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Effect of Multicomponent Interventions on Caregiver Burden and Depression: The REACH Multisite Initiative at 6-Month Follow-Up

Laura N. Gitlin,

Thomas Jefferson University

Louis D. Burgio,

University of Alabama

Diane Mahoney,

Hebrew Rehabilitation Center for Aged

Robert Burns,

University of Tennessee

Song Zhang,

University of Pittsburgh

Richard Schulz,

University of Pittsburgh

Steven H. Belle,

University of Pittsburgh

Sara J. Czaja,

University of Miami School of Medicine

Dolores Gallagher-Thompson,

Stanford University School of Medicine, and Veterans Affairs Palo Alto Health Care System

Walter W. Hauck, and

Thomas Jefferson University

Marcia G. Ory

National Institute on Aging

For the REACH Investigators

Abstract

Correspondence concerning this article should be addressed to Laura N. Gitlin, Community and Homecare Research Division, Thomas Jefferson University, 130 South 9th Street, Suite 513, Philadelphia, Pennsylvania 19107. E-mail: laura.gitlin@jefferson.edu. Laura N. Gitlin, Community and Homecare Research Division, Thomas Jefferson University; Steven H. Belle, Departments of Epidemiology and Biostatistics, University of Pittsburgh; Louis D. Burgio, Applied Gerontology Program, University of Alabama, Tuscaloosa; Sara J. Czaja, Department of Psychiatry and Behavioral Sciences, University of Miami School of Medicine; Diane Mahoney, Research and Training Institute, Hebrew Rehabilitation Center for Aged; Dolores Gallagher-Thompson, Veterans Affairs Medical Center, Stanford University School of Medicine, and Veterans Affairs Palo Alto Health Care System; Robert Burns, Preventative Medicine, University of Tennessee; Walter W. Hauck, Department of Clinical Pharmacology, Thomas Jefferson University; Song Zhang, Department of Epidemiology, University of Pittsburgh; Richard Schulz, Department of Psychiatry and University Center for Social and Urban Research, University of Pittsburgh; Marcia G. Ory, Behavioral and Social Science Program, National Institute on Aging. Marcia G. Ory is now at Texas A&M University System—Health Sciences Center.

This article appears in the special section describing the Resources for Enhancing Alzheimer's Caregiver Health (REACH) study. The participating investigators are listed in the Appendix of the introductory article (Schulz et al., 2003).

Meta-analysis was used to examine pooled parameter estimates of 9 active compared with 6 control conditions of the Resources for Enhancing Alzheimer's Caregiver Health (REACH) project at 6 months on caregiver burden and depressive symptoms. Associations of caregiver characteristics and outcomes were examined. For burden, active interventions were superior to control conditions ($p = .022$). Also, active interventions were superior to control conditions for women versus men and for caregivers with lower education versus those with higher education. For depressive symptoms, a statistically significant association of group assignment was found for Miami's family therapy and computer technology intervention ($p = .034$). Also, active interventions were superior to control conditions for Hispanics, nonspouses, and caregivers with lower education. Results suggest interventions should be multicomponent and tailored.

Caring for individuals suffering from dementia has profound consequences for family caregivers. Potential stressors associated with family caregiving are numerous and may include managing behavioral disturbances, attending to physical needs, and providing seemingly constant vigilance (Gold et al., 1995; Vitaliano, Russo, Young, Teri, & Maiuro, 1991; Wright, Clipp, & George, 1993). The effects of these stressors on family caregivers can be catastrophic. Family caregiving has been associated with increased levels of depression and anxiety as well as higher use of psychoactive medications, poorer self-reported physical health, compromised immune function, and increased mortality (Kiecolt-Glaser & Glaser, 2001; Light, Niederhe, & Lebowitz, 1994; Schulz & Beach, 1999; Schulz, O'Brien, Bookwala, & Fleissner, 1995).

The extensive descriptive findings documenting the negative effects of caregiving have led to numerous studies testing interventions to alleviate burden and depression in families caring for persons with dementia. Early studies tested interventions that were primarily psychosocial, typically involving support groups, individual counseling, and education. Reviews of these studies concluded that such interventions had only modest therapeutic benefits as measured by global ratings of well-being, mood, stress, psychological status, and caregiving burden (Knight, Lutzky, & Macofsky-Urban, 1993; Toseland & Rossiter, 1989). Furthermore, programs designed for individual caregivers appeared to be more effective than group programs (Knight et al., 1993). As Zarit and Teri (1991) noted, interpretations of these early efforts should be tempered by the fact that expectations for particular intervention outcomes and the malleability of caregivers were initially overly optimistic. Also, some intervention effects may have been underestimated because of methodological limitations.

More recent studies have evaluated a broader scope of interventions that can be categorized as individual or family counseling, case management, skills training, and combinations thereof. In a comprehensive review of this second generation of intervention studies by Bourgeois, Schulz, and Burgio (1996), several important conclusions were derived. First, the complexity and rigor of intervention studies continues to improve with an increasing emphasis on randomized designs. Second, the literature, on the whole, supports the conclusion that more is better in that multicomponent interventions that provide caregivers with diverse services and supports tend to generate larger effects than narrowly focused interventions. Similarly, single-component interventions with higher intensity (frequency and duration) have a greater positive impact on the caregiver than comparable interventions with lower intensity. However, a persistent limitation of caregiver intervention research is that individual studies offer relatively small sample sizes or test a limited range of intervention strategies. As a result, it is difficult to identify the optimal mix of program elements for a given caregiver-care-recipient dyad. This review of caregiver intervention research was recently updated and expanded by Kennet, Burgio, and Schulz (2000) and Schulz et al. (2003), and their conclusions remained unchanged.

Differential Treatment Effects Based on Caregiver Characteristics

Previous research on caregiving shows that family caregivers differ in their coping styles and appraisals of their situation based on a number of characteristics such as gender, race/ethnic identity, educational attainment, and relationship to the individual with dementia. Similarly, caregiver characteristics may also influence a caregiver's response to interventions. The relationship of race and ethnicity to caregiver outcomes has received considerable attention recently. Comprehensive reviews of the literature have identified differences in the stress process, psychosocial outcomes, and service utilization among caregivers of different racial and ethnic backgrounds (Connell & Gibson, 1997; Janevic & Connell, 2001). For example, studies consistently show important differences in perceived burden and depression among African American, White, and Hispanic family caregivers (Calderon & Tennstedt, 1998; Haley et al., 1996; Stueve, Vine, & Struening, 1997). Studies suggest that African American caregivers report fewer depressive symptoms and lower burden than White or Hispanic caregivers (Connell & Gibson, 1997). Caucasian caregivers tend to report greater depression and appraise caregiving as more stressful than African American caregivers (Farran, Miller, Kaufman, & Davis, 1997; Gonzales, 1997; Haley et al., 1996). However, Hispanic caregivers report greater depression and behavioral burden than Caucasians and African Americans (Harwood et al., 1998; Valle, Cook-Gait, & Tazbaz, 1993).

