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## Acculturation Level and Caregiver Outcomes from a Randomized Intervention Trial to Enhance Caregivers' Health: Evidence from REACH 2

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### Abstract

**Objective**—Latinos comprise a growing segment of the caregiver population and vary widely in acculturation, yet little is known regarding how acculturation might affect caregiver stress or intervention outcomes. This study examined the relationship between acculturation and burden, bother, and depression in Latino dementia caregivers at baseline and following an intervention.

**Methods**—This was a secondary data analysis of 211 Latino caregivers of older adults with dementia from Resources for Enhancing Caregiver's Health (REACH) II, a multi-site randomized trial of caregiver interventions. Baseline and follow-up data were used to run mixed-effects models examining the main and moderating effect of acculturation on caregiver stress.

**Results**—No significant main effect of acculturation was found for any of the outcome measures, controlling for demographic covariates. Acculturation moderated the effect of the intervention on caregiver burden: those who were more acculturated benefited more from the intervention.

**Conclusion**—Differential acculturation for Latino caregivers was not directly associated with caregiver burden, bother, or depression, but was associated with reducing burden from the intervention. Future research should explore by what mechanism acculturation influences caregiver burden following an intervention.

## Keywords

Caregiving; depression; burden; Latino; dementia

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## Introduction

As the population ages, the number of individuals affected with dementia and their family caregivers will increase significantly. Dementia caregiving is accompanied by challenges that place caregivers at risk for significant physical-, emotional-, and cognitive health problems. Compared to non-caregivers, caregivers are more likely to experience poorer physical health, increased mortality, lower immune function, and cognitive decline (Gallagher-Thompson et al., 2003; Schulz & Beach, 1999; Schulz & Martire, 2004; Schulz et al., 2008; Schulz et al., 1997; Yaffe et al., 2002). Many studies have documented the high rates of depressive symptoms found in dementia caregivers, some indicating significantly higher depressive symptoms among Latino compared to White and Black caregivers (Covinsky et al., 2003; Cox & Monk, 1990; Harwood et al., 1998; Herrera et al., 2012; Sorensen & Pinquart, 2005). This may be because racial/ethnic minorities, including Latinos, are more likely to take on the burden of caregiving for someone at home (Evercare and National Alliance for Caregiving, 2008) compared to Whites.

Compared to Whites, rates of cognitive impairment and Alzheimer's disease are as high among Latinos and perhaps higher depending on Latino subgroup (Haan et al., 2003; Tang et al., 1998). Additionally, Latino caregivers spend more hours per week caring for frail older adults and tend to be in more demanding caregiving situations; they also provide more assistance with activities of daily living compared to White caregivers. Cox and Monk (1990) found that Latino caregivers had higher levels of personal and role strain than Black caregivers. Additionally, they are less likely to utilize formal care services (e.g., personal care, case management) (Evercare and National Alliance for Caregiving, 2008). These findings are troubling given that Latinos already experience significant health and health care disparities and are more likely to experience poverty compared to other racial/ethnic groups (DeNavas-Walt, Proctor, & Smith, 2013; Gallagher-Thompson et al., 2003; Keppel, 2007). Greater caregiver stress and burden may exacerbate existing health and socioeconomic disparities for Latinos. This awareness has generated a number of intervention studies aimed at reducing caregiver burden and stress in Latino and other minority populations (Napoles, Chadiha, Eversley, & Moreno-John, 2010).

Evidence-based dementia caregiving interventions exist (Lykens, Moayad, Biswas, Reyes-Ortiz, & Singh, 2014; Mahoney, Tarlow, & Jones, 2003; Napoles et al., 2010; Schulz et al., 2003), and some are linguistically and culturally congruent for Spanish speaking populations. Evidence from caregiver intervention research indicate that combined interventions that target multiple sources of caregiving stress and multiple individuals simultaneously produce a significant improvement in caregiver psychosocial outcomes, ability, and knowledge, and occasionally care recipient outcomes (Brodsky, Green, and Koschera, 2003; Schulz, O'Brien, and Czaja, et al., 2002). Napoles et al. (2010) examined the extent to which psychosocial support interventions for ethnically diverse caregivers

