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# A Randomized, Controlled Trial of a Home Environmental Intervention: Effect on Efficacy and Upset in Caregivers and on Daily Function of Persons With Dementia

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***Purpose of Study:*** The authors determined short-term effects of a home environmental intervention on self-efficacy and upset in caregivers and daily function of dementia patients. They also determined if treatment effect varied by caregiver gender, race, and relationship to patient. ***Design and Methods:*** Families ($N$ = 171) of dementia patients were randomized to intervention or usual care control group. The intervention involved 5 90-min home visits by occupational therapists who provided education and physical and social environmental modifications. ***Results:*** Compared with controls, intervention caregivers reported fewer declines in patients' instrumental activities of daily living ($p$ = .030) and less decline in self-care and fewer behavior problems in patients at 3 months post-test. Also, intervention spouses reported reduced upset ($p$ = .049), women reported enhanced self-efficacy in managing behaviors ($p$ = .038), and women ($p$ = .049) and minorities ($p$ = .037) reported enhanced self-efficacy in managing functional dependency. ***Implications:*** The environmental program appears to have a modest effect on dementia patients' IADL dependence. Also, among certain subgroups of caregivers the program improves self-efficacy and reduces upset in specific areas of caregiving.

*Key Words: Clinical trial, Home modification, Home care*

A primary focus of caregiver research has been on developing and testing interventions for families caring for persons with dementia. Most tested interventions have been psycho-educational, typically involving a combination of counseling, education, stress management, and problem-solving skill development. Recent reviewers of this burgeoning research have concluded that psycho-educational interventions are only moderately effective in reducing caregiver distress and that a broad range of intervention strategies to address the multiple needs of caregivers at each stage of the illness trajectory should be tested (Bourgeois, Schulz, & Burgio, 1996). These reviewers also suggested the need for future studies to determine what types of interventions benefit which types of caregivers (Biegel & Schulz, 1999). The few studies that have examined caregiver characteristics in relationship to service use and treatment outcomes suggest differential effects along a number of dimensions. For example, Cox (1998) found that African American caregivers benefited more than White caregivers from a psychosocial intervention, and Zarit, Stephens, Townsend, Greene, and Leitsch (1999) showed that brief users of adult day services tended to be spouses.

In this study we evaluated an innovative intervention approach involving occupational therapist home visits targeted at helping caregivers modify their living space to address daily caregiving challenges. Whereas psycho-educational interventions have been extensively evaluated, that is not the case for a home environmental approach. The rationale for using the home environment as a therapeutic modality is based in a competence-environmental press framework and recent advances in control theory. A competence-environmental press framework suggests that as competency declines, an unchanging physical and social environment poses significant demands or press on an individual that may result in negative behavioral and functional outcomes (Lawton & Nahemow, 1973). Adjusting and simplifying dimensions of the environment to match reduced competency may minimize excess disability in persons with dementia. For example, removing unnecessary objects from a room may enhance orientation and reduce confusion and agitation.

Additionally, personal control theory provides the rationale for why an environmental approach may also benefit caregivers. According to this theory, main-

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taining control is a universal imperative achieved by using primary mechanisms such as changing the immediate environment (e.g., people, objects), secondary mechanisms such as changing cognition or emotions, or a combination thereof (Schulz & Heckhausen, 1999). The unsuccessful application of these mechanisms to achieve control may result in negative affective consequences such as emotional upset and lowered self-efficacy. Applied to the caregiving context, family members may be motivated to use an environmental strategy, a primary mechanism, as a part of their repertoire of coping strategies to achieve personal control over overwhelming and unpredictable situations. Maintaining personal control may in turn reduce upset and enhance self-efficacy beliefs among caregivers.

A few exploratory studies have shown that family caregivers accept and use environmental strategies and perceive them as helpful in addressing specific dementia-related behaviors. These studies, however, have used single-case and panel designs, and outcomes have been limited to utilization rates of environmental strategies and self-reported benefits. Pynoos and Ohta (1991), in a pilot study of 12 family caregivers, found that 66% of recommended environmental strategies were reported by caregivers as initially effective in managing specific problems, and of those, 89% remained in use at study follow-up. Consistent with this study, Gitlin and Corcoran (1993) found that among 17 spouse caregivers, 92% of environmental strategies offered by occupational therapists to improve bathing routines were subsequently implemented by caregivers and were reported as helpful in reducing resistance to bathing. For managing incontinence, caregivers used 53% of the recommendations that were offered. These findings suggest that caregivers are selective about which environmental strategies they use but that those that are acceptable are implemented. Other studies have also shown that caregivers, independent of a formal service provider and through trial and error, adjust the physical home environment in response to safety concerns, wandering, or a decline in self-care (Olsen, Ehrenkrantz, & Hutchings, 1993). In clinical practice, environmental recommendations for home safety have become routine in hospital and home care (Alzheimer's Association, 1997). Nevertheless, the effects of helping caregivers modify their home environment on caregiver well-being and level of dependency of the person with dementia remain untested.

We report on a randomized controlled study of a home environmental intervention with family caregivers. The intervention provided caregivers with a set of skills and strategies that lowered the threshold or press of the social and physical environment for the person with dementia. That is, the intervention was designed to help caregivers develop an environment supportive of reduced competencies such that the person with dementia would exhibit fewer disruptive behaviors and experience a slower rate of decline in instrumental and basic activities of daily living (IADLs and ADLs). Moreover, because this approach provided caregivers with practical skills and a mechanism to exert control over difficult situations, it targeted caregiver upset and self-efficacy beliefs in managing day to day. Therefore, we anticipated that the intervention would affect behavioral occurrences and functional dependency of the person with dementia as reported by the caregiver as well as the caregiver's own level of upset and self-efficacy with these problem areas.