Nevertheless, a limitation of caregiver intervention studies is the lack of attention to the potential impact or role of racial and ethnic identity on caregiving and how that may affect responses to intervention (Aranda & Knight, 1997; Connell & Gibson, 1997). It has long been understood that culture influences the construction of illness perceptions (Kleinman, Eisenberg, & Good, 1978; Lockery, 1991). The failure to address multicultural issues in intervention research has led to significant gaps in knowledge about psychosocial problems such as depression and its treatment (Sue, Bingham, Porsche-Burke, & Vasquez, 1999). It seems reasonable to expect that racial and ethnic identity may shape cultural beliefs about dementia and the family's responsibility for care, which in turn may affect how families respond to the challenges of long-term caregiving and interventions designed to support these efforts (Haley, Han, & Henderson, 1998). This is supported by one study that found that African American caregivers benefited more than White caregivers from a psychosocial intervention (Cox, 1998).

The caregiver's relationship to the care recipient has also been identified as an important factor that influences caregiver outcomes, particularly well-being (Kramer, 1997). Compared with White caregivers, non-White caregivers are much less likely to be a spouse and much more likely to be an adult child, friend, or other family member (Cox, 1995; Gonzales, 1997; Knight & McCallum, 1998). A consistent finding in caregiver research is that among predominantly Caucasian samples, caregiving outcomes differ between adult child and spouse caregivers (Deiming, Bass, Townsend, & Noelker, 1989; George & Gwyther, 1986), with spousal caregivers reporting higher rates of upset and depression than nonspouse caregivers (Pruchno & Resch, 1989). Less is known as to whether spouses and nonspouses respond differently to interventions. A randomized controlled study evaluating a home environmental intervention to address problem behaviors found that spouses in treatment reported less upset with the care recipient's disruptive behaviors in comparison to nonspouses, who showed no significant reductions (Gitlin, Corcoran, Winter, Boyce, & Hauck, 2001). In a study of adult day-care utilization, Zarit, Stephens, Townsend, Greene, and Leitsch (1999) found that spouses tended to be brief users of such services in comparison to nonspouses.

To date, there is little knowledge about the impact of educational attainment on the caregiving experience. Education has primarily been examined in combination with caregiver income, although there is speculation that educational level exerts an independent effect. Lawton,

Rajagopal, Brody, and Kleban (1992) found that African American caregivers who were disadvantaged economically and educationally tended to be less burdened than Caucasian caregivers, whereas more advantaged African Americans reported more burdens. Despite the lack of data on educational attainment, Aranda and Knight (1997) suggested that caregiving is complicated by lower income and education and this, in turn, may impact on intervention outcomes. This is supported by Buckwalter et al.'s (1999) study, which showed that caregivers who were less educated tended to report slightly more depression than those who were better educated.

One of the most robust findings from research on caregiving is the effect of caregiver gender on well-being (Ford, Goode, Barrett, Harrell, & Haley, 1997). In a systematic review of gender differences and caregiving, Yee and Schulz (2000) showed that women caregivers reported more psychiatric symptoms than men caregivers, including greater depression (Beach, Schulz, Yee, & Jackson (2000), burden (Lutzsky & Knight, 1994), and anxiety (Parks & Pilisuk, 1991). However, few studies have examined the relationship between gender and intervention effects. In a randomized controlled trial, Gitlin, Corcoran, Winter, Boyce, and Marcus (1999; Gitlin et al., 2001) found that women were more likely than men to comply with a home environmental modification intervention, implement recommended strategies, and derive greater benefits. Thus, research evidence suggests that it is important to consider the relationship between intervention effects and specific caregiver characteristics.

Present Research

The Resources for Enhancing Alzheimer's Caregiver Health (REACH) initiative addresses some of the major limitations of previous intervention research. It also offers important advantages to examining treatment effects on caregiver burden and depression and the association between treatment effects and caregiver characteristics. A primary strength of this initiative is the large ($N = 1,222$) racially and ethnically diverse sample of caregivers recruited by REACH. The REACH sample included large numbers of White/Caucasian, Black/African American, and Hispanic/Latino caregivers. This last group included subsamples of Cuban Americans, primarily recruited at the Miami site, and Mexican Americans, primarily recruited at the Palo Alto site. In the analyses presented here these subgroups were combined and are referred to as Hispanic/Latino (Torres-Gil & Kuo, 1998). Another advantage of the REACH initiative is the ability to conduct cross-site analyses to examine the combined effects of diverse interventions. Each site tested different theory-driven interventions and used randomized clinical trial procedures to test hypotheses about the effects of interventions. These interventions were developed independently at each site and included the provision of individual information and support strategies, group support and family systems efforts, psychoeducational and skill-based training approaches, home-based environmental strategies, and enhanced technology systems (Wisniewski et al., 2003). To enable cross-site comparisons to examine the collective effects of interventions, a common set of measures and procedures were implemented, supplemented by site-specific outcome measures.

This article examines the pooled treatment effects of 15 site-specific REACH interventions (9 active and 6 control group conditions) on caregiver burden and depressive symptoms following 6 months of intervention. Exploratory analyses were also conducted to examine the overall effects of treatments by categories of caregiver race/ethnic identity, gender, educational level, and relationship to care recipient. REACH collected follow-up data on all caregivers at 6, 12, and 18 months. The data reported here reflect the outcomes of the first phase of the REACH interventions at 6 months and address one of the primary goals of the REACH initiative, to examine the combined effects of diverse interventions (Schulz et al., 2003) using a preplanned meta-analytic approach, and explore which caregivers derive the most benefit. We hypothesized that the combined effect of active compared with control conditions would result

in less upset and fewer depressive symptoms for caregivers in active interventions at the 6-month follow-up.

Method

Recruitment and Sample

REACH recruited family caregivers of individuals with dementia from multiple community sites and health and social agency settings, with special attention to enrolling diverse participants. Recruitment goals were based on power analyses for detecting different effect sizes for the different intervention strategies. Thus, enrollment numbers differed across the sites. Details about the extensive recruitment efforts, as well as their related costs and outcomes, are reported in Nichols, Malone, Tarlow, and Lowenstein (2000) and Tarlow and Mahoney (2000). Eligibility criteria and characteristics of the 1,222 family caregivers enrolled and randomized in this study are described in detail in this issue by Wisniewski et al. (2003).