incorporate evidence of ethnic-specific differences in dementia caregiving in designing and delivering their intervention. They focused their review on three major ethnic groups, which included Latinos. Of the 18 intervention studies that met study inclusion criteria, only 11 considered cultural factors in their design; 8 of the 11 that addressed cultural tailoring were from one multisite research initiative – the Resources for Enhancing Alzheimer’s Caregiver Health (REACH) program. The REACH 2 intervention indicated statistically significant improvements in caregiver quality of life (as measured by depression, burden, and care recipient problem behaviors) as a result of the intervention (Belle et al., 2006). However, it is unclear whether cultural differences within ethnic subgroups moderate the impact of these interventions. It is reasonable to assume this might be the case since REACH 2 interventions were culturally tailored by addressing familism, language, literacy, need for advocacy, protecting elders, and logistical barriers, as well as having bilingual-bicultural staff (Napoles et al., 2010).

Aranda and Knight’s sociocultural stress and coping model suggests that within-group cultural variation may influence caregiver distress and health outcomes (Aranda & Knight, 1997; Knight & Sayegh, 2010). Latino caregivers may come from any one of the more than 20 countries in Latin America (Operation World, 2016). Within Latino populations, there is a large degree of heterogeneity beyond subtle language differences, including education level, family, social and health values, beliefs, and cultural practices (Elder, Ayala, Slymen, Arredondo, & Campbell, 2009). Cultural values such as familismo may influence the variability and use of coping strategies by Latino caregivers. Familismo is a core cultural value that includes commitment to support family members both emotionally and financially, reliance on family for help, and deferring to family for how one should think or behave (Llanque & Enriquez, 2012). Consequently, not assuming responsibility for the caregiver role may bring shame upon individuals and their families. Thus, stronger adherence to cultural values such as familismo may help caregivers assume the caregiver role with less reluctance or distress/depression (Coon et al., 2004).

Many times, differences in adherence to within-group cultural values are reflected broadly in the concept of acculturation. Acculturation refers to the process of change in one group’s beliefs, values, and behaviors as a result of continuous contact with the host or American culture (Aranda & Knight, 1997). It is a dynamic and complex construct, but it has important consequences for health and mental health outcomes. Acculturation level influences caregiving appraisals and coping strategies for Latino populations, which may influence caregiving and intervention outcomes (Knight & Sayegh, 2010; Lara, Gamboa, Kahramanian, Morales, & Bautista, 2005). Several studies have examined the relationship between acculturation and psychosocial outcomes (e.g., depressive symptoms, burden) in Latino caregivers. Some have found that older Mexican American caregivers who were more acculturated had a greater risk of depressive symptoms (Hahn, Kim, & Chiriboga, 2011). Meyer and colleagues (2014) found that acculturation (as measured by language of interview) was positively related to depressive symptoms in older caregivers, but this relationship was attenuated in younger caregivers. Polich and Gallagher-Thompson (1997) found Latina caregivers’ dissatisfaction with familial support (one of two measures of caregiver burden in the study) was significantly correlated with depression among more acculturated caregivers (Polich & Gallagher-Thompson, 1997). More acculturated Latinas

also appeared to use less positive religious coping to cope with their caregiving situations compared to their less acculturated counterparts (Mausbach et al., 2003). All of these studies' findings emphasize the importance of within-group heterogeneity (as measured by acculturation level) in Latino caregiver outcomes.

Although there has been some research on how acculturation might impact caregiver outcomes, very few studies have examined how acculturation might influence interventions meant to reduce caregiver stress. A better understanding of within-group differences among Latino caregivers, especially with respect to acculturation, could lead to better tailoring of interventions and an understanding of the types of adaptations that are necessary to achieve comparable outcomes within diverse cultural groups (Llanque & Enriquez, 2012). In the present study using data from the Resources for Enhancing Alzheimer's Caregiver Health (REACH) II trial (Schulz et al., 2003), we assessed the influence of acculturation level on caregiver baseline stress and examined whether acculturation level moderated the effectiveness of the REACH II intervention. We hypothesized the following:

- H1** More acculturated individuals will report more caregiving stress (bother, depression, burden) on average at baseline than less-acculturated caregivers (main effect).
- H2** More acculturated individuals will benefit more from the REACH 2 intervention than those who are less acculturated (interaction effect).