Additionally, in this study, we wanted to determine whether certain caregivers evinced greater benefits than others from this type of intervention on the basis of gender, race, and relationship to the person with dementia. An environmental intervention is behaviorally demanding in that it requires caregivers to actively problem solve; change lifelong daily routines; and adjust or remove material aspects of the environment that may have personal, symbolic, and historical meaning. We speculated that the intervention might not work for everyone. Previous research on caregiving has shown that family caregivers differ in their coping styles and appraisals of their situation on the basis of a number of characteristics including gender, race, and their relationship to the person with dementia (Kramer, 1997; Levin, Chatters, & Taylor, 1995). Because our previous research showed that women were more likely to comply with a home environmental intervention than men (Gitlin, Corcoran, Winter, Boyce, & Marcus, 1999), we speculated that women would derive greater therapeutic benefit than men. We also anticipated that minority caregivers, the majority of whom were African American in this study, would demonstrate greater benefit than White caregivers on the basis of previous research that has shown that African Americans are more likely to derive improved self-efficacy from behavior-change interventions. Finally, given that studies on caregiving have consistently shown that spouses have higher rates of upset and depression than nonspouse caregivers (Pruchno & Resch, 1989), we believed that spouses had more to gain from this intervention.

In this study we have contributed systematically to the growing body of caregiver intervention research by testing a new intervention approach; examining outcomes for both the caregiver and the person with dementia; and determining whether treatment effects vary by caregiver gender, race, and relationship.

## Methods

### *Participants*

Family caregivers were recruited from local social service and medical centers and through media announcements in the Philadelphia region between 1993 and 1996. To participate in the study, caregivers had to live with a family member with a medical diagnosis of Alzheimer's disease or a related disorder, perceive themselves as the primary caregiver, report dependence of the person with dementia in at least two ADLs, and report one or more difficulties managing either IADL or ADL assistance or a dementia-related behavior (e.g., wandering, agitation). Caregivers of persons who were bedridden and nonresponsive to touch or the physical environment were excluded from participating in the study. We designed these criteria to provide a sample of caregivers that were confronted with difficulties managing functional dependency and behavioral difficulties, the target of the intervention. These criteria also excluded caregivers of persons for which an environmental adaptation would have relatively no benefit given their severe stage of dementia.

A trained interviewer met with eligible caregivers in their homes, obtained signed informed consent approved by the Institutional Review Board, and conducted the baseline interview. Following the baseline interview, caregivers were randomly assigned to either treatment or a usual care control condition. Randomization was stratified by gender (male, female) and race (minority, White) to ensure equivalence between experimental and control group participants along these two characteristics. Participants were interviewed again following completion of the intervention at 3 months postbaseline. Control group participants received education materials and a booklet describing home environmental safety tips at the conclusion of the study.

### *Home Environmental Intervention*

The environmental program, described in detail elsewhere (Corcoran & Gitlin, 1992; Gitlin et al., 1999) is briefly reviewed here. The intervention, which is based in a competence-environmental press framework and personal control theory as discussed earlier, is a targeted, multicomponent program led by an occupational therapist. It involves educating caregivers about the impact of the environment on dementia-related behaviors and helping caregivers simplify objects in the home (e.g., remove clutter), break down tasks (e.g., one- or two-step commands, lay out clothing in the order in which it is to be donned), and involve other members of the family network or formal supports in daily caregiving tasks. For example, occupational therapists provided education about dementia and the relationship between excess stimulation (auditory and visual) and behavioral disturbances such as agitation or resistance to assistance with self-care. Strategies such as removing objects to simplify the home and breaking down tasks provided primary control mechanisms by which caregivers could manage problems areas, such as agitation or the inability to follow directions or initiate tasks by the person with dementia.

The program consisted of five 90-min sessions that were spaced approximately every other week over 3 months. In the first home session, the occupational therapist met with the caregiver to develop a targeted plan that addressed the specific aspects of daily care (e.g., bathing, dressing, activity engagement, caregiver fatigue) that were problematic and for which the caregiver wanted to learn new strategies. Education about the disease process was also introduced in this session. In the second visit, the occupational therapist used role-play, direct observation, and interviewing to explore the ways in which the caregiver handled problem areas and conceptualized or cognitively framed their situation. Education about dementia and the role of the physical and social environment was presented in relation to the specific care difficulties presented by caregivers. The therapists engaged caregivers in mutual problem solving to identify alternate care strategies using an environmental perspective. Environmental simplification and task breakdown strategies were introduced, and caregivers were asked to practice their use prior to the next home visit. In each subsequent home visit, the occupational therapist reinforced education about dementia through written materials and discussion, addressed a targeted problem area, observed the caregiver using previously recommended strategies, provided refinements to those strategies, and/or offered new recommendations. In the course of providing verbal instruction, the therapist used cognitive restructuring and validation to instill greater perceived control and confidence in the caregivers' own abilities to manage the problem and to develop more realistic appraisals of the caregiving situation, dementia-related behaviors, and expectations. Helping caregivers reframe attributions and explain events was important to enable behavioral change and the use of environmental strategies. Also, therapists served as coaches and provided ongoing validation and reinforcement of the caregivers' use of environmental strategies. In the final visit, the occupational therapist reviewed previously introduced strategies and how they might be applied to future potential problems.