Procedure

Potential participants were initially interviewed at each site via telephone using a common set of screening questions. After obtaining informed consent from those who were eligible, caregivers were administered the core battery of measures in person and then were randomly assigned to intervention or control group conditions at each site (Wisniewski et al., 2003). Caregivers were subsequently interviewed using the REACH core battery of measures at 6, 12, and 18 months. In order to minimize bias in outcomes assessment, individuals who served as assessors did not serve as interventionists. The core battery was modified for caregivers for whom the care recipient's status had changed prior to their next scheduled interview. If the care recipient had died, a bereavement battery was substituted; if the care recipient had been institutionalized, a placement battery was used. Both of these batteries eliminated measures that were not relevant to current caregiving concerns, such as care recipients' bothersome behaviors and caregivers' upset with such behaviors, but maintained the relevant domains, such as caregivers' depression. Consequently, the analytic sample size reported here varies for the two outcome measures according to the disposition status of the caregiver (active caregiving at home, placement, or bereaved).

Each site obtained local Institutional Review Board approval for their specific interventions and maintained ongoing approval throughout the study. The coordinating center conducted site visits to monitor adherence to study protocols and confirm the exclusive use of REACH trained and certified interviewers. It also conducted monthly monitoring of enrollment and data processing for quality control purposes.

Outcome Measures

Demographic and background measures and characteristics of the sample are discussed in detail in this issue by Wisniewski et al. (2003). We focus here on the primary outcome measures.

Specific psychometrically based guidelines governed the selection of REACH measures. A REACH subcommittee conducted a 1-year extensive investigation to identify appropriate measures following these guidelines (Switzer, Wisniewski, Belle, Dew, & Schulz, 1999). Preference was given to established measures with appropriate psychometric properties that had been used with Alzheimer's disease and related disorders (ADRD) family caregivers and had acceptable measurement properties for ethnically diverse samples. Two measures were used to assess the combined effects of the REACH interventions, the Revised Memory and Behavior Problems Checklist (RMBPC; Teri et al., 1992) as modified by REACH (Roth et al., in press) and the 20-item Center for Epidemiological Studies–Depression Scale (CES–D;

Radloff, 1977). The RMBPC 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 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*). Upset scores were calculated by summing scores across all behaviors, assigning 0 (*no upset*) to behaviors that were not manifested. The summary calculation reports an average upset rating across all participants, with scores ranging from 0 to 96. For this study sample providing data at 6 months ($n = 911$), Cronbach's alpha was .87. We used the 6-month measure as the outcome variable (RMBPC Burden score). A higher score indicates greater upset or burden. To measure the presence of depressive symptoms, we used a global measure of well-being. The CES-D was initially designed as a screen for community dwellers at risk of developing major depressive symptomatology. It has been used widely in intervention studies with family caregivers. For each of the 20 items, participants rate its frequency of occurrence during the past week on a 4-point scale from 0 (*rarely*) to 3 (*most of the time*). Scores range from 0–60 with a higher score indicating the presence of a greater number and frequency of depressive symptoms. A score of 16 or higher has been identified as discriminatory between groups with clinically relevant and nonrelevant depressive symptoms (Radloff & Teri, 1986). For this study sample providing data at 6 months ($n = 1,087$), Cronbach's alpha was .90. The 6-month score for the CES-D was used as the outcome variable.

Randomization

Assignment was equal to treatment and control except at the Palo Alto site in which a 2–2–1 randomization scheme was used such that for every 2 caregivers randomized to each of the two treatment conditions, 1 caregiver was randomized to the minimal support control condition. Three of the sites (Memphis, Miami, and Philadelphia) developed a stratified randomization scheme, one site (Birmingham) used a minimization scheme, and one site (Boston) did not stratify. The stratification variables used in randomization for sites are shown later in Tables 2 and 3. In the Palo Alto site, White/Caucasians and Hispanic/Latinas were randomized separately to treatment conditions without stratification. The two race/ethnicity groups were treated as two separate studies at the site and in this report.

Interventions

A total of 15 interventions (9 active and 6 control group conditions) were tested across the six REACH sites. These interventions are described in detail in Wisniewski et al. (2003) and in site-specific reports (Burgio, Stevens, Guy, Roth, & Haley, 2003; Burns, Nichols, Martindale-Adams, Graney, & Lummus, 2003; Eisdorfer et al., 2003; Gallagher-Thompson et al., 2003; Gitlin et al., 2003; Mahoney, Tarlow, & Jones, 2003).

Three sites, Birmingham, Boston, and Philadelphia, tested a single active intervention (skills-training condition, telephone-linked computer [TLC], environmental skill building program [ESP], respectively). Three sites implemented two active interventions: Memphis (behavior and enhanced care), Miami (family-based multisystem in-home intervention [FSMII], and FSMII combined with computer telephone integration system [CTIS]), and Palo Alto (coping with caregiving class and enhanced support group). Two sites used modified usual care control groups (Boston and Philadelphia) in which caregivers received information packets only. One site (Memphis) provided information and referral and three other sites (Birmingham, Miami, and Palo Alto) utilized a minimal support control (MSC; information and empathetic listening). An important feature of REACH was the use of rigorous treatment implementation approaches in which each site developed procedures to assure minimal deviation from intervention protocols (Burgio et al., 2001). Also, interventions were responsive to the particular cultural

backgrounds of study participants (Gallagher-Thompson et al., 2000) as discussed in Wisniewski et al. (2003).

The professional background of individuals who delivered the interventions (e.g., occupational therapists, social workers, psychologists, and counselors) varied at each site and across interventions, as did the delivery characteristics, including dose and intensity of contact and location of intervention (e.g., home, community, or medical office; Czaja, Schulz, Lee, & Belle, 2003). Overall, the active phase of the REACH interventions ranged in length from 6 months (Birmingham, Philadelphia, Miami, and Palo Alto), to 12 months (Boston), to 24 months (Memphis), with each intervention requiring a different frequency and type of contact (e.g., telephone, face-to-face, group). There was wide variation in the average number of contacts for each intervention in the first 6 months ranging from 5.2 (Philadelphia ESP) to 59 (Miami FSMII + CTIS). On average, during the first 6 months, the amount of contact time was considerably higher in active than in control conditions at every site (see Belle et al., 2003, for details regarding contact time).

