

# The Effect of a Family Therapy and Technology-Based Intervention on Caregiver Depression

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**Purpose:** The majority of persons with Alzheimer's disease (AD) are cared for at home by a family member such as a spouse or daughter. Caregiving places enormous demands on these caregivers, and the negative consequences associated with caregiving are well documented. This paper reports results from the Miami site of the REACH (Resources for Enhancing Alzheimer's Caregiver Health) program that examined the efficacy of a family therapy and technology-based intervention in reducing depressive symptoms (according to the Center for Epidemiological Studies Depression scale) among family caregivers of AD patients at 6 months and 18 months follow-up. **Design and Methods:** There were 225 White American and Cuban American caregivers that were randomized into a structural ecosystems therapy, structural ecosystems therapy + computer–telephone integrated system, or minimal support control condition. **Results:** Caregivers in the combined family therapy and technology intervention experienced a significant reduction in depressive symptoms at 6 months. The 18-month follow-up data indicated that the intervention was particularly beneficial for Cuban American husband and daughter caregivers. **Implications:** The results indicate that information technology has a promising role in alleviating distress and depression among groups of

AD caregivers. The data also demonstrate that interventions have differential impacts according to ethnic group and the caregiver–patient relationship.

**Key Words:** Alzheimer's disease, Caregiving, Intervention research, Technology

Currently, approximately 4 million Americans suffer from Alzheimer's Disease (AD), and projections are that by the year 2050 this number will increase to about 14 million (Volicer, 2001). In the United States, family members bear the primary responsibility for providing care for AD patients. Living with and caring for a family member with dementia is extremely challenging and time-consuming and may require the performance of tasks that are physically demanding or unpleasant. Family routines and dynamics are frequently disrupted, and many caregivers become isolated from family and friends. Furthermore, caregivers are continually confronted with the loss of a loved one and in many cases adaptation to new familial roles. As a consequence, many caregivers experience considerable burden and stress, resulting in compromised physical and mental health.

A large body of evidence suggests that caregivers are at risk for depression (e.g., Cohen & Eisdorfer, 1988; Cohen et al., 1990; Eisdorfer, 1991). Prevalence rates of self-reported depression among community-dwelling caregivers of persons with dementia have ranged from 30% (Cohen & Eisdorfer, 1988; Cohen et al., 1990; Eisdorfer, 1991; Kiecolt-Glaser, Dura, Speicher, Trask, & Glaser, 1991) to as high as 83% (Drinka, Smith, & Drinka, 1987). Studies that have included clinical diagnosis also report elevated levels of depression among dementia caregivers as compared with age-matched controls (Schulz, O'Brien, Bookwala, & Fleissner, 1995; Vitaliano, Scanlan, Krenz, Schwartz, & Marcovina, 1996). Caregivers

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also report an increased use of psychotropic medications such as antidepressants to manage their psychological distress (Schulz et al., 1995).

The incidence of depression among caregivers appears to be related to the chronic stress of caring for an impaired relative (Dura, Stukenberg, & Kiecolt-Glaser, 1991; Ory, Yee, Tennstedt, & Schulz, 2000). Factors that contribute to depression include behavior problems among the care recipient, the caregiver's appraisal of their caregiving skills, isolation, family disharmony, lack of support, and disruption in other roles and activities. Female caregivers tend to be more depressed than male caregivers (Anthony Bergstone, Zarit, & Gatz, 1988), and spouses are generally more depressed than other family members (Dura et al., 1991). There also appear to be ethnic differences in depressive symptoms. African American and Hispanic American caregivers tend to report lower levels of distress, burden, and depression than White American caregivers (Connell & Gibson, 1997; Gallagher-Thompson et al., 2000a). However, the link between ethnicity and depression is not entirely clear, as there are some conflicting results in the literature. For example, John and McMillian (1998) found that Mexican American caregivers experienced less emotional stress than White American caregivers, whereas Mintzer and colleagues (1992) found no difference in level of depression between White American and Cuban American caregivers. These differences may reflect the diversity among the various Hispanic cultures. Amount of education and financial resources appear to be inversely related to depression, and caregivers in poor health and those who live with the patient tend to report higher levels of depression (Brody, Litvin, Hoffman, & Kleban, 1995; Moritz, Kasl, & Ostfeld, 1992; Rankin, Haut, & Keefover, 1992).

Understanding depression among caregivers is important, as the onset of depression is not only harmful to the caregivers but also may affect their continued ability to provide care. Generally, the ability of caregivers to provide care for the patient at home is influenced by the interrelationship among four variables: caregiver-patient relationship, caregiver values, caregiver coping resources and strategies, and discontinuities in patient behavior (Czaja, Eisdorfer, & Schulz, 2000; Miller & Eisdorfer, 1989). An imbalance among these four variables, such as a reduction in the caregiver's coping resources as a result of depression, may increase the likelihood of patient institutionalization. Depression in the caregiver may also lead to depression in the AD patient, resulting in furthering the level of impaired functioning beyond that associated with the disease itself (Teri & Uomoto, 1991).