## Methods

Data from our study were obtained from the online database of the REACH study. REACH was a 2-phase multi-site clinical trial study that investigated effects of multiple interventions on caregivers in the U.S., beginning in 1995. The first phase, REACH I, aimed at finding the most effective measures of reducing caregivers' burden and depression among the interventions conducted in six sites in the U.S. Our study is based on the second phase, REACH II, conducted between 2002 and 2004 and guided by the results of REACH I. Interventions performed in REACH II involved active techniques which were suggested by REACH I to be superior to control in reducing burden and depression of caregivers.

## Participants

Participants in REACH II were caregivers whose care recipients suffered from dementia and were recruited from five sites in the U.S. (Birmingham, AL; Memphis, TN; Miami, FL; Palo Alto, CA; and Philadelphia, PA). Participants were recruited from multiple community organizations, with special attention paid to the recruitment of minority caregivers. Caregivers were included if they were at least 21 years old, living with or sharing cooking facilities with the care recipient, providing an average of 4 or more hours of care per day to a care recipient with at least two functional impairments of instrumental activities of daily living (IADLs) or one activity of daily living (ADL) impairment (Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963; Lawton & Brody, 1969), providing care for at least the last 6 months, and reporting at least two symptoms of distress associated with caregiving (Belle et al., 2006). The care recipient had to have a diagnosis of Alzheimer's disease or a related dementia or a Mini-Mental State Examination (MMSE; Folstein, Folstein, & McHugh,

1975) score of 23 or lower; however, bed-bound care recipients with a score of zero on the MMSE were excluded. A total of 642 caregivers and their care recipients were recruited in REACH 2. Caregivers eligible for the study were age 21 years or older who self-reported as Hispanic or Latino, white or Caucasian, or black or African American (henceforth referred to as Latino, White, or Black). Further details regarding inclusion/exclusion criteria of caregivers and care recipients can be found elsewhere (Belle et al., 2006). For the purposes of this study, only Latino caregivers who completed six-month follow up with available information on outcomes of interest were included in the analysis, which resulted in a sample size of 211.

Among the 211 Latino participants, 174 (82.5%) were female, 144 (68.2%) had a high school diploma or equivalent, and 134 (63.5%) were married. The majority of this Latino sample (80.6%) were born in non-U.S. countries, with the highest percentages coming from Cuba (34.1%) and Mexico (14.2%).<sup>1</sup> Ages ranged from 23–85 years old at baseline (mean = 58.73,  $SD = 13.92$ ). A total of 51 caregivers (24.2%) were lost to follow-up at six months, due to death of the caregivers or care recipients, institutionalization of the care recipients, and other reasons. There were no significant differences between participants lost to follow-up at six months and those who participated through the entire follow up in age ( $t_{df=79} = -0.22, p = 0.82$ ), years lived in the U.S. (i.e., acculturation level) ( $t_{df=85} = 1.78, p = 0.08$ ), gender ( $\chi^2_{df=1} = 0.06, p = 0.81$ ), country of birth (U.S. versus Other) ( $\chi^2_{df=1} = 1.11, p = 0.29$ ), education ( $t_{df=90} = -0.38, p = 0.71$ ), or marital status (married and not-currently-married) ( $\chi^2_{df=1} = 1.92, p = 0.09$ ).

## Procedures

Qualified caregivers and care recipients were randomly assigned to the intervention ( $n = 106$ ) or control group ( $n = 105$ ) and were followed up at six months. The intervention started after the randomization process and was performed over six months via 9 in-home sessions, 3 telephone sessions, and 5 structured telephone support group sessions. Intervention strategies included provision of information, didactic instruction, role-playing, problem solving, skills training, stress management techniques, and telephone support groups. These strategies were delivered by certified interventionists in English or Spanish to participating caregivers through education, providing skills to manage troublesome care recipient behaviors, social support, cognitive strategies for reframing negative emotional response, and strategies enhancing healthy behaviors and managing stress (Belle et al., 2006). In the control group, participants were mailed a package of educational materials related to dementia and Alzheimer's disease. Two brief, "check-in" phone-calls were provided to the control group at three- and five-months post-randomization.