Analytic Strategy

In accordance with clinical trial research principles, we examined intervention effects for the entire sample for which data were available. This intention-to-treat strategy is designed to preserve randomization by not deleting participants from the analyses. Although we did not delete participants based on postrandomization information, not all participants provided 6-month data on the RMBPC Burden measure. Caregivers who were bereaved or who had placed their family member in a care facility received a battery different from the core assessment. These placement and bereavement batteries did not include the RMBPC Burden measure because it was not appropriate for these caregivers. This yielded different sample sizes for the two outcome measures: RMBPC Burden ($n = 911$) and CES-D ($n = 1,087$).

To reduce the number of participants with missing data on both dependent variables, we interpolated 6-month values using linear interpolation when the participant had 12-month or 18-month but not 6-month data on the outcome variable. The difference between the follow-up and baseline values was divided by time between follow-up and baseline to obtain a difference per day. Then, this value was multiplied by 182 (the number of days in 6 months) and added to the baseline score. Thus, the analyses with RMBPC Burden score as the outcome variable include caregivers who were actively caring for a person with dementia at home at either 6, 12, or 18 months ($n = 911$). Thirty-two caregivers had interpolated scores for the 6-month RMBPC Burden. The analyses involving CES-D 6-month scores as the outcome variable included this same set of caregivers, as well as individuals who were bereaved and those who placed their family member in a long-term care facility ($n = 1,087$). A total of 50 participants had interpolated values for the 6-month CES-D scores.

We used techniques of meta-analysis to compare and summarize the effect of REACH interventions overall. Meta-analysis is typically used to synthesize data from multiple independent studies to derive a summary estimate of effect. The first step therefore was to conduct within-site analyses. This initially involved a series of independent t tests and chi-square tests of association to examine differences at the site level in caregiver characteristics between caregivers for whom we obtained 6-month data and for those who were not included in the 6-month analyses due to loss to follow-up (withdrawal from study or status unknown). Then, for each site an adjusted mean difference score was calculated for treatment effects on the two outcome measures using analysis of covariance (ANCOVA). In these site-level analyses, covariates included the baseline value of the outcome measure and any stratifying or design variables applicable to that site. Tables 2 and 3 present these analyses and list the covariates used by each site. We assessed the normality assumption for each dependent measure by examining the distribution of the residuals from Tables 2 and 3. In some cases (Birmingham,

Boston, Miami, and Philadelphia), the residual distribution was skewed and normality would have been improved with a transformation of the data. However, in all cases, use of the transformation did not change the results. Therefore, we report untransformed results for all sites and measures.

Next, for each outcome, linear regression models were used to estimate treatment effects (each active treatment vs. control condition) within site. The regression models included 6-month outcome as the dependent variable. Independent variables included the baseline value of the outcome measure, the design variables (see Tables 2 and 3), and an indicator variable for treatment assignment. If there was no difference between the treatments, the parameter estimate for the indicator variable was zero. Because higher scores on both RMBPC and CES-D indicated poorer outcomes and the indicator variable took the value 1 for the active treatment and 0 for the control condition, a negative parameter estimate implied that the active treatment was more efficacious than the control treatment. A positive parameter estimate implied the opposite.

In the Palo Alto site, interventions were conducted separately for each ethnic group. Therefore, regression models were fit separately for White/Caucasians and Hispanic/Latinas at Palo Alto. This resulted in seven separate regression models for each of the two outcome measures. We report the individual parameter estimates for treatment assignment and the combined effect using a procedure assuming random effects (DerSimonian & Laird, 1986). The homogeneity of effects was also tested (Petitti, 2000). We report the magnitude of the treatment effect (pooled estimate) of combined active to control group conditions and the confidence interval.

Finally, we used the preceding meta-analytic procedures to examine the differential effects of the combined active treatments compared with controls for four caregiver characteristics: gender, race/ethnicity (White, African American, Hispanic), educational level ($\leq$ high school, $>$ high school), and relationship (spouse, nonspouse). Also, we used the preceding procedures to examine whether there were differential treatment effects for caregivers with high baseline levels of burden and depressive scores using a cutoff point that excluded caregivers with scores of 0 (e.g., no burden or no depression). The latter analyses were intended to avoid potential floor effects. For analyses in which significance levels were calculated, $p < .05$ was considered statistically significant.

Results

Recruitment, Attrition, and Demographics

Table 1 shows the number of caregivers randomized at baseline and their participation status at 6 months by site and intervention assignment. The REACH sites, overall, were successful in retaining 89% of the participants through the first follow-up time point of 6 months. All sites retained at least 85% of randomized caregivers. As shown, of 1,222 caregivers randomized at baseline, at the 6-month follow-up, 77 caregivers (6%) had placed their care recipients in a long-term care facility, 79 caregivers (6%) were bereaved, the status of 74 caregivers (6%) was unknown (e.g., caregiver missed 6-month follow-up and status in study is unknown), and 61 caregivers (5%) withdrew from study participation (inactivated). Table 1 also shows the number of participants by site and intervention assignment for the RMBPC Burden sample and the CES-D sample.

Each site also conducted a series of analyses to identify large or statistically significant differences in caregiver and care-recipient characteristics between those in the 6-month analyses for the CES-D sample (completers) and those for whom we did not have 6-month data (noncompleters; status unknown or inactivated). These comparisons showed statistically

significant differences on different variables at each site. However, no systematic pattern of attrition was found across sites.

Demographic data for caregivers and care recipients at each of the six sites are presented in Wisniewski et al. (2003). The demographic characteristics of the sample reported in this article are similar to those reported for the total baseline sample and are therefore not presented here.

Main Effects of Interventions on RMBPC Burden and CES–D Scores

The first set of analyses was at the site level using ANCOVA. In these analyses, group assignment was not significantly related to 6-month RMBPC Burden at any of the sites (see Table 2). A statistically significant effect for race/ethnicity was found at the Memphis site, with African American caregivers reporting less burden than White caregivers at 6 months ($p = .031$). For CES–D, a statistically significant effect for group assignment was found at the Miami site only ($p = .012$; see Table 3). There, the combination of FSMII + CTIS was more effective than FSMII alone compared to MSC (control group). A statistically significant effect for race/ethnicity was found at the Philadelphia site, with minority caregivers reporting fewer depressive symptoms than White caregivers at 6 months ($p < .01$).