Although the onset of depression is common among AD caregivers, to our knowledge there have been relatively few systematic studies of interventions directed specifically at reducing depression as

the primary outcome. The results of these studies have been mixed. Buckwalter and colleagues (1999) found that a community-based psychoeducational program aimed at teaching AD caregivers to manage behavior problems was effective in reducing caregiver depression. Gallagher-Thompson and colleagues (2000b) reported moderate levels of success in reducing depression among caregivers who participated in psychoeducational programs as compared with wait-list controls. In contrast, Brodaty, Roberts, and Peters (1994) did not find any differences between caregivers who attended a 4-month educational and skills acquisition training group and wait-list controls on measures of affect and family burden. Other investigators (e.g., Demers & Lavoie, 1996; Gallagher-Thompson & Steffen, 1994) have also found that psychoeducational interventions have not been effective in reducing depression among caregivers. Similarly, findings from the Medicare Alzheimer's Disease Demonstration project indicate that improved access to community-based care did not translate into significant reductions in caregiver depression (Newcomer, Yordi, DuNah, Fox, & Wilkinson, 1999). A recent meta-analysis of 78 caregiver intervention studies (Sorensen, Pinquart, & Duberstein, 2002) found that, taken together, caregiver interventions produced a significant improvement in depressive symptoms; however, the effects were smaller than for other outcomes such as caregiver ability and knowledge. The results also suggest that a combination of interventions that directly target the caregiver is effective in reducing depression. Schulz and colleagues (2002), in a recent review of the caregiver intervention literature, also found that the majority of studies that included a measure of depression as an outcome measure reported a small to moderate improvement in depressive symptoms. The effects were associated with a variety of intervention approaches.

One overarching problem with these intervention programs is that they may not target the range of the contextual elements that are critical to the caregiving situation. As discussed by Zarit and Leitsch (2001), the well-being and functioning of the caregiver and the person with dementia are shaped by their physical and social environment. Thus, in order for interventions to be effective in reducing caregiver burden and distress, they must be embedded within the larger social context of the caregiver. The social environment includes family members, friends, physicians, service providers, and the like. In fact, support from other family members and friends has been linked to caregiver burden and depression. However, despite the success of interventions that incorporate family members with other clinical populations (Bischoff, McKeel, Moon, & Sprenkle, 1996; Campbell & Patterson, 1995; Szapocznik, Scopetta, Ceballos, & Santisteban, 1994), most interventions for caregivers of AD patients do not incorporate the wider social

network of the caregiver. The results of those that have are promising.

Mittleman and colleagues (1995) found that a comprehensive support program for spouse caregivers of AD patients that treated the caregivers and family members over the course of the disease was effective in reducing depression among the caregivers at 8-month and 12-month follow-ups. The data indicated that an increase in family cohesion and an increase in the caregiver's satisfaction with his or her social network were linked to depression at baseline and the follow-up assessments. However, the caregiver population was restricted to spouses, and the majority of caregivers were White Americans. As discussed, level of caregiver distress varies according to the caregiver's relationship to the patient and the caregiver's ethnicity.

This paper presents the results of a structural ecosystems therapy (SET), a family-based therapy intervention, and the SET intervention augmented by an innovative computer–telephone integrated system (SET + CTIS) in reducing depression among family caregivers of person's with AD. The specific intent is to examine the efficacy of the two interventions across Cuban American and White American caregivers and to examine the efficacy of the interventions over time. A further aim is to explore the differential effects of the treatment across varying caregiver–care recipient dyads. The interventions were evaluated at the Miami site of the REACH (Resources for Enhancing Alzheimer's Caregiver Health) program.

### *Overview of the REACH Project*

In response to the need for efficacious interventions for family caregivers of people with AD or a related dementia, the National Institute on Aging and the National Institute of Nursing Research recently sponsored a multisite research project known as REACH. In contrast to traditional multicenter clinical trials in which a single intervention is implemented at multiple sites, within the REACH project there were 15 well-defined interventions (9 active and 6 control group conditions) that were implemented at six sites (Birmingham, Boston, Memphis, Miami, Palo Alto, and Philadelphia) and assessed by use of common outcome measures. The interventions consisted of psychosocial–psychoeducational services, behavioral interventions, environmental modifications, and technology interventions. Three of the research sites included a minimal support telephone contact control group, and three sites included a usual care control condition.

The study population ( $N = 1,222$ ) included African American, Cuban American, Mexican American, and White American family caregivers of patients with AD and related disorders (ADRD).

A common set of measures was collected at all sites at baseline, 6 months, 12 months, and 18 months following the population's random assignment to an intervention condition. The measures included indicators of caregiver mental health or well-being and depression; social support; caregiver burden; religiosity; service utilization; caregiver and care recipient physical health and medication usage; and care recipient behavior and cognition (see Wisniewski et al., 2002, for detailed information regarding the REACH interventions, sample, design, and measures).

### *Overview of the Miami Interventions*

The Miami site of the REACH program investigated the efficacy of SET and SET + CTIS in two different cultural groups of caregivers (Cuban American and White American). The interventions were compared to a telephone-administered minimal support control (MSC) condition.

*Structural Ecosystems Therapy.*—SET, a structural family therapy intervention, was based on a Brief Strategic Family Therapy intervention developed by Szapocznik and Kurtines (1989) for treatment of behavior problems in Hispanic families. The efficacy of Brief Strategic Family Therapy has been demonstrated in a wide range of clinical studies for the treatment of child and adolescent problems (e.g., Nelson, Mitrani, & Szapocznik, 2000; Szapocznik, Santisteban, Hervis, Spencer, & Kurtines, 1982). The goal of SET is to identify and restructure specific interactions within the family and between the family and other systems that may be linked to the caregiver's burden. The intent is to identify specific problems caregivers are experiencing, the range of usable resources available to the caregiver and their formal support systems, the range of community resources available and accessible to the family, and the capacity of the caregivers and their family to collaborate in the caregiving effort (Mitrani & Czaja, 2000).