## Measures

All outcomes described below were measured at baseline of the study and at six-month follow-up.

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<sup>1</sup>Site was another variable in REACH 2, but given that it was highly correlated with country of birth (e.g., the majority of Latinos in California were from Mexico, the majority in Florida were from Cuba), we believe that country of birth as a variable would be more informative than site.

**Burden**—Caregiver burden was measured using the shortened version of the Zarit Caregiver Burden Interview (Bedard et al., 2001; Zarit, Reever, & Bach-Peterson, 1980) with 12 items that measured caregivers' responses to questions regarding physical and emotional strain on a 5-point scale ranging from 0 (never) to 4 (nearly always). Higher scores indicated greater burden for the caregiver. The average score over all items was used as the final measure of burden (coefficient  $\alpha = 0.86$ ).

**Depression**—Depressive symptoms were assessed via a shortened 10-item version of the Center for Epidemiologic Studies-Depression Scale (CES-D-10) (Zhang et al., 2012). A total summed score was used with items ranging from 0 (rarely or never) to 3 (most or all of the time) that reflected the frequency of respondents' depressive feelings. Total scores ranged from 0 to 30, with higher values indicating greater presence of depressive symptoms (coefficient  $\alpha = 0.85$ ).

**Bother**—Caregiver bother was assessed via two measures: the Revised Memory and Behavior Problems Checklist (RMBPC: (Roth et al., 2003; Teri et al., 1992) and the Caregiver Assessment of Function and Upset (CAFU: (Gitlin et al., 2005). The RMBPC is a 25-item questionnaire that assesses the presence of 24 problem behaviors that the care recipient may have exhibited in the past week (e.g., trouble remembering recent events, asking the same question over and over). Scores on the RMBPC reflect (1) frequency of behavior problems and (2) reactions to or appraisals of the problematic behavior. Frequency was assessed on a scale from 0–3 (0 = Not in the past week, 1 = 1–2 times in the past week, 2 = 3–6 times in the past week, and 3 = daily or more often); coefficient  $\alpha = 0.74$ . Appraisal was assessed by asking caregivers how “upsetting” the behavior was on a scale from 0–4 (0 = Not at all, 1 = a little, 2 = moderately, 3 = very much, and 4 = extremely); coefficient  $\alpha = 0.93$ . Scores on this measure of bother consisted of dividing the appraisal score by the frequency score, with final values ranging from 0 to 3.

The CAFU measures dependence in dementia patients and caregiver reaction through asking the caregiver 15 questions related to the amount of daily caring or assistance with activities of daily living (ADLs) needed by the care recipient (Katz et al., 1963; Lawton & Brody, 1969). For those activities where the care recipient needed supervision or more help, further questions were asked about the extent of upset or bother the caregiver felt as a result. Responses were recorded using a 5-point Likert-type scale ranging from (0 = not at all to 4 = extremely). Higher scores indicated more upset on the part of the caregiver. The CAFU bother score was a result of dividing the average upset score by the frequency score, with final values ranging from 0 to 3.27 (coefficient  $\alpha = 0.90$ ).

**Predictors**—Similar to previous studies of Latino dementia caregivers (Harwood et al., 2000), length of time in the U.S. (continuous) was a proxy for acculturation level. Time was coded as 0 (pre-treatment) or 1 (post-treatment) and intervention group (control = 0, treatment = 1) to which each participant was assigned were also included as predictors.

**Covariates**—We used demographic data measured at baseline and controlled for age, gender, years of education, marital status and country of birth (U.S.-born versus non U.S.-born). Marital status was a dichotomous variable: married or living as married versus never



married, widowed, not currently married, or divorced. Age and acculturation were not strongly correlated ( $r = 0.38$ ), but to minimize collinearity, age was grouped into the following categories: younger than 46 years old, 46 – 60 years old, 61–69 years old, and older than 69 years old.