The 10 occupational therapists that served as interventionists for this study were licensed practitioners with at least 1 year experience in home care or working with older adults. Although occupational therapists are formally trained in a person-environment framework, this intervention represented a nontraditional approach in that the focus was exclusively on enhancing the environmental problem-solving skills of the caregiver. Accordingly, the intervention represented a unique program for which training was required. Therapists participated in 20 hr of training conducted by the investigators in which they were introduced to the intervention protocol, specific strategies, and treatment documentation. We monitored the occupational therapists throughout the study using several techniques to ensure treatment fidelity. These included formal case reviews, on-site observation of randomly selected visits, and follow-up interviews with caregivers to evaluate their satisfaction with the intervention process.

### *Measures*

Basic background characteristics of family caregivers and their coding included age, income, education, and number of months caregiving collected as continuous variables and gender, relationship to person with dementia (spouse, nonspouse), race (White, minority), and marital status (married, not married).

### *Outcome Variables*

Nine outcome variables were examined, three of which referred to the performance of the person with dementia, and six of which referred to the well-being of caregivers.

*Outcomes Related to the Dementia Patient.*— Concerning the dementia patient, we were interested in three outcomes: the frequency of occurrence of behavioral problems, the level of dependency in ADLs, and the level of dependency in IADLs. For behavior problems, family caregivers reported on the frequency of behavioral occurrences using 29 items from the Memory and Behavior Problems Checklist (MBPC; Zarit, Reever, & Bach-Peterson, 1980) and four additional behaviors reported in the literature that were relevant to the focus of the intervention. Although respondents rated how often each problem occurred on a 5-point Likert scale (0 = "never" to 4 = "at least once a day"), for these analyses we computed an index that reflected the total number of behaviors that occurred. We refer to this index as *Behaviors*. High scores indicated the occurrence of a greater number of problem behaviors (Cronbach's alpha = .78).

For dependency, family caregivers were asked to rate the level of ADL dependence of the person with dementia using a modification of the Functional Independence Measure (FIM; Granger & Hamilton, 1992). We used eight items from the mobility domain of the FIM (bathing, eating, dressing upper and lower body, toileting, grooming, getting around the house, getting in and out of bed). For this study, we collapsed the FIM ratings of complete independence (7) and modified independence (6) to represent independence (without or with an assistive device or extended time). We also reverse coded the scoring of items. A high score reflected greater dependency such that 1 referred to complete independence and 6 to total dependence. We computed a total score by averaging the scores for all items. We refer to this index as *ADL dependence*. Cronbach's alpha for ADL dependence was .90.

Caregivers were also asked to rate the level of dependence in nine IADLs using the same 6-point modified FIM rating scale described previously. Included were eight items from Lawton and Brody (1969; meal preparation, management of finances, telephone use, housework, laundry, grocery shopping, travel, and taking medication) and one additional item, leisure participation. We averaged the scores for these items to derive the index we refer to as *IADL dependence*. High scores indicated greater dependence. Cronbach's alpha was .60 for this sample.

*Outcomes Related to Caregiver Well-Being.*— We examined two dimensions of caregiver well-being: self-efficacy and upset in managing dementia behaviors, IADL dependence, and ADL dependence.

Self-efficacy refers to an individual's assessment of his or her ability to perform specific activities and achieve a desired outcome (Bandura, 1997). Whereas the related concept of mastery refers to a global assessment, self-efficacy concerns beliefs about one's competence to successfully perform discrete or specific tasks. Self-efficacy beliefs may therefore vary across specific activities of caregiving (Haley et al., 1996; McAvay, Seeman, & Rodin, 1996). This relationship may exist because self-efficacy influences the initiation and maintenance of effort in demanding situations. To examine situation-specific self-efficacy, we used the approach of Haley and colleagues (Haley, Levine, Brown, & Bartolucci, 1987; Haley et al., 1996) in which caregivers rate their level of confidence in handling specific caregiving tasks and problems. This approach allows the computation of average self-efficacy scores based on the particular problem areas of caregiving. Scores are independent of the total number of items. Thus, for each reported behavioral occurrence that was identified with the MBPC and each ADL and IADL activity for which assistance was required as measured by the modified FIM, caregivers were asked to rate their confidence in managing the item. Initially, we scored each item using a 5-point Likert scale (0 = "not at all confident" to 4 = "extremely confident"). For these analyses, however, we followed the approach of McAvay and colleagues (1996) and recoded each item into a dichotomous indicator to reflect low versus high levels of efficacy (0 = "not at all or a little confident," 1 = "moderately to extremely confident"). This approach is clinically meaningful and maximizes the potential to detect change at post-test. We then computed three indices by summing the respective dichotomized scores on each item and dividing by the number of reported items. We refer to these indices as *behavior self-efficacy, ADL self-efficacy*, and *IADL self-efficacy*. Higher scores indicated greater perceived self-efficacy in managing behaviors that occurred or the self-care activities in which caregiver assistance was provided. Cronbach's alpha could not be calculated for these indices, because each caregiver rated different items within each index (Haley et al., 1996).

Upset reflects the operational definition of a caregiver's appraisal in coping with problem areas (Lazarus & Folkman, 1984). Caregivers were asked to rate their level of upset on a 5-point scale (0 = "no upset" to 4 = "extremely upset") for each behavioral occurrence and IADL and ADL item. We followed the procedures for self-efficacy and recoded each item as a dichotomous indicator (0 = "not at all or very little upset," 1 = "moderate or extreme upset"). A mean caregiver upset score was then computed for each index. We refer to these indices as *behavior upset, ADL upset*, and *IADL upset*. Higher scores for each index indicated greater caregiver upset. To derive an alpha coefficient, we coded caregiver upset as 0 (no upset) for cases where no problem was reported. We reasoned that if the problem did not exist, then the caregiver did not experience upset with that area. Cronbach's alpha for this sample was .88 for the behavior upset index, .57 for the IADL upset index, and .76 for ADL upset index.