*Structural Ecosystems Therapy + Computer–Telephone Integrated System.*—The CTIS is an information network that utilizes computer–telephone technology. The system was designed to augment the therapeutic intervention by facilitating linkages of the caregivers with both their family and with supportive resources outside of the home. In addition, the CTIS provided the therapist with enhanced access to both the caregivers and their family members. For example, the system allowed family members who are unable to attend sessions (e.g., those who are at distant locations, physically incapacitated, or too frail to leave their home) to participate in therapy.

**Minimal Support Control.**—The MSC condition was designed to provide contact with the control group and form a face valid minimal intervention to prevent differential dropout between the more active intervention (SET and SET + CTIS) groups and this comparison group. This telephone-based, minimal support condition consisted of biweekly calls for the first 6 months and monthly calls during the next 7–12 months. The duration of the calls ranged from 5 min to 15 min and consisted of active listening and empathic comments when appropriate. In these comments, neither did the interventionist provide additional information on dementia nor did the comments consist of recommendations. Generic educational materials were also provided and included information on AD, local contact numbers, and caregiving.

## Methods

### Sample

The sample included 225 family caregivers (114 Cuban American and 111 White American) of patients with AD/DR. Caregivers were required to live with the patient and provide care for a minimum of 4 hr per day for at least 6 months. In addition, at least one other family member needed to agree to participate in the project. Other family members could include actual or fictive family who were identified by the caregiver as providing emotional or instrumental support. Caregivers were excluded if they were involved in another caregiver intervention study, had an acute illness that would prevent them from participating in the study, or were not planning to reside in the Miami area for at least 6 months. Caregivers were also excluded if their care recipients had a terminal or severe illness or disability that would prohibit them from participating in the interventions. Care recipients had to have a medical diagnosis of probable AD/DR or exhibit a Mini-Mental State Exam (MMSE; Folstein, Folstein, & McHugh, 1975) score of less than 24. They also had to have at least one limitation in basic activities of daily living (ADLs; Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963) or two dependencies in their instrumental activities of daily living (IADLs; Lawton & Brody, 1969). Participants were recruited from referrals from memory disorder clinics, primary care clinics, social service agencies, and physician offices. Community outreach efforts included radio, telephone, targeted newsletters, public service announcements, and presentations.

The mean age of the caregivers was 69 years ( $M = 68.48$ ;  $SD = 11.33$ ), and on average they had been caring for the patient for 4 years ( $M = 3.75$ ;  $SD = 2.97$ ). Caregivers included both men (25%) and women (75%). Forty-three percent of the caregivers were wives, 22% were husbands, 27% were daughters, and 8% were other relatives. Of the sample,

20% had less than a high school education, 21% completed high school, and the remaining 49% had more than a high school education. Center for Epidemiological Studies–Depression scale (CES-D) scores for Cuban caregivers ( $M = 17.36$ ;  $SD = 21.5$ ) were similar to those of White American caregivers ( $M = 14.62$ ;  $SD = 19.0$ ), that is,  $F(1,224) = 2.94$  and  $p < .08$ , although there was significant variability in scores among both groups. Fifty percent of the sample had a score above 16, which supports other data (e.g., Cohen, Kennedy, & Eisdorfer, 1984) and indicates high levels of clinically significant depressive symptomatology among caregivers.

The mean age of the care recipients was 83 years ( $M = 83.23$ ;  $SD = 7.7$ ); 48% were men and 52% were women. There were no significant differences between the ages of the White American and Cuban care recipients, that is,  $F(1,224) = 2.65$  and  $p > .10$ .

A majority of the sample was moderately to severely cognitively impaired. The average score on the MMSE for White American care recipients was  $M = 14.50$  and  $SD = 8.5$  compared with  $M = 12.67$  and  $SD = 8.1$  for Cuban care recipients;  $F(1,224) = 2.73$  and  $p = .10$ . Cuban care recipients had more ADL limitations, that is,  $M = 3.05$  and  $SD = 2.4$  as compared with  $M = 2.44$  and  $SD = 2.2$  for White American care recipients;  $F(1,224) = 4.09$  and  $p < .05$ . Similarly, Cuban care recipients had more IADL limitations, that is,  $M = 7.07$  and  $SD = 1.6$  compared with  $M = 5.95$  and  $SD = 1.9$  for White American care recipients;  $F(1,224) = 22.64$  and  $p < .001$ .

### Measures—Equipment

The core battery of measures is described in Wisniewski and colleagues (2002). All measures were translated and backtranslated into Spanish. The 20-item CES-D scale (Radloff, 1977) was used to measure the presence of depressive symptoms. The CES-D is a global measure of well-being that has been widely used in the mental health literature, including intervention studies with family caregivers. A score of 16 or above has been identified as discriminating between groups with clinically relevant and non-relevant depressive symptoms (Radloff & Teri, 1986).

The Revised Memory and Behavior Problems Checklist (RMBPC; Teri et al., 1992) was used to measure upset or burden with the presence of memory and behavior problems. Caregivers were asked at baseline and 6 months whether their care recipients manifested any 1 of 24 problem behaviors (7 memory, 8 depressive, and 9 disruptive) during the past week. If caregivers responded yes, they were asked how bothered or upset they were for each reported behavior, using a 5-point scale ranging from 0 (not at all) to 4 (extremely). Average upset scores were calculated among all behaviors, with an assignment of no upset to behaviors that were not

manifested. The summary calculation reports an average upset rating with scores ranging from 0 to 96.

Satisfaction with social support was measured on a 5-point Likert scale that provided a global assessment of the caregiver's satisfaction with overall level of support. Scores ranged from 1 (very dissatisfied) to 5 (very satisfied).