Next, we used meta-analysis techniques to derive parameter estimates within each site and the pooled treatment effect of the nine REACH active interventions compared to the six REACH control group conditions. Figure 1 shows the results of the meta-analysis for the RMBPC Burden and CES–D 6-month scores, respectively. For the RMBPC Burden outcome, unstandardized point estimates ranged from -3.03 in Boston to 1.35 in Miami for the FSMII therapy. This implies that, on average, the adjusted 6-month RMBPC Burden score of caregivers receiving the Boston TLC intervention was 3.03 points better than the scores of caregivers in Boston receiving usual care. However, none of the parameter estimates differed significantly from zero. The test for homogeneity had an associated p value of .94, indicating no evidence of departure from homogeneity. The pooled parameter estimate (-1.40 ; 95% confidence interval = -2.59 to -0.20 , $p = .022$) indicated that across REACH, active interventions were superior to control conditions with respect to 6-month RMBPC Burden scores. The mean scores at baseline and 6 months for active and control group conditions show that the difference between active and control group conditions, although statistically significant, was small. At baseline, the average mean for RMBPC Burden scores for caregivers in active treatments across sites ($n = 580$) was 16.63, and for controls ($n = 330$), 15.06. At the 6-month follow-up, average mean scores for caregivers in active treatments was 13.63, and for controls, 13.85.

For the 6-month CES–D scores, only one active intervention, the Miami FSMII + CTIS, was significantly more efficacious than the control at that site (MSC). The average adjusted 6-month score was 2.48 points better in the combined active treatment than in the control condition (95% confidence interval = -4.88 to -0.22 , $p = .034$).

For the remaining six active interventions for which the point estimate indicated that they were more efficacious than their control conditions, the difference was not statistically significant. The test for homogeneity did not provide evidence of a lack of homogeneity in effect ($p = .52$). The pooled parameter estimate (-0.59 ; 95% confidence interval = -1.42 to 0.23 , $p = .095$) did not differ significantly from zero (see Figure 1). Although not statistically significant, the mean scores at baseline and at 6 months for caregivers in active treatments showed a slight decline, whereas the mean scores for control group conditions showed a very small increase. At baseline, the average mean for CES–D scores for caregivers in active treatments across sites ($n = 700$) was 15.27, and for control group conditions ($n = 387$), 14.69. At the 6-month follow-up, average mean scores for caregivers in active treatments was 14.54, and for control groups, 14.76.

Subgroup Effects of Interventions on RMBPC Burden and CES-D Scores

Next, exploratory analyses were conducted using the same meta-analytic techniques described previously to evaluate whether basic caregiver characteristics (gender, race, relationship, and educational attainment) were associated with pooled treatment effects. Here the emphasis is on the pooled parameter estimate. With regard to gender, for 6-month RMBPC Burden, the pooled parameter estimate for women ($n = 735$; -1.97 ; 95% confidence interval = -3.32 to -0.62) indicated that across REACH, the active interventions were superior to the control conditions for women. The test for homogeneity had an associated p value of .88, indicating no evidence of departure from homogeneity. However, for men ($n = 174$), active interventions were not superior to control conditions (0.81 ; 95% confidence interval = -1.69 to 3.32). For 6-month CES-D scores, there was no statistically significant difference between active and control group conditions for either women ($n = 884$) or men ($n = 202$).

With regard to treatment differences by race and ethnicity for RMBPC Burden, there were no statistically significant differences between combined active and control group conditions for White ($n = 494$), African American ($n = 232$), or Hispanic ($n = 178$) caregivers. For 6-month CES-D scores, there were no statistically significant differences between combined active and control group conditions for White ($n = 611$) and African American ($n = 260$) caregivers. However, the pooled parameter estimate for Hispanic ($n = 207$) caregivers (Miami and Palo Alto sites combined) indicated that active interventions were superior to control group conditions (-2.29 ; 95% confidence interval = -4.57 to -0.003). The test for homogeneity had an associated p value of .43, indicating no evidence of departure from homogeneity.

Next, we examined treatment effects for caregiver educational attainment defined as high school or less education versus more than high school education. We found that for both outcomes, the 6-month RMBPC Burden ($n = 383$) and CES-D scores ($n = 462$) for those with high school or less education assigned to active interventions improved in comparison with caregivers of the same educational level who were in the control group conditions. However, for both outcomes (RMBPC $n = 526$; CES-D $n = 624$), higher educated individuals in active interventions were not significantly different at 6 months in comparison with higher educated caregivers in the control groups. For RMBPC Burden, the pooled parameter estimate for caregivers with lower education was -2.65 (95% confidence interval = -4.57 to -0.74 ; homogeneity, $p = .69$); for CES-D, the pooled parameter estimate was -1.66 (95% confidence interval = -3.05 to $-.027$; homogeneity, $p = .33$).

Treatment effects for caregiver relationship to care recipient (spouse, nonspouse) were also examined (RMBPC spouse $n = 429$; RMBPC nonspouse $n = 480$; CES-D spouse $n = 524$). Here the only statistically significant difference between active and control group conditions was for nonspouses on the 6-month CES-D scores ($n = 562$). The pooled treatment effect for non-spouses indicated that active interventions were better than control group conditions for this group (-1.87 ; 95% confidence interval = -3.67 to -0.07). However, the test for homogeneity had a p value of .04, indicating that a summary measure of the estimates may not adequately depict the results because the effects differed significantly among sites.

Our final set of analyses involved examining whether active interventions were superior to control conditions for caregivers with some level of burden and for those with depressive symptoms. For RMBPC Burden we excluded from the analysis 67 caregivers ($n = 843$ remaining) whose baseline scores were equal to zero, reflecting no upset (-1.36 ; 95% confidence interval = -2.63 to -0.09). For CES-D, we excluded 32 caregivers ($n = 1,055$ remaining) from the analysis whose baseline scores were equal to zero (-0.56 ; 95% confidence interval = -1.40 to 0.29). Although the difference was statistically significant for RMBPC Burden scores, these analyses did not reveal significant differences between the combined active and control group conditions for CES-D.

Discussion

REACH was designed to examine the feasibility and effectiveness of multiple intervention approaches for family caregivers of individuals with dementia. Each site was conducted as a randomized trial with high levels of quality control, including formal treatment implementation procedures (Burgio et al., 2001; Lichstein, Riedel, & Grieve, 1994) and use of the intention-to-treat analytic strategy. This article reports the results of the combined effects of active interventions in comparison with control group conditions at 6 months on two outcome measures of importance in caregiver research: perceived caregiver burden and caregiver depressive symptoms. These measures have been extensively examined in caregiver research and are widely viewed as clinically meaningful indicators of caregiver status, as described in this issue by Schulz et al. (2003). Our basic assumption was that the combined effect of active interventions would result in less caregiver burden and caregiver depressive symptoms in comparison with controls at the first 6-month interval of the REACH initiative. Also, we examined on an exploratory basis, the relationship between treatment and caregiver characteristics, an expressed goal of the REACH initiative as described by Schulz et al.