### *Analysis*

We compared background characteristics of the caregiver, the three outcome variables specific to the functioning of the person with dementia (behaviors, ADL dependence, and IADL dependence), and the six outcome variables specific to caregiver well-being (ADL self-efficacy, IADL self-efficacy, behavior self-efficacy, ADL upset, IADL upset, and behavior upset) using chi-square and *t* tests as appropriate to determine significant differences between experimental and control group participants at baseline.

Following the intention-to-treat principle, all randomized participants with follow-up data were included in the analyses regardless of number of intervention sessions completed. We examined the main effects of the intervention on ADL and IADL dependency and behavioral occurrences of persons with dementia (the three outcomes related to the dementia patient), and domain-specific caregiver self-efficacy and upset (the six outcomes related to caregivers) at 3 months postbaseline using analysis of covariance (ANCOVA) with the entire sample for which data were available. Baseline values were the covariates in each of the nine analyses.

Next, we used separate regression analyses to examine possible differential effects of the intervention on the basis of gender (male, female), relationship (spouse, nonspouse), or race (White, minority) of caregivers. Each of these analyses consisted of a sequence of models. For each analysis, we entered the baseline score of the outcome variable first to control for initial differences between participants. Next, treatment assignment was entered. In the third step, the characteristic of interest was entered (e.g., gender, relationship, or race). In the final step, the effect of the intervention was measured by the interaction of treatment and the specific characteristic. We considered these analyses to be secondary to the initial main effects model. We therefore tested each interaction in separate models because we did not have sufficient power to test all the interactions of interest in a single model. We report in this article only the interactions that were large in magnitude and/or reached statistical significance.

We repeated the previous analyses with two additional covariates, months caregiving and behavior self-efficacy, in addition to the baseline value of the outcome variable. We conducted these analyses to control for potential nonrandomized bias because there were large differences between caregivers who remained in the study and those that dropped out along these variables, although these differences were not statistically significant. However, the results did not change and we do not report these models.

The reported *p* values were not corrected for multiple endpoints. We conducted analyses of the main effects for nine outcomes. The secondary analyses of the interactions considered a total of 27 interactions (3 for each of the 9 outcomes). We conducted all analyses using SPSS version 9.0. The level of significance was set at .05.

## Results

### *Recruitment and Attrition Rates*

A total of 202 family caregivers were enrolled in the study, of which 100 were randomly assigned to intervention and 102 were assigned to the control group. Of this group, 171 participated in the 3-month postbaseline assessment, 93 in the treatment group, and 78 in the control group. This represented a total of 31 caregivers that were unavailable at post-test or a 15% attrition rate for the total sample. Of the 31 caregivers who dropped out, 7 (23%) were in the experimental group and 24 (77%) were in the control group. This differential dropout rate was statistically significant ($p = .001$). Reasons for not participating in the follow-up interview included illness (6 caregivers), illness of the care recipient (7 caregivers), extended vacation (5 caregivers) or unknown reasons (13 caregivers).

We compared the 31 dropouts (intervention and control participants) to the 171 remaining participants (stay-ins) on their baseline scores for demographic variables and outcome variables (Table 1). There were no large or statistically significant differences between the two groups, except for months caregiving and behavior self-efficacy, in which differences were large but not significant.

We also compared experimental group participants who dropped out ($n = 7$) to experimental group participants ($n = 93$) who remained in the study along all variables. Again, there were no large or significant differences between the groups. Likewise, similar analyses showed no statistical differences between control group dropouts ($n = 24$) and control group stay-ins ($n = 78$) on any study variables.

### *Sample Characteristics*

Baseline characteristics of participants in both the experimental and control groups are shown in Table 2. There were no large or significant differences at baseline between the two groups. The sample was primarily female, married, and had a high school or higher education. Of the 171 participants, 126 (74%) identified themselves as White, 43 (25%) identified as African American, 1 caregiver identified as Hispanic, and 1 identified as other. Spouse caregivers represented 25% of the sample. Therefore, most caregivers were not spouses, with daughters and daughters-in-law constituting 59% of the sample; sons, sons-in-law, and grandsons 13% of the sample; and other family relationships (e.g., nephew) 3% of the sample. Caregivers were, on average, 61 years of age (range = 23 to 92 years) and reported providing care for an average of 45 months (range = 2 months to 16 years).

