addition, support for technology-based intervention studies is hampered by small samples and limited outcomes measured. Despite these limitations, technology-based programs offer promise for the future as an exemplary method to minimize the need for professional support services, be used by family caregivers, be offered for minimal costs, and be widely disseminated.

Multimodal interventions demonstrate beginning promise and warrant further investigation. They are included as exemplar programs for several reasons, including the power of the intervention; the effects on a variety of outcomes, including cognitive, functional, and affective behaviors; and the fit of the intervention with one of the most promising theories supporting therapies for adults with AD. Multimodal interventions are particularly promising in the treatment of early-stage AD. Many intervention studies are designed to affect one or two symptoms, whereas the more powerful multimodal interventions may actually influence the course of the disease through their effects on neuronal functioning, producing widespread positive benefits. However, testing of multimodal interventions is complex and requires researchers to ask questions such as: Are the multiple components the key, or is it the combinations of specific interventions? and, How can the most efficacious combinations of interventions be identified?

CONCLUSIONS AND RECOMMENDATIONS

This literature review of exemplar programs was conducted to identify effective means of supporting, maintaining, and improving independent functioning in early-stage AD. A variety of approaches showed promise in improving the lives of adults with dementia. These exemplar studies have resulted in a variety of positive outcomes, including improved cognition and physical abilities, reduced depression, heightened self-esteem, and enhanced communication ability. Nevertheless, much more rigorous research in the area of interventions for early-stage AD is needed, specifically, research that uses randomized controlled trials with psychometrically sound measures of standardized

outcomes in early-stage AD. Indeed, many of the reviewed studies show promise but do not yet reach the level of evidence necessary to be considered robust enough to move forward into clinical trials. It is essential that our approach to interventions be broad based to include all potentially promising intervention strategies until sound research provides evidence to the contrary. It is also essential that a national agenda for research in this area is developed, promulgated, and recognized as a national priority.

To move this agenda forward, we proposed seven recommendations comprising an *Imperative for a Research Agenda to Rapidly Advance the Evidence Base* to the national Alzheimer's Association in 2007. The recommendations are set forth in Table 3.

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