The MMSE (Folstein et al., 1975) is one of the most widely used cognitive screening tests that quantify the degree of global cognitive impairment in older adults. The scale ranges from 0 to 30 and primarily taps memory and attentional factors with an emphasis on language and praxis.

Level of ADL impairment was measured by using a revised version of the Activities of Daily Living scale (Katz et al., 1963). This is a six-item scale that assesses the care recipient's ability to perform tasks of day-to-day importance such as dressing, eating, and toileting. IADL impairment was measured using the Lawton Instrumental Activities of Daily Living scale (Lawton & Brody, 1969). This scale consists of eight items and assesses the care recipient's ability to live independently in the community and perform tasks such as using the telephone and managing medication.

The CTIS system was a custom-built application that used computer-telephone technology. ADSI-capable Philips P-100 screen phones, which allow both text and voice to be sent and received during an interactive session, were placed in the users' homes. The phones included a handset, base unit, and display. The display is capable of displaying eight lines of text. The system allowed users to place and receive calls, send and receive messages, leave reminders, access databases, and conference with several people simultaneously.

## Procedures

All intervention materials were translated into Spanish for the Hispanic participants by using established techniques for forward and backward translation, and the staff included bilingual assessors and interventionists. Local Institutional Review Board approval was obtained and maintained throughout the study. Strategies were also used to induce and assess treatment implementation (Burgio et al., 2001). They included the use of detailed treatment manuals, training and certification of the assessors and interventionists, and ongoing monitoring and feedback of the interventionists' performance.

Potential participants were initially interviewed at each site over the telephone, using a common set of screening questions. After informed consent was obtained from those who were eligible, caregivers were administered the core battery of measures in person and then were randomly assigned to intervention (SET or SET + CTIS) or the MSC

conditions. Randomization was stratified according to the ethnicity of the caregiver (Cuban American or White American). Caregivers were subsequently interviewed by using the REACH core battery of measures at 6, 12, and 18 months. The core battery was modified, however, if the care recipient's status changed prior to his or her next scheduled interview. If the care recipient died, a bereavement battery was substituted; if the care recipient was institutionalized, a placement battery was used.

The SET intervention took place over the course of 12 months, with weekly sessions for the first 4 months, biweekly sessions for the subsequent 2 months, and monthly sessions for the final 6 months of treatment. The duration of each session was typically 60–90 min. The average contact time per caregiver was 14 hr, ranging from 32 min to 34 hr, with 13 average contacts per caregiver over the intervention period. The treatment schedule varied somewhat with the needs of the caregiver. The majority of the sessions were conducted in the caregiver's home or other settings (e.g., adult child's home). In the SET + CTIS condition, some family sessions were conducted by means of the computer-telephone system. The therapy sessions using the CTIS were restricted to the final 6 months of treatment. The average number of contacts using the CTIS system (across all system features) was 56 ( $M = 56.49$ ) and the average amount of time the system was used per caregiver was 19 hr ( $M = 17.66$ ) across the intervention period.

In the initial sessions, the therapist met with the caregiver alone or with the caregiver and other family members and gathered the histories of the family, the care recipient, and the caregiving experience. The goal of these initial sessions was to build rapport, establish therapeutic goals, and begin to assess the caregiver's family interactions. Over the next sessions, the therapist assessed interactions, determined which of these might be targeted in treatment, and established a plan to transform the interactions. This approach typically involved (a) developing a clear understanding of the nature of supportive and problematic interactions, (b) understanding how these interactions are related to the family's current level of functioning, and (c) intervening to enhance supportive and reduce maladaptive interactions.

The CTIS system was designed to augment the SET intervention by providing the caregiver with enhanced access to formal and informal resources. Caregivers were given a monthly allowance for long-distance charges to family members who lived out of town. Available features (Table 1) were presented by means of hierarchical menus. The user is guided through the menus with visual and voice prompts. The prompts were presented in the preferred language of the caregiver (Spanish or English).

The caregivers and family members were trained in the use of the CTIS in their own homes by their

**Table 1. Features Available on the Computer–Telephone Integrated System**

Feature	Description
Place a call	The user can use the system to place a phone call to family or friend. In the family screen, the caregivers can spontaneously launch a conference call with up to six other family members. The order and number of linkages are determined “on the fly” by the caregiver.
REACH discussion groups	These are “online” telephone conferences with other caregivers that are held monthly. The caregivers are invited to participate in a group of trained professionals, including family therapists (the therapists did not facilitate groups that included their own clients).
Voice messaging	All caregivers and their family members are provided with a voice mail box. They may leave messages for each other, their therapist, or both. Single and broadcast messaging is available.
Reminders	Therapists are able to leave reminders to caregivers (e.g., reminding them of upcoming appointments). The reminders can be made on a one time or daily basis.
Caregiver resources	The contents of the local <i>Alzheimer’s Association Resource Guide</i> was placed on the system with active linking to the providers’ telephone number, if selected by the caregiver. The services were arranged geographically to help the caregivers with their selections.

*Note:* REACH = Resources for Enhancing Alzheimer’s Caregiver Health.

therapist. The CTIS was installed over the first three visits by the therapist to the family’s home. The system was introduced during the initial visit, and caregivers were asked for a list of family members and friends they wanted placed on the menus. During the second visit, the system was installed, and caregivers–family members received training and practice in using the system. During the third visit, the caregivers were provided with refresher training after they were observed using the system. The caregivers were also provided with a user’s manual and a help card. The system also had a help function.