**Table 1. Comparison of Stay-Ins and Dropouts at Baseline**

| | Stay-Ins | | Dropouts | | | | |
|---|---|---|---|---|---|---|---|
| Factor | *M* or *F* | *SD* or % | *M* or *F* | *SD* or % | *t* Value | $\chi^2$ | *p* |
| **Patients** | | | | | | | |
| ADL dependence, *M* | 3.06 | 1.43 | 2.57 | 1.32 | −1.78 | | .077 |
| IADL dependence, *M* | 5.48 | .59 | 5.25 | .76 | −1.85 | | .065 |
| Behaviors, *M* | 1.81 | .67 | 1.78 | .80 | −.22 | | .822 |
| Age, *M* | 78.50 | 7.60 | 78.61 | 6.22 | .08 | | .936 |
| Gender | | | | | | | |
| Male | 58 | 33.9 | 6 | 19.4 | | 2.57 | .109 |
| Female | 113 | 66.1 | 25 | 80.6 | | | |
| **Caregivers** | | | | | | | |
| ADL self-efficacy, *M* | .80 | .33 | .75 | .43 | −.63 | | .535 |
| IADL self-efficacy, *M* | .87 | .29 | .81 | .37 | −.93 | | .352 |
| Behavior self-efficacy, *M* | .75 | .29 | .61 | .37 | −1.98 | | .055 |
| ADL upset, *M* | .27 | .35 | .31 | .40 | .45 | | .654 |
| IADL upset, *M* | .21 | .32 | .18 | .31 | −.43 | | .667 |
| Behavior upset, *M* | .48 | .28 | .48 | .31 | .08 | | .937 |
| Age, *M* | 60.48 | 13.75 | 62.48 | 14.65 | .74 | | .461 |
| No. months caregiving, *M* | 44.73 | 33.82 | 39.94 | 34.05 | −.72 | | .469 |
| Education, *M* | 13.88 | 3.03 | 13.77 | 3.23 | −.17 | | .863 |
| Income, *M* | 6.92 | 4.78 | 6.53 | 5.06 | −.40 | | .690 |
| Gender | | | | | | | |
| Male | 46 | 26.9 | 11 | 35.5 | | .94 | .328 |
| Female | 125 | 73.1 | 20 | 64.5 | | | |
| Race | | | | | | | |
| Minority | 45 | 26.3 | 7 | 22.6 | | .19 | .661 |
| White | 126 | 73.7 | 24 | 77.4 | | | |
| Relationship to Patient | | | | | | | |
| Nonspouse | 128 | 74.9 | 26 | 83.9 | | 1.18 | .278 |
| Spouse | 43 | 25.1 | 5 | 16.1 | | | |

*Notes*: ADL = activity of daily living; IADL = instrumental activity of daily living; M = mean; F = frequency. For chi-square statistics, *df* = 1 and *N* = 202.

This group of caregivers reported, on average, minimal to no upset with ADL and IADL dependencies and only a modest level of upset with behavioral occurrences. Caregivers also reported, on average, a moderate level of self-efficacy in managing IADLs, ADLs, and behavioral disturbances. Care recipients varied widely in their level of functional dependency as reported by caregivers. A high level of dependency

**Table 2. Comparison of Experimental and Control Group Participants on Background Characteristics**

| | Experimental Group ($n$ = 93) | | Control Group ($n$ = 78) | | | | |
|---|---|---|---|---|---|---|---|
| Variable | *M* or *F* | *SD* or % | *M* or *F* | *SD* or % | *t* Value | $\chi^2$ | *p* |
| **Caregiver** | | | | | | | |
| Age, *M* | 59.70 | ±14.35 | 61.41 | ±13.03 | .82 | | .419 |
| Race | | | | | | | |
| Nonwhite | 22 | 23.7% | 23 | 29.5% | | .74 | .388 |
| White | 71 | 76.3% | 55 | 70.5% | | | |
| Gender | | | | | | | |
| Male | 24 | 25.8% | 22 | 28.2% | | .12 | .725 |
| Female | 69 | 74.2% | 56 | 71.8% | | | |
| Education, *M* | 14.06 | ±3.36 | 13.65 | ±2.58 | −.88 | | .378 |
| Income, *M*[a] | 7.14 | ±4.88 | 6.64 | ±4.69 | −.68 | | .502 |
| Relation to Dementia Patient | | | | | | | |
| Nonspouse | 70 | 75.3% | 58 | 74.4% | | .02 | .891 |
| Spouse | 23 | 24.7% | 20 | 25.6% | | | |
| No. Months Caregiving, *M* | 41.01 | ±32.54 | 49.15 | ±34.98 | 1.57 | | .117 |
| **Patients** | | | | | | | |
| Age, *M* | 78.61 | ±7.28 | 78.36 | ±8.02 | −.22 | | .829 |
| Gender | | | | | | | |
| Male | 31 | 33.3% | 27 | 34.6% | | .03 | .860 |
| Female | 62 | 66.7% | 51 | 65.4% | | | |

[a] Income Level 6 = $2,501–3,000 per month; Level 7 = $3,001–3,500 per month.

(mean FIM score = 5.5) occurred in IADLs, with 56% of caregivers reporting moderate to complete dependence in all nine IADLs and 23% reporting moderate to complete dependence in eight IADLs. In contrast, a minimal level of dependency (mean FIM score = 3.1) in ADLs was found, with only 13% reporting some level of dependence in all seven ADLs.

### *Compliance With Intervention*

Compliance with the intervention was measured in two ways. First, we considered the number of visits completed, referred to as the *level of participation*. Second, we considered the proportion of strategies used to those provided by the occupational therapists at each intervention session, referred to as the *level of adherence*. We considered participation in four home sessions and use of or adherence to at least 50% of the strategies provided in intervention as necessary to achieve a treatment effect. We found that the intervention group participated in an average of four home visits, with 69% participating in at least four sessions and only 9% in one session. We also found that 75% of the strategies provided by the occupational therapists were used or adhered to by caregivers. We thus considered compliance with the intervention, as measured by participation and adherence, to be adequate (Gitlin et al., 1999).

### *Effect of Intervention on Study Outcomes*

Table 3 shows baseline and post-test mean scores along with the adjusted mean and confidence interval for experimental and control group participants for the nine outcome variables. There were no significant or large differences at baseline between experimental and control group participants for the nine outcome variables. In regard to the outcomes related to dementia patients, there was a statistically significant effect in one of the three outcomes studied; caregivers in the experimental group reported less decline in IADL dependence in the person with dementia than control group caregivers ($p$ = .03). There was a trend toward less decline from baseline to post-test for behaviors and ADL dependence, although these were not statistically significant.