Caregivers enrolled across the REACH sites had been providing care for an average of 4 years to individuals at the moderate to severe stage of dementia. Most caregivers reported a moderate level of burden associated with care-recipient behavior problems, and on average were slightly below the cutoff score (≥ 16) for being at risk for clinical depression.

Using meta-analysis, the combined effects of active versus control group conditions were examined. We found that the pooled treatment effect from the meta-analysis for RMBPC Burden was statistically significant ($p = .022$), albeit the difference was small. Overall, caregivers across the REACH sites in active interventions showed lower values in burden associated with the occurrences of behavior problems than caregivers enrolled in the control conditions. There were no statistically significant effects for any one intervention for the measure of burden, although for each site's active intervention, burden scores were in the hypothesized direction.

In contrast to the RMBPC Burden results, the pooled treatment effect across sites for the meta-analysis for CES-D was not statistically significant ($p = .095$). Only one site, Miami, reported a significant reduction in depressive symptoms ($p = .034$) in the combined family therapy plus technology treatment condition compared with the control condition. The family-therapy intervention by itself did not have a significant effect on depressive symptoms. The unique feature of the 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 using a simple computer-telephone technology. The technology may have enabled caregivers to receive additional needed individualized support without having to leave their homes. In addition, the availability of a telephone that enabled family conferencing may have facilitated the resolution of conflicts that arose in the context of in-person family therapy sessions.

Although REACH found only a modest overall intervention effect, this finding is consistent with the results of a recent meta-analytic review of the intervention literature (Sorenson, Pinquart, & Duberstein, 2002). The magnitude of the effect sizes for the combined active REACH interventions on caregiver burden (0.15 standard deviation units) and Miami's FSMII + CTIS intervention on depressive symptoms (0.23 standard deviation units) fall within the range of effect sizes reported by Sorenson et al. (2002) in their review of 78 caregiver interventions reported in the literature. Overall, they found improvement ranging from 0.14 and 0.41 standard deviation units in caregiver burden, depressive mood, and other measures of well-being. Moreover, dementia caregivers in these studies benefited less from interventions

than did caregivers of older adults without dementia. It is also noteworthy that most of these studies were not carried out as randomized clinical trials, nor were data analyzed using intention-to-treat statistical methods. This calls into question the reliability of findings previously reported in the literature. One multisite study, which was most similar to REACH in terms of overall design, reported similar small reductions in caregiver burden following a case-management intervention, and comparable to our findings, did not find consistent improvement across all sites (Newcomer, Yordi, DuNah, Fox, & Wilkinson, 1999).

In a review of 43 recently published caregiver intervention studies, Schulz et al. (2002) examined the issue of clinical significance to move the field forward in achieving more reliable and clinically meaningful outcomes. In comparison to existing caregiver intervention literature, the REACH program sets new standards with respect to the application of randomized clinical trial methodology. However, REACH was only somewhat successful in achieving clinically meaningful outcomes. As with most other caregiver intervention studies, the overall findings from REACH met one of the four criteria of clinical significance identified by Schulz et al.: social validity. Across sites, study participants consistently rated active interventions as more beneficial, helpful, and valuable than control conditions (data not reported). Nevertheless, the evidence for outcomes with public health significance are less compelling. For example, the magnitude of change on RMBPC Burden for the REACH combined active groups compared to control conditions was 10%. A 10% reduction in burden on the RMBPC (score range = 0–96) is equivalent to the decrease or elimination of two very bothersome behaviors, such as repetitive vocalization or waking at night.

One reason for the relatively small overall effects of REACH may be the complex pattern of significant outcomes observed for various subgroups. Across the REACH sites, for RMBPC Burden, women and those with high school or less education who were in active interventions reported reduced burden compared to the control conditions. In contrast, men and those with higher education levels did not show significant levels of benefit from the interventions overall. Across the REACH sites, for CES–D, caregivers in active interventions who were Hispanic, those who were nonspouses, and those who had less education reported lower 6-month scores than those with the same characteristics who were in the control group conditions. These findings suggest that the combined interventions had an effect for those caregivers in most need of support.

This study has several limitations that should be noted. First, the meta-analytic approach used here is unable to disaggregate which treatment elements within and across the interventions are most important for decreasing caregiver burden. This analytic approach does not fully take advantage of the power of REACH and its potential to yield information about the impact of specific components of interventions. To address this methodological issue, REACH developed a comprehensive classification system for characterizing and measuring caregiver interventions that captures the content, process, and goals of an intervention in a theoretically relevant manner. This classification system is presented in Czaja et al. (2003) and Belle et al. (2003) in this issue. The analyses based on the classification structure systematically extend the traditional analyses presented here and contribute to a fuller understanding of REACH treatment effects. A second limitation is that some of the REACH interventions did not have, as their primary goal, the reduction of caregiver depression (Birmingham, Boston, and Philadelphia). There may be other outcomes not measured in the REACH core batteries, which are more proximal to the goals of these interventions, that are sensitive to the positive benefits that may have occurred, and that are also clinically meaningful. These outcomes are examined in site-specific reports (Burgio et al., 2003; Burns et al., 2003; Eisdorfer et al., 2003; Gallagher-Thompson et al., 2003; Gitlin et al., 2003; Mahoney et al., 2003).

Another related consideration is the interval of data collection. The 6-month follow-up may have been too soon to detect change, particularly in depressive symptoms. Mittelman et al. (1995), in their study of the effects of a combined individual and family counseling intervention with spouses, found a significant reduction in depressive symptoms at 12 months but not at the 4- and 8-month follow-up assessments.

The results of the REACH initiative provide important insights for developing and testing future interventions for family caregivers. They confirm the conclusions from recent reviews of the caregiver intervention research that there is no single, easily implemented, and consistently effective method for eliminating the multiple stresses of providing care to persons with dementia. For example, although the Miami FSMII + CTIS intervention reduced depressive symptoms, it did not have a significant effect on burden associated with behavior problems. This suggests that a multicomponent intervention that includes elements that target different aspects of the caregiving experience (e.g., affective responses, behavioral burden, and unsafe physical environments) might be most beneficial. Moreover, the challenge for future research will be to match intervention approaches with specific target populations. The optimal match may vary as a function of the outcome measure, regional context (e.g., Northeast vs. Deep South), and characteristics of caregivers, including gender, race and ethnic identity, educational level, and relationship to care recipient. Intervention strategies may also need to be refined to address the needs of caregivers who, in this study, did not show consistent or significant improvements, such as men, spouses, and White or African American caregivers. Thus, future research is necessary to test a multicomponent intervention approach tailored to match specific characteristics of caregivers and their needs in order to maximize benefits.