## Results

### Statistical Methods

A stratified randomization scheme was employed by which caregivers were assigned equally to the SET, SET + CTIS, and MSC conditions. In accordance with clinical trial research principles, we examined intervention effects for the entire sample for which data were available. There were 225 subjects enrolled at baseline: 73 subjects were enrolled in the MSC condition, 75 subjects were enrolled in the SET condition, and 77 subjects were enrolled in the SET + CTIS condition. Our primary outcomes were 6 months following the most active phase of the SET and SET + CTIS intervention and 18 months, because the long-term effects of therapeutic interventions are rarely explored in the literature.

At 6 months, 147 subjects had follow-up data, with 42 caregivers in the MSC condition, 54 caregivers in the SET condition, and 51 caregivers in the SET + CTIS condition. We interpolated 18-month scores, using linear interpolation, for all caregivers at baseline who had CES-D scores available at 12 months but not 18 months. This resulted in 18-month follow-up data for a total of 154 subjects (MSC = 41, SET = 54, and SET + CTIS = 59), with approximately 90% with data at exactly the 18-month follow-up interval.

A comparison of the completers with CES-D scores at 6 months relative to noncompleters showed that noncompleters had higher CES-D scores at baseline ( $M = 20.16$ ;  $SD = 11.72$ ) than completers ( $M = 17.61$ ;  $SD = 11.7$ ), which approached statistical significance at  $F(1,223) = 5.89$  and  $p = .056$ . A comparison of the completers versus noncompleters at 18 months showed that noncompleters had higher CES-D scores at baseline ( $M = 21.04$ ;  $SD = 12.0$ ) than completers ( $M = 17.18$ ;  $SD = 11.6$ );  $F(1,223) = 4.52$  and  $p = .031$ .

The change in CES-D score from baseline to the 6-month follow-up was analyzed by utilizing a 3 (group) by 2 (ethnicity) by 2 (time) repeated measures mixed model design. Level of caregiver educational attainment, length of time as a caregiver, hours per day caring, family socioeconomic status, and patient MMSE scores were entered into the model as covariates. A similar analytic strategy was utilized to examine the changes in CES-D scores from baseline to 18 months.

Table 2 reveals that there were no statistically significant differences across the MSC, SET, and SET + CTIS conditions among those Cuban American (CA) and White non-Hispanic (WNH) caregivers who were followed up at 6 months with regard to baseline caregiver age, care recipient age, CES-D scores, length of time caregiving, RMBPC Disruptive Behavior score, total social support, and self-rated health. WNH caregivers in the MSC condition had a higher mean level of educational attainment, and patients had higher MMSE scores relative to CA caregivers and their patients in the MSC and SET + CTIS conditions. A similar pattern of results was obtained for CA and WNH caregivers across the three intervention groups at 18 months, except that WNH caregivers in the MSC condition had a higher mean baseline of educational attainment than CA caregivers in the MSC condition (Table 3).

In an evaluation of baseline depression scores at 6 months, there were significant group differences by

**Table 2. Baseline Demographic Variables for CA and WNH Groups in Various Conditions With 6-Month CES-D Follow-Up**

Variable	MS-CA ( <i>n</i> = 22)	MS-WNH ( <i>n</i> = 20)	SET-CA ( <i>n</i> = 29)	SET-WNH ( <i>n</i> = 26)	CTIS-CA ( <i>n</i> = 25)	CTIS-WNH ( <i>n</i> = 26)	<i>F</i> Value	<i>p</i> Value
Caregiver age	68.9 (8.8)	72.75 (11.1)	66.48 (8.6)	70.35 (11.8)	67.08 (13.3)	71.23 (11.3)	1.20	.312
Patient age	79.00 (7.1)	79.19 (7.5)	79.07 (7.2)	81.65 (5.4)	78.28 (8.9)	81.19 (5.6)	0.96	.447
Caregiver educ.	11.36 <sup>a</sup> (4.1)	14.25 <sup>b</sup> (1.5)	12.17 <sup>a,b</sup> (3.9)	13.08 <sup>a,b</sup> (2.2)	11.80 <sup>a</sup> (3.3)	13.65 <sup>a,b</sup> (1.7)	3.16	.010
Patient MMSE score	10.00 <sup>a</sup> (8.9)	19.30 <sup>b</sup> (8.3)	14.83 <sup>a,b</sup> (8.0)	12.76 <sup>a</sup> (6.5)	12.32 <sup>a</sup> (7.4)	14.31 <sup>a,b</sup> (7.3)	3.46	.006
CES-D score	17.83 (8.9)	17.60 (11.9)	21.26 (13.9)	14.78 (11.7)	19.76 (9.3)	14.85 (11.7)	1.38	.236
Years as caregiver	4.81 (2.8)	3.65 (2.9)	3.66 (2.2)	3.92 (4.9)	4.36 (3.9)	3.54 (2.4)	0.53	.751
RMBPC disruption	2.14 (2.0)	1.90 (1.0)	1.99 (1.7)	1.73 (1.5)	2.45 (2.0)	1.85 (1.5)	0.58	.716
Total social support	23.06 (5.7)	25.18 (8.1)	21.06 (6.5)	25.40 (7.0)	23.44 (10.8)	24.92 (9.0)	1.15	.336
Self-reported health	13.82 (3.1)	13.60 (3.9)	12.21 (4.4)	14.31 (4.3)	13.49 (3.9)	13.80 (3.1)	0.96	.447