For each of the six study outcomes related to caregiver well-being, ANCOVAs showed a marginal improvement from baseline to post-test for the experimental group in comparison with the control group, although these improvements were not statistically significant.

### *Effect of Intervention for Specific Subgroups*

We conducted separate regression analyses to examine intervention by specific caregiver characteristic (race, gender, and relationship) interaction effects. Table 4 shows the adjusted mean effect, difference of means, confidence interval for the mean difference, and interaction $p$ values for significant interaction effects and those approaching significance. Not shown on the table is the interaction term of ADL self-efficacy by race. Although this interaction did not approach statistical significance, the magnitude of the interaction effect was large (adjusted mean effect, minority = .08, White = .00) such that minority caregivers showed a trend toward improvement and Whites did not.

As shown in Table 4, a number of interaction effects were larger than the main effects (Table 3). The largest interactions were for caregiver behavior self-efficacy and behavior upset. For behavior self-efficacy, women showed a benefit and men declined by an equal amount. For behavior upset, nonspouses showed no benefit and spouses a large benefit. The other large benefit was for minority caregivers in IADL self-efficacy in contrast to no benefit for Whites. Finally, with regard to ADL dependence, male caregivers reported less decline in self-care dependence of dementia patients than female caregivers, and this approached significance.

## Discussion

In contrast to previous caregiver studies that have tested psycho-educational approaches, in this inter-

**Table 3. Comparison of Experimental (*n* = 93) and Control (*n* = 78) Group Participants on Study Outcomes**

| Factor | Baseline | | | | 3-Month Follow-Up | | | | Adjusted Mean Difference | 95% CI | *p* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Experimental | | Control | | Experimental | | Control | | | | |
| | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* | | | |
| Caregivers | | | | | | | | | | | |
| ADL self-efficacy | .81 | .33 | .80 | .34 | .93 | .18 | .90 | .21 | .03 | −03, .08 | .375 |
| IADL self-efficacy | .87 | .30 | .87 | .26 | .96 | .15 | .95 | .14 | .01 | −.03, .05 | .704 |
| Behavior self-efficacy | .77 | .27 | .74 | .32 | .84 | .24 | .80 | .27 | .03 | −.03, .10 | .314 |
| ADL upset | .26 | .35 | .29 | .36 | .25 | .34 | .34 | .37 | −.06 | −.16, .03 | .156 |
| IADL upset | .17 | .30 | .22 | .33 | .17 | .29 | .22 | .32 | −.02 | −.10, .07 | .663 |
| Behavior upset | .48 | .27 | .47 | .30 | .43 | .31 | .45 | .29 | −.02 | −.09, .05 | .501 |
| Patients | | | | | | | | | | | |
| ADL dependence | 2.93 | 1.49 | 3.23 | 1.36 | 3.24 | 1.59 | 3.57 | 1.38 | −.06 | −.30, .18 | .599 |
| IADL dependence | 5.43 | .62 | 5.56 | .50 | 5.54 | .60 | 5.75 | .36 | −.13 | −.24, −.01 | .030 |
| Behaviors | 20.25 | 5.39 | 18.74 | 6.31 | 17.20 | 7.73 | 14.43 | 9.82 | 1.85 | −.42, 4.13 | .110 |

*Note*: CI = confidence interval; ADL = activity of daily living; IADL = instrumental activity of daily living.

Table 4. Adjusted Means for Treatment by Caregiver Factor Interactions

| Dependent Variable | Factor | Adjusted Mean Effect | 95% CI of Difference | *p* for Interaction |
|---|---|---|---|---|
| Caregiver | | | | |
| IADL self-efficacy | Male | −.07 | | |
| | Female | .03 | | |
| | Difference | .10 | .0003, .20 | .049 |
| IADL self-efficacy | Minority | .09 | | |
| | White | −.02 | | |
| | Difference | −.10[a] | −.20, −.006 | .037 |
| Behavior self-efficacy | Male | −.08 | | |
| | Female | .08 | | |
| | Difference | .16 | .009, .31 | .038 |
| Behavior upset | Nonspouse | .02 | | |
| | Spouse | −.14 | | |
| | Difference | −.16 | −.32, −.0005 | .049 |
| Patients | | | | |
| ADL dependence | Male | .32 | | |
| | Female | −.21 | | |
| | Difference | −.53 | −1.06, .005 | .052 |

*Note*: CI = confidence interval; IADL = instrumental activity of daily living; ADL = activity of daily living.
[a]Because of rounding, difference does not add up.

vention trial we evaluated an environmental approach. This five-session home program involved educating caregivers about the impact of their living space on dementia-related behaviors and introducing modifications to the home in response to caregiver concerns with dependency and behavioral disturbances. The intervention provided caregivers with primary control mechanisms, that is, strategies to reduce environmental press, and self-knowledge of their skills. The findings of this study suggest that an environmental approach has a positive impact on both the caregiver and the person with dementia such that it may slow the progression of IADL dependence of patients and enhance self-efficacy and reduce upset for select caregivers.