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Figure 1.

Meta-analysis comparing active to control groups on 6-month Revised Memory and Behavior Problems Checklist (RMBPC) Burden and Center for Epidemiologic Studies—Depression (CES–D) scores. A: Meta-analysis for RMBPC Burden scores ($n = 909$; excludes 2 caregivers due to missing baseline data and 1 caregiver due to missing data on race in Memphis). B: Meta-analysis for CES–D scores ($n = 1,086$; excludes 1 caregiver due to missing data on race in Memphis). Behavior = behavior care; Enhanced = enhanced care in Memphis and enhanced support group in Palo Alto; FSMII = family-based structural multisystem in-home intervention; CTIS = computer telephone integration system; Coping = coping with caregiving class.

Resources for Enhancing Alzheimer's Caregiver Health (REACH): Six-Month Participation Status by Site and Intervention Assignment

Table 1

Site	No. randomized	RMBPC Burden ^a (n = 911)		CES-D sample (n = 1,087)		Placement (n = 77)		Bereavement (n = 79)		Status unknown (n = 74)		Inactivated (n = 61)	
		n	%	n	%	n	%	n	%	n	%	n	%
Birmingham, AL	70	52	74.3	60	85.7	3	4.2	4	5.7	8	11.4	2	2.9
Control (MSC)	70	47	67.1	61	87.1	5	7.2	8	11.4	6	8.6	3	4.3
Skills training													
Boston, MA	51	43	84.3	49	96.1	5	9.8	1	2.0	2	3.9	0	
Control (usual care)	49	36	73.5	46	93.9	5	10.2	4	8.2	2	4.0	1	2.0
TLC													
Memphis, TN	78	56	70.5	66	84.6	6	7.7	4	5.1	8	10.3	4	6.4
Control (IR)	85	67	78.8	76	89.4	4	4.7	5	5.9	4	4.7	5	5.9
Behavior	82	65	79.3	74	90.2	3	3.7	6	7.3	2	2.4	6	7.3
Enhanced													
Miami, FL	73	46	63.0	54	74.0	1	1.4	2	2.7	13	17.8	6	8.2
Control (MSC)	75	57	76.0	66	88.0	3	4.0	5	6.7	6	8.0	3	4.0
FSMII	77	61	79.2	71	92.2	4	5.2	2	2.6	6	7.8	0	
FSMII + CTIS													
Palo Alto, CA	44	32	72.7	41	93.2	7	15.9	2	4.5	1	2.3	2	4.5
Control (MSC)	105	73	69.5	91	86.7	8	7.6	10	9.5	1	1.0	13	12.4
Coping	108	85	78.7	99	91.7	7	6.5	6	5.6	0		9	8.3
Enhanced													
Philadelphia, PA	126	102	81.0	117	92.9	7	5.6	6	4.8	6	4.8	3	2.4
Control (usual care)	129	89	69.0	116	89.9	9	7.0	14	10.9	9	7.0	4	3.1
ESP													
REACH overall	442	331	74.9	387	87.6	29	6.6	19	4.3	38	8.6	17	3.8
Control	780	580	74.4	700	89.7	48	6.2	60	7.7	36	4.6	44	5.6
Active interventions													

Note. CES-D = Center for Epidemiological Studies—Depression Scale; MSC = minimal support condition; TLC = telephone-linked computer; IR = information and referral; FSMII = family-based structural multisystem in-home intervention; CTIS = computer telephone integration system; ESP = environmental skill building.

^aRevised Memory and Behavior Problems Checklist (RMBPC) Burden sample excludes placement, bereavement, and 1 other caregiver with a missing baseline RMBPC, all of whom are included in CES-D sample, but missing RMBPC.

Revised Memory and Behavior Problems Checklist (RMBPC) Burden Score at 6 Months Within Each Site

Table 2

Site and intervention	n	Baseline		6 months		Adjusted 6-month score		p
		M	SD	M	SD	M	SE	
Birmingham, AL	99							
Group assignment								
Control (MSC)	52	19.88	15.87	15.25	15.48	14.97	1.68	.515
Skill training	47	19.01	15.90	13.27	13.48	13.60	1.66	<.001
Baseline Burden score								.817
CG sex								
Male	24	16.91	15.03	11.99	14.83	14.00	2.20	
Female	75	20.29	16.06	15.05	14.44	14.57	1.26	
CG race/ethnicity								
White/Caucasian	58	18.69	13.89	13.68	12.69	13.92	1.48	.753
Black/African American	41	20.59	18.31	15.21	16.90	14.64	1.94	
MMSE								
Mild	22	24.73	14.42	18.26	16.34	14.96	2.51	.751
Moderate	40	19.00	14.99	14.63	13.70	14.76	1.79	
Severe	37	16.86	17.08	11.63	14.07	13.12	1.81	
Boston, MA	79							
Group assignment								
Control (usual care)	43	10.86	10.96	12.65	11.15	13.49	1.19	.091
TLC	36	14.39	15.55	11.47	9.38	10.47	1.30	
Baseline Burden score								<.001
Memphis, TN	187							.413
Group assignment								
Control (IR) ^a	55	13.95	11.87	14.02	13.23	13.72	1.46	
Behavior	67	17.01	13.22	16.17	12.77	14.12	1.35	
Enhanced	65	13.90	13.84	12.22	11.95	11.87	1.37	
Baseline Burden score								
CG race/ethnicity								
White/Caucasian	109	15.98	11.93	15.89	12.39	14.91	1.05	<.001
Other race/ethnicity	77	13.63	14.58	11.61	12.00	11.57	1.31	.031
CG sex								
Male	44	13.32	12.80	11.89	10.02	12.06	1.51	.188
Female	143	15.55	13.16	14.86	12.80	14.41	0.86	
Miami, FL	164							
Group assignment								
Control (MSC)	46	15.50	10.24	13.18	12.54	13.59	1.63	.700
FSMIII	57	14.53	12.23	14.08	12.17	14.97	1.50	
FSMIII + CTIS	61	18.25	13.66	14.36	13.68	13.34	1.23	
Baseline Burden score								<.001
CG race/ethnicity								.178
White/Caucasian	79	17.29	11.87	12.28	10.82	15.14	1.30	
Cuban	85	15.20	12.70	15.72	14.45	12.79	1.21	
Palo Alto, CA—Caucasian	101							
Group assignment								
Control (MSC)	18	19.22	14.08	16.02	10.39	15.50	1.94	.537
Coping	41	19.27	10.68	15.22	10.34	14.69	1.29	
Enhanced	42	16.72	13.80	12.41	10.55	13.16	1.28	
Baseline Burden score								<.001
Palo Alto, CA—Hispanic/Latina	89							.728
Group assignment								
Control (MSC)	14	16.02	9.24	15.43	13.86	16.35	2.81	
Coping	32	18.24	14.39	13.93	12.37	13.69	1.85	