*Notes:* Means with different alphabet superscripts are significantly different at  $p < .05$  by Tukey's *b* test. CA = Cuban American; WNH = White non-Hispanic; MS = minimal support; SET = structural ecosystems therapy; CTIS = computer–telephone integrated system; MMSE = Mini-Mental State Exam; CES-D = Center for Epidemiological Studies–Depression; RMBPC = Revised Memory and Behavior Problem Checklist.

caregiver type, that is,  $F(5,142) = 3.02$  and  $p = .013$ . Post hoc tests utilizing Tukey's *b* procedure indicated that WNH husband caregivers had lower mean CES-D scores ( $M = 11.32$ ;  $SD = 8.9$ ) than did CA wives ( $M = 20.10$ ;  $SD = 11.8$ ) or CA daughters ( $M = 21.39$ ;  $SD = 10.3$ ). There were no differences among WNH wives ( $M = 18.28$ ;  $SD = 12.4$ ), WNH daughters ( $M = 15.70$ ;  $SD = 12.2$ ), or CA husbands ( $M = 14.75$ ;  $SD = 9.9$ ), or any other groups.

As indicated in Table 4, there was an overall relationship effect, that is,  $F(2,124) = 8.16$  and  $p < .001$ , indicating that husband caregivers had lower mean CES-D scores than wives or daughter caregivers. In addition, a group by time interaction effect, that is,  $F(2,124) = 3.40$  and  $p = .036$ , indicated that, as a whole, SET + CTIS patients demonstrated a decrease in CES-D scores over time, whereas the SET group demonstrated an increase in CES-D scores and the MSC condition remained relatively stable over the two measurement points. As indicated in Table 4, this finding was further clarified by the significant Group  $\times$  Time  $\times$  Relationship  $\times$  Ethnicity interaction;  $F(4,124) = 2.46$  and  $p = .049$ . An inspection of means (Table 5) revealed that CA husbands and daughters in the SET + CTIS

condition had over a 6.5- and 5-point drop in CES-D scores at the 6-month follow-up, respectively, whereas a similar drop of over 5 points was noted for WNH daughters. In contrast, all caregiver groups in the SET condition except for CA wives evidenced an increase or minimal change in CES-D scores at 6 months. A different pattern of results emerged in the MSC condition in that minimal change in CES-D scores were noted for all groups except for the CA husbands, who had a significant increase in CES-D scores.

At the 18-month follow-up, there was a significant relationship effect, that is,  $F(2,131) = 4.70$  and  $p = .011$ . Husband caregivers as a whole experienced lower CES-D scores than wives and daughter caregivers. There was also a Time  $\times$  Relationship effect, that is,  $F(1,131) = 8.02$  and  $p = .001$ ; a Group  $\times$  Time  $\times$  Ethnicity effect,  $F(2,131) = 8.03$  and  $p = .001$ ; a Time  $\times$  Ethnic  $\times$  Relationship effect,  $F(2,131) = 5.31$  and  $p = .006$ ; and a Group  $\times$  Relationship  $\times$  Ethnic effect,  $F(4,131) = 2.58$  and  $p = .04$  (Table 6). An inspection of means for the significant Group  $\times$  Time  $\times$  Ethnicity effect (Table 7) indicates that CA caregivers in the MSC and WNH in the SET condition actually evidenced an increase in mean

**Table 3. Baseline Demographic Variables for CA and WNH Groups in Various Conditions With 18-Month CES-D Follow-Up**

Variable	MS-CA ( <i>n</i> = 20)	MS-WNH ( <i>n</i> = 21)	SET-CA ( <i>n</i> = 27)	SET-WNH ( <i>n</i> = 28)	CTIS-CA ( <i>n</i> = 29)	CTIS-WNH ( <i>n</i> = 30)	<i>F</i> Value	<i>p</i> Value
Caregiver age	68.4 (9.2)	71.52 (10.6)	66.85 (8.8)	69.86 (11.5)	65.41 (12.7)	69.17 (12.4)	0.98	.431
Patient age	78.95 (8.0)	80.57 (5.3)	79.63 (7.7)	81.18 (5.9)	77.38 (9.1)	80.50 (6.6)	1.01	.417
Caregiver educ.	11.50 <sup>a</sup> (4.3)	14.10 <sup>b</sup> (1.3)	12.33 <sup>a,b</sup> (4.0)	13.32 <sup>a,b</sup> (2.2)	11.90 <sup>a,b</sup> (3.3)	13.70 <sup>a,b</sup> (1.6)	2.94	.015
MMSE score	8.35 (7.2)	14.29 (9.4)	15.04 (8.2)	14.00 (7.3)	13.69 (7.9)	14.97 (7.5)	2.17	.060
CES-D score	17.70 (8.9)	18.57 (11.9)	21.77 (14.3)	14.91 (10.7)	19.31 (9.3)	15.67 (11.8)	1.35	.246
Years as caregiver	2.98 (5.5)	2.42 (5.0)	2.82 (4.6)	1.95 (5.6)	2.79 (5.6)	2.50 (4.2)	0.28	.923
RMBPC disruption	1.08 (2.8)	.92 (1.7)	1.21 (2.5)	1.25 (2.6)	1.74 (3.4)	1.32 (2.5)	1.33	.255
Total social support	23.29 (5.8)	25.22 (7.8)	21.36 (6.9)	27.16 (7.5)	22.79 (10.4)	25.85 (9.9)	1.81	.113
Self-reported health	14.05 (3.5)	13.81 (3.5)	11.85 (4.3)	14.96 (4.1)	13.46 (4.0)	14.00 (3.1)	2.00	.082

*Notes:* Means with different alphabet superscripts are significantly different at  $p < .05$  by Tukey's *b* test. CA = Cuban American; WNH = White non-Hispanic; MS = minimal support; SET = structural ecosystems therapy; CTIS = computer–telephone integrated system; MMSE = Mini-Mental State Exam; CES-D = Center for Epidemiological Studies–Depression; RMBPC = Revised Memory and Behavior Problem Checklist.