The present study systematically builds on and expands caregiver intervention research in four significant ways. First, we used a controlled design to determine the impact of an innovative approach that has previously not been systematically tested. Second, the intervention was innovative in that it involved teaching family caregivers the knowledge and skills to manipulate components of the physical environment, skills that are not traditionally included in psycho-educational caregiver interventions. Also, this intervention was innovative in that it differed from traditional occupational therapy practice. Typically, occupational therapy home care is driven by reimbursement considerations, so treatment focus is on the impaired person and improving function. Although therapists may provide education to caregivers, the service remains patient based. Third, this study extends knowledge about the types of outcomes to include in caregiver intervention research. Self-efficacy has not typically been included in previous intervention research. Also, with few exceptions, research has not examined functional change in the person with dementia following a home intervention (Bourgeois, Burgio, Schulz, Beach, & Palmer, 1997; Chang, 1999). Fourth, this study extends previous research on caregiver interventions by examining whether certain caregivers derive benefit from the intervention than others. As articulated by Biegel and Schulz (1999), the next step in caregiver studies is to identify specific characteristics of individuals who benefit from different types of interventions. We evaluated the impact of caregiver gender, race, and relationship on treatment gains as a first step in understanding the relationship between intervention and caregiver characteristics.

In accordance with clinical trial research principles, we first examined intervention effects for the entire sample. We found a small but statistically significant effect such that caregivers in the treatment group reported fewer declines in IADLs than caregivers in the control group 3 months postbaseline. This suggests that through intervention the caregivers developed an environment that was supportive of IADL performance such that persons with dementia experienced slightly less dependency in comparison with controls over time. That is, although caregivers in both the experimental and control group reported decline in IADL performance from baseline to 3 months, those in treatment were able to maintain more function of the person with dementia. To assess IADL status, we used the FIM response set, which is a measure of level of assistance required to perform a task. It reflects caregiver burden in that scores represent the level of care provided, at least as perceived by the caregiver. This finding suggests that the intervention had a modest impact on the level of burden as perceived by caregivers in the area of IADL management. The extent to which there was an objective reduction in dependence in IADLs remains questionable. A limitation of this study might have been the reliance on caregiver report to characterize dependence of the dementia patient. Some research has suggested that caregivers tend to report greater functional dependence in persons with dementia (Skurla, Rogers, & Sunderland, 1988). Nevertheless, one recent study has shown that scores derived from caregiver self-report of function of a person with dementia using the FIM significantly correlates with FIM scores derived from direct observation of performance by a trained professional (Cotter, Burgio, Stephens, Roth, & Gitlin, in press). Thus, caregiver ratings of function in our study may reflect objective IADL performance.

There were no statistically significant differences, however, in the other eight outcome measures, including ADL dependence and behaviors, and caregiver self-efficacy and upset scores between the experimental and control groups. The analyses showed a trend toward improvement in all areas for the experimental group, but these minimal effects were not statistically significant, for several possible reasons.

First, one reason we did not see main effects is that we did find interaction effects, suggesting that the intervention did not have a consistent effect. The inclusion of groups that did not benefit from intervention may dilute the main effects.

Second, a limitation of the present study may be that intervention effects were examined at one time point immediately following completion of the intervention. Caregivers may need more time to practice and use environmental strategies before beneficial outcomes are measurable. The 3-month post-test may have been too close to the intervention for us to adequately evaluate treatment effects. A few caregiver intervention studies have shown a delayed intervention effect such that caregivers report reduced burden and less depression but only over an extended period of time (Mittelman et al., 1995). Studies on environmental interventions with other populations have also reported a delayed positive effect of up to a year (Mann, Ottenbacher, Fraas, Tomita, & Granger, 1999). Future research should consider evaluating the impact of home environmental strategies over a longer time period.

Third, it may be that an environmental approach for caregivers requires a higher dose and level of intensity than that tested in this study. Case presentations and anecdotal comments by the interventionists support this point. Interventionists reported that some caregivers appeared to need more time than the protocol allowed to practice and incorporate the recommended environmental strategies. Also, interventionists reported that caregivers who initially rejected recommendations often inquired about these strategies at the final intervention visit. A consistent finding in research on the use of environmental modifications is that individuals are highly selective in their acceptance and use of environmental strategies and need repeated opportunities to think about and practice strategies. In their review of caregiver interventions, Biegel and Schulz (1999) also suggested that more may be better and that interventions of high intensity and long duration appear to work best.

Fourth, a limitation of this intervention trial was that some recommendations, such as the purchase or installation of adaptive equipment (e.g., commode or grab bars), were recommended but not actually provided or installed for the caregiver. Providing equipment was beyond the scope of this particular study. Other community-based studies have shown that recommending such strategies without assisting in their installation may result in noncompliance because of the cost and time required for an individual to follow these prescriptions. Although these types of recommendations represented a very small percentage of those offered in intervention, they may still have had some impact on outcomes. Yet another explanation may be that this group of caregivers initially reported only minimal upset with dementia-related behaviors and functional dependency and moderately high self-efficacy. There may have been a ceiling effect such that the potential for improvement was limited.

Turning to the subgroup analyses, we were interested in determining whether there was a differential treatment effect. Because our previous research had shown differential compliance rates on the basis of caregiver characteristics, we were interested in determining treatment effects for men and women, spouses and nonspouses, and minority and nonminority participants (Gitlin et al., 1999). Also, because the intervention was behaviorally demanding and required caregivers to engage in mutual problem solving and behavioral change, we reasoned that it might benefit only certain caregivers who may be predisposed to this type of approach.