Site and intervention	n	Baseline		6 months		Adjusted 6-month score		p
		M	SD	M	SD	M	SE	
Enhanced Baseline Burden score Philadelphia, PA	43	17.99	16.01	14.42	12.97	14.30	1.59	<.001
Group assignment	191							
Control (usual care)	102	13.90	13.87	13.26	13.85	14.16	.93	.122
ESP	89	15.76	13.84	12.37	11.14	12.09	1.00	
Baseline Burden score								<.001
CG race/ethnicity	85	19.87	16.00	16.16	14.11	12.94	1.04	.795
White/Caucasian	106	10.68	10.23	10.19	10.75	13.31	0.98	
Other race/ethnicity								
CG relationship to CR	67	14.43	12.48	14.17	13.72	14.37	1.13	.082
Spouse	124	14.95	14.59	12.13	12.09	11.89	0.84	
Nonspouse								

Note. MSC = minimal support control; CG = caregiver; MMSE = Mini-Mental State Exam (Folstein, Folstein, & McHugh, 1975); TLC = telephone-linked computer; IR = information and referral; FSMII = family-based structural multisystem in-home intervention; CTIS = computer telephone integration system; ESP = environmental skill-building program; CR = care recipient.

^a n = 186 due to missing data on race/ethnicity for 1 caregiver.

Table 3
Center for Epidemiologic Studies—Depression Scale (CES-D) Score at 6 Months Within Each Site

Site and intervention	n	Baseline		6 months		Adjusted 6-month score		p
		M	SD	M	SD	M	SE	
Birmingham, AL Group assignment	121							
Control (MSC)	60	11.36	9.91	12.06	9.92	12.06	9.91	0.347
Skill training	61	15.74	9.40	13.62	11.55	11.38	1.22	
Baseline CES-D score								<.001
CG sex								.363
Male	26	11.58	8.48	9.88	9.60	11.26	1.67	
Female	95	14.28	9.94	13.66	10.96	12.93	0.89	.969
CG race/ethnicity								
White/Caucasian	71	13.17	9.46	12.23	10.55	12.12	1.08	
Black/African American	50	14.46	10.02	13.74	11.09	12.06	1.43	.348
MMSE								
Mild	25	14.88	10.66	12.05	9.45	10.67	1.84	
Moderate	49	12.88	10.22	13.45	11.48	13.56	1.30	
Severe	47	13.94	8.62	12.65	10.81	12.04	1.28	
Boston, MA Group assignment	95							
Control (usual care)	49	13.23	11.01	14.62	11.66	12.54	1.28	
TLC	46	12.83	10.69	12.33	9.02	12.43	1.32	.258
Baseline CES-D score								<.001
Memphis, TN Group assignment	216							.244
Control (IR)	66	11.28	6.71	12.13	7.89	12.34	0.82	
Behavior	76	13.08	9.94	14.41	9.92	13.26	0.78	
Enhanced	74	11.72	10.22	11.64	10.03	11.55	0.78	
CG race/ethnicity ^a								.153
White/Caucasian	130	11.56	9.19	12.83	9.82	13.01	0.60	
Other race/ethnicity	85	12.86	9.19	12.66	8.91	11.76	0.75	<.001
Baseline CES-D score								.383
CG sex								
Male	49	9.90	8.83	10.51	8.20	11.94	0.91	
Female	167	12.70	9.20	13.42	9.68	12.83	0.49	
Miami, FL Group assignment	191							
Control (MSC)	54	18.34	11.03	17.73	10.07	17.08	1.03	.012
FSMII	66	17.76	13.05	18.69	12.54	18.43	0.93	
FSMII + CTIS	71	16.08	10.50	13.88	8.76	14.60	0.90	
Baseline CES-D score								<.001
CG race/ethnicity								.130
White/Caucasian	95	15.65	11.59	14.80	10.72	15.86	0.78	
Cuban	96	18.94	11.37	18.44	10.47	17.55	0.78	
Palo Alto, CA—Caucasian Group assignment	128							.506
Control (MSC)	24	17.13	13.50	15.61	11.42	15.44	1.60	
Coping	53	18.84	11.48	14.62	8.68	13.50	1.08	
Enhanced	51	14.55	11.08	13.72	10.93	14.97	1.10	
Baseline CES-D score								<.001
Palo Alto, CA—Hispanic/Latina Group assignment	103							.383
Control (MSC)	17	26.67	14.75	22.88	13.95	17.10	2.55	
Coping	38	16.74	12.53	14.10	12.28	15.27	1.66	

Site and intervention	n	Baseline		6 months		Adjusted 6-month score		p
		M	SD	M	SD	M	SE	
Enhanced Baseline CES-D score Philadelphia, PA Group assignment	48 233	17.02	12.40	17.29	14.48	18.34	1.47	<.001
Control (usual care) ESP	117 116	14.85 15.25	10.73 12.17	14.97 15.25	11.20 11.79	15.05 15.06	0.66 0.66	.987
Baseline CES-D score CG race/ethnicity	112	17.03	11.58	18.07	11.98	16.56	0.67	<.001
White/Caucasian	121	13.23	11.05	12.36	10.28	13.55	0.69	.002
Other race/ethnicity								
CG relationship to CR	88	15.99	11.01	15.72	11.34	14.61	0.76	.362
Spouse								
Nonspouse	145	14.48	11.70	14.72	11.74	15.50	0.60	

Note. MSC = minimal support control; CG = caregiver; MMSE = Mini-Mental State Exam (Folstein, Folstein, & McHugh, 1975); TLC = telephone-linked computer; IR = information and referral; FSMII = family-based structural multisystem in-home intervention; CTIS = computer telephone integration system; ESP = environmental skill-building program; CR = care recipient.

^a n = 215 due to missing data on race/ethnicity for 1 caregiver.