**Table 4. Results of Repeated Measures Analysis of Change for CES-D Scores at 6 Months**

Source	F Value	df	p Value
Time effect	2.94	(1,124)	.089
Group effect	0.80	(2,124)	.451
Ethnicity effect	0.16	(1,124)	.693
Relationship effect	8.16	(2,124)	<.001
Time × Group	3.40	(2,124)	.036
Time × Ethnicity	2.55	(1,124)	.113
Time × Relationship	1.94	(1,124)	.148
Group × Ethnicity	3.44	(2,124)	.035
Group × Relationship	4.24	(4,124)	.003
Time × Group × Ethnicity	1.59	(2,124)	.209
Time × Group × Relationship	2.18	(4,124)	.075
Time × Ethnic × Relationship	0.04	(2,124)	.965
Group × Ethnic × Relationship	3.04	(4,124)	.020
Time × Group × Ethnicity × Relationship	2.46	(4,124)	.049

Note: CES-D = Center for Epidemiological Studies–Depression.

CES-D scores, whereas WNH in the MSC condition and CA in the SET condition evidenced decreased CES-D scores over time. Mean CES-D scores of both CA and WNH groups decreased in the SET + CTIS condition, particularly CA groups, which demonstrated almost a 5-point decline in mean CES-D scores.

## Discussion

The purpose of the current investigation was to determine the efficacy of two therapeutic interventions and a minimal support condition on levels of reported depression among CA and WNH AD caregivers. A further aim was to determine the efficacy of the interventions over time.

The results at the 6-month follow-up indicate that, overall, subjects in the SET + CTIS condition

evidenced a decrease in reported depression relative to the other interventions. However, the efficacy of the intervention differed according to ethnicity and the type of caregiver. Both CA and WNH daughters evidenced reductions of over 5 points at the 6-month follow-up, and CA husbands demonstrated a reduction of CES-D scores of over 6.5 points over the same period. In contrast, there were minimal changes in CES-D scores for WNH husband and wife caregivers at the 6-month follow-up, whereas CA wife caregivers had an *increase* in CES-D of almost 4 points. In contrast, among caregivers in the SET condition, CA wives evidenced a decrease in CES-D scores of over 5.5 points, whereas CA husbands evidenced an *increase* of over 7.5 points. There were either increases or minimal changes in CES-D scores for other caregiver groups at 6 months. Finally, WNH husbands and wives demonstrated a modest decrease in CES-D scores of approximately 3 points in the MSC condition, whereas CA husbands demonstrated an *increase* in CES-D scores of 6 points upon the 6-month follow-up.

At the 18-month follow-up period, both CA and WNH caregivers in the SET + CTIS condition as a whole had reductions in CES-D scores, with reductions in the CA group approaching 5 points. Unlike the 6-month follow-up, however, there was no interaction between the Relationship factor and the Intervention or Time factors. CA caregivers in the MSC and WNH in the SET conditions evidenced an increase in mean CES-D scores, whereas WNH caregivers in the MSC condition and CA caregivers in the SET condition evidenced decreased CES-D scores over time.

Overall, these findings indicate that the SET + CTIS intervention was effective in lowering both CA and WNH caregiver depression scores upon an initial 6-month and a subsequent 18-month follow-up period. At the 6-month follow-up, CA husband caregivers in the therapy plus technology condition

**Table 5. Changes in CES-D Scores Over 6 Months for All Caregivers in the Groups Reflecting the Significant Time by Group by Ethnicity by Relationship Interaction**

Condition	CA Baseline	CA 6 Months	WNH Baseline	WNH 6 Months
Minimal support ( <i>n</i> = 42)				
Husbands (3 CA and 9 WNH)	9.67 (2.5)	15.67 (8.0)	9.33 (5.2)	6.56 (4.4)
Wives (12 CA and 9 WNH)	17.67 (8.4)	20.66 (7.8)	23.00 (12.4)	19.89 (8.6)
Daughters (7 CA and 2 WNH)	21.62 (9.9)	21.00 (8.2)	30.50 (2.1)	32.50 (20.5)
SET ( <i>n</i> = 54)				
Husbands (6 CA and 7 WNH)	9.62 (5.4)	17.19 (9.9)	25.85 (11.9)	25.12 (7.9)
Wives (13 CA and 13 WNH)	27.12 (14.2)	21.57 (15.3)	18.07 (12.1)	20.57 (12.0)
Daughters (9 CA and 6 WNH)	19.90 (13.0)	25.56 (12.9)	6.19 (3.0)	4.67 (4.5)
SET + CTIS ( <i>n</i> = 51)				
Husbands (8 CA and 9 WNH)	20.50 (11.4)	13.88 (7.6)	9.11 (8.6)	8.22 (5.1)
Wives (9 CA and 12 WNH)	16.33 (7.7)	20.22 (10.1)	16.50 (12.4)	14.25 (8.7)
Daughters (8 CA and 5 WNH)	22.88 (8.3)	17.87 (7.3)	21.20 (12.2)	15.50 (12.6)

Note: CES-D = Center for Epidemiological Studies–Depression; SET = structural ecosystems therapy; CTIS = computer–telephone integrated system; CA = Cuban American; WNH = White non-Hispanic.