This intervention trial did suggest that there were modest gains for specific groups of caregivers. Specifically, women showed enhanced self-efficacy in managing both troublesome behaviors and IADL dependence compared with men. This gender difference may be explained in part by previous research on the coping styles of male and female caregivers. This literature suggests that women are more likely to focus on the emotional aspects of care, spend more time carrying out both instrumental and personal care, and admit the need for assistance and seek social support (Connidis & Davies, 1990; Neal, Ingersoll-Dayton, & Starrels, 1997). Conversely, men tend to be more self-reliant and use an authoritative, problem-solving approach that may reflect their traditional work role (Kramer, 1997). Consequently, the caregiving style of women may be a better match with the client-driven approach to treatment delivery of this environmental program. In this intervention, occupational therapists initially worked with caregivers to identify their specific areas of concern and tailored strategies to address those areas. Also, because women may be more intensely involved with instrumental and personal care, they may actually experience more environmental challenges and may therefore be receptive to an intervention that provides instruction in its modification. Alternately, previous research has shown that being male is associated with a higher sense of control (Pearlin & Schooler, 1978; Thoits, 1987). Male caregivers in our study did report at baseline higher confidence (mean = .83) in managing troublesome behaviors than women (mean = .73, $p$ = .031) and managing IADL dependency (mean = .92 for men and .85 for women, $p$ = .07). As a result, there may have been less room for improvement among male participants. Also, as previously reported, we found the men had lower rates of adherence to the intervention (Gitlin et al., 1999). Hence, higher self-efficacy at baseline combined with lower compliance with intervention may explain why male participants showed less self-efficacy enhancement after intervention. Ideally, to benefit from the intervention, participants should start with low self-efficacy and be maximally compliant with the program.

Minority participants in the treatment group also showed greater improvement in IADL and ADL self-efficacy compared with White participants. Of the 45 minority participants in this sample, 43 (96%) were African American. The treatment by race differential found in this study may be explained in part by previous research reporting lower mean levels of self-efficacy among African Americans compared with Whites (Lachman, 1985). Minority participants in our study did report at baseline lower self-efficacy in managing behaviors and ADL and IADL dependency compared with White participants, although the difference was statistically significant only for ADL self-efficacy. This suggests that African American study participants had more room for improvement because they initially had lower scores. Alternately, other studies have shown that African American caregivers may be predisposed to experience improvements in self-efficacy (McAvay et al., 1996).

It is difficult to determine from this study whether the enhancements evidenced by minority caregivers are in part explained by gender. However, the fact that women showed gains in the domain of behavior and IADL self-efficacy and that minority caregivers gained in ADL and IADL self-efficacy would suggest that these groups obtained somewhat different benefits. Clearly, more research is required to disentangle these relations and the salience of both race and gender in structuring intervention gains.

We predicted that the intervention would not only enhance self-efficacy but also reduce levels of upset. We found, however, that the intervention did not reduce upset for either women or men. One explanation may be that upset and self-efficacy represent conceptually distinct appraisals, such that caregivers may find a behavior upsetting but have confidence in their ability to manage it. Another explanation for why we did not see a treatment by gender interaction for upset is a floor effect. There was minimal upset reported at baseline with behaviors and IADL dependency such that improvement may not have been possible.

We did find a differential treatment effect on the basis of the familial relationship of the caregiver to the person with dementia and upset. Specifically, spouse caregivers demonstrated reduced upset with behavioral occurrences in comparison with nonspouse caregivers. Both groups reported similar low levels of upset and moderate levels of self-efficacy at baseline, so a ceiling effect for one group or the other was not operative here. One explanation for this treatment by relationship differential may be related to the consistent finding in previous research of the relatively high rate of depression and emotional upset experienced by spouse caregivers. Spouses may thus be more likely to experience reduced upset or intervention benefit than nonspouse caregivers. Previous research has shown that behavioral disturbances are the primary source of upset for family caregivers rather than IADL and ADL dependency of the person with dementia. Also, the literature has consistently shown a significant relationship between depressive symptoms and reactions of caregivers to problem behaviors. A reduction in the level of upset with behavioral occurrences may be clinically significant in that it may lessen the risk for depression.

Thus, intervention effects were seen more in the area of self-efficacy for select participants. The gains in self-efficacy that were shown for women and minority caregivers, although admittedly modest, may be clinically important. There is abundant research literature showing that feeling efficacious is beneficial to both psychological and physical health (McAvay et al., 1996; Rodin & McAvay, 1992). The role of perceived control in buffering the effects of stressful situations in older people has been shown to function similarly among family caregivers (Skaff, Pearlin, & Mullan, 1996). Specifically, caregivers with high levels of mastery tend to be at lower risk for depression and role overload (Yate, Tennstedt, & Chang, 1999).

We could not compare the differential treatment effects we found in this study to other caregiver intervention trials because, with few exceptions, such studies have not systematically tested for differences. One study that tested the effectiveness of a brief education program for 40 spouse caregivers of persons with dementia (Chiverton & Caine, 1989) found no gender difference in coping ability as a consequence of intervention. Likewise, Mittelman and colleagues (1995) found that gender was not associated with changes in depression over time following an intervention.

In summary, the entire treatment group demonstrated gains in the area of IADL dependence, and there was a decline in upset and improved sense of efficacy beliefs for specific subgroups of caregivers. The data suggest that this is a helpful approach with female, African American, and spouse caregivers, whereas the intervention would need to be adjusted to match the needs of male and nonspouse caregivers. The findings also suggest that further research is warranted to evaluate a more intense and long-term intervention involving home environmental strategies, its underlying mechanisms, and the subsequent impact of improved self-efficacy on caregiver psychological and physical health. Finally, the findings provide preliminary evidence of the importance of examining intervention effects for specific subgroups of caregivers and incrementally add to an understanding of who benefits from interventions.

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