**Table 6. Results of Repeated Measures Analysis of Change for CES-D Scores at 18 Months for All Caregivers**

Source	F Value	df	p Value
Time effect	1.76	(1,131)	.187
Group effect	0.43	(2,131)	.650
Ethnicity effect	0.49	(1,131)	.488
Relationship effect	4.70	(2,131)	.011
Time × Group	1.91	(2,131)	.152
Time × Ethnicity	2.42	(1,131)	.122
Time × Relationship	8.02	(1,131)	.001
Group × Ethnicity	0.20	(2,131)	.823
Group × Relationship	1.49	(4,131)	.209
Time × Group × Ethnicity	8.03	(2,131)	.001
Time × Group × Relationship	0.51	(4,131)	.732
Time × Ethnic × Relationship	5.31	(2,131)	.006
Group × Ethnic × Relationship	2.58	(4,131)	.040
Time × Group × Ethnicity × Relationship	0.51	(4,131)	.728

Note: CES-D = Center for Epidemiological Studies–Depression.

tended to show reductions in reported depression, whereas CA husbands in the other conditions showed an *increase* in CES-D scores. In general, the SET condition was not effective in lowering scores for any of the caregiver groups, with the exception of CA wives. The MSC condition appeared to be associated with modest decreases for WNH caregiver spouses and was associated with *higher* CES-D scores for CA spouses.

The family therapy intervention by itself did not have a significant effect on depressive symptoms for most of the caregivers. The unique feature of the more successful combined therapy and technology intervention was that, in addition to receiving in-home family therapy, caregivers were able to access local resources and participate in family conferences and online support groups by using a simple, readily accessible computer–telephone technology. The technology may have facilitated the ability of caregivers to receive additional needed individualized support without having to leave their homes. Caregivers were also able to control the type and amount of support that they received. They were able to access resource information and participate in the online discussion groups as frequently as they wished. The system may have also helped caregivers to resolve family conflicts that may have arisen during the therapy sessions, as the system provided

additional opportunities for family interaction. The caregivers reported that they liked using the system and found it valuable to participate in family conferencing and the online discussion groups (Czaja & Rubert, in press). This effect was likely maintained because the computer–telephone technology was maintained within caregivers’ homes over the 18-month follow-up period so that the technology was continuously accessible and available for use. The maintenance of treatment effects is critical in outcomes research, and technology can both enhance and extend treatment efficacy.

The treatment effects found in the current investigation extend the literature on caregiver intervention, because previous treatment research demonstrating combined individual and family therapy among AD caregivers has been limited to spouses, has not demonstrated efficacy across different treatment groups, and has not demonstrated maintenance of these effects upon follow-up (Mittleman et al., 1995). The current findings at 6 months for the SET + CTIS group, as well as the finding that there were opposite effects among different ethnic caregivers in the SET and MSC conditions, demonstrate that the interaction between caregiver type and ethnicity has to be an important consideration in designing and implementing intervention studies. This finding is similar to those reported by Gitlin and colleagues for the overall REACH sample (Gitlin et al., in press).

The current findings are particularly noteworthy in light of the fact that caregivers in the REACH study sites were not selected for participation on the basis of a predetermined clinical level of reported burden or depressive symptoms. Furthermore, in accordance with an intention-to-treat methodology, we did not exclude caregivers with minimal levels of burden and depressive symptoms from the analyses. Half of the study participants at the Miami site had CES-D scores below the typically defined cutoff for indication of depressive symptoms (<16). In addition, the control groups at each of the sites received some form of intervention that may have further decreased the power to detect change in the active interventions. Active comparison conditions were chosen because of ethical concerns and to discourage differential dropout among groups.

Significant three-way and four-way interactions were obtained despite very modest cell sizes, indicating that the observed treatment effects were of sufficient magnitude to compensate for the relative

**Table 7. Changes in CES-D Scores Over 18 Months for All Caregivers in the Groups Reflecting the Time by Group by Ethnicity Interaction Effect**

Condition	CA Baseline	CA Follow-Up	WNH Baseline	WNH Follow-Up
Minimal support ( <i>n</i> = 41)	17.70 (8.9)	18.60 (8.3)	18.60 (8.3)	13.28 (7.4)
Family therapy ( <i>n</i> = 54)	21.77 (14.3)	18.81 (12.3)	14.91 (10.7)	14.91 (10.7)
Family therapy + technology ( <i>n</i> = 59)	19.31 (9.3)	14.41 (8.9)	15.67 (11.8)	13.87 (8.8)

Note: CA = Cuban American; WNH = White non-Hispanic; CES-D = Center for Epidemiological Studies–Depression.

loss of statistical power related to the relatively small numbers in subjects stratified by ethnicity and caregiver type. The finding that decreases in CES-D scores equaled or exceeded 5 points for CA and WNH daughters and CA husbands in the SET + CTIS condition at 6 months and CA caregivers as a whole at 18 months suggests a robust treatment effect.

Future studies would benefit from larger numbers of different types of caregivers belonging to different ethnic or cultural groups to determine whether the CTIS is efficacious with other caregivers such as African Americans. Furthermore, there is a need to evaluate the efficacy of the CTIS without the in-home therapy component. The CTIS technology is extremely cost-effective and can be permanently left within the home to maintain potential treatment gains; intensive family therapy within the home is extremely expensive and difficult to implement in the normal clinical environment. The technology also holds promise as a treatment system for caregivers who may be isolated and do not have available family supports (Czaja et al., 2000). Further research should also include clinical measures of depression, because self-report indices such as the CES-D may tap constructs such as general psychological distress rather than putative depression.

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