## Data Analysis

Baseline demographics and outcome variables were compared between study arms using *t*-tests for continuous variables and chi-square tests for categorical variables (see Table 1) and unadjusted linear associations among baseline variables were estimated using Pearson correlation. Linear mixed models (LMM: Fitzmaurice et al., 2004) for longitudinal data were estimated using R Version 3.1.2 and R Studio Version 0.99.484 (R Development Core Team, 2014) to assess the main and intervention-modifying effects of acculturation level on the outcome measures of burden, depression, and bother. For each outcome, we built a LMM that included time, acculturation (centered at the mean, 33 years), intervention group, and all of the two-way and three-way interactions among time, intervention, and acculturation, adjusting for covariates mentioned above.

## Results

### Characteristics of the Sample

Table 1 summarizes and compares baseline demographic and outcome data by study arm. Control and intervention participants were similar across all variables, except that intervention participants were more educated than controls. Table 2 displays bivariate correlations for all study measures for individuals at baseline. Acculturation was significantly and positively correlated with age, education, and both measures of bother (RMBPC and CAFU). All of the outcomes measures – burden, bother, and depression were significantly and positively correlated with one another, with correlations ranging from 0.33 to 0.56.

### Main effect of acculturation on baseline caregiver stress

In adjusted LMMs that simultaneously tested the main and moderating effect of acculturation, no significant effect of acculturation was found for caregiver burden, bother, or depression (Table 3). However, acculturation was marginally associated with greater bother (CAFU:  $p = 0.068$ ; RMBPC:  $p = 0.051$ ). Specifically, for every one-year increase in acculturation (i.e., length of time in the U.S.), CAFU and RMBPC bother scores increased by 0.01 ( $SE = 0.005$ ) and 0.006 ( $SE = 0.003$ ), respectively, for the average caregiver in the control group, adjusting for demographic covariates.

### Moderating effect of acculturation on treatment outcomes

There was a significant three-way interaction between time, treatment, and acculturation for caregiver burden. That is, the estimated adjusted linear change in mean burden change scores was different in the control group than in the intervention group (see Figure 1). For someone with the average acculturation level (i.e., length of time in the U.S. is 33 years), there were no differences between the intervention and control group in burden change scores. However, at the lowest level of acculturation, the intervention vs. control group



difference in differences was positive; in other words, intervention participants had higher burden change scores (on average) than control participants. In contrast, for people with the highest level of acculturation, the difference in differences was positive, suggesting that those participants benefited more from the intervention, compared to their counterparts in the control arm.

## Discussion

We hypothesized that acculturation would be associated with greater caregiver burden, bother, and depression (H1), and that those who were most acculturated would benefit the most from the intervention (H2), as indicated by less burden, bother, and depression. Our hypotheses were only partially supported in the present study. While we found no main effect of acculturation on caregiver burden and depression (H1), we did find a marginally significant effect of acculturation on caregiver bother, and that acculturation was associated with differences in the effect of the intervention on changes in burden scores (H2). The most acculturated individuals in the study benefited more from the intervention in terms of reduced burden, while those who were the least acculturated reported increased burden. Acculturation did not moderate the intervention's effects on caregiver bother or depression. The different nature of the outcomes may explain this pattern of results. The REACH 2 intervention, despite having been culturally adapted for Latino populations, was nonetheless created in the U.S. and conformed to U.S. norms. As such, the intervention might have inadvertently been more tailored to those who were more acculturated. In contrast, it is possible that after participating in an intervention focused on managing stress associated with caregiving, less acculturated participants may have taken away the overarching message that caregiving is in fact stressful and burdensome. Thus, the findings, while somewhat paradoxical with regard to our stated hypotheses, nonetheless support our overarching argument: understanding acculturation and culture more broadly is crucial for developing appropriate interventions (Kagawa Singer et al.). Findings also suggest that perhaps more tailoring of interventions like REACH 2 should be done, especially in regards to decreasing burden so that despite acculturation level, the intervention is effective.

We found a marginally significant main effect of acculturation level: caregivers who had lived in the U.S. longer tended to report feeling upset or bothered at having to help the care recipient with activities of daily living and at the care recipient's behavioral problems (e.g., repeating the same question). This may be because, as other researchers have suggested, those who are more acculturated may have lower filial obligation beliefs, and thus feel more bothered at responding to caregivers' needs (Hahn et al., 2011). Surprisingly, acculturation was not related to caregiver depression or burden. Results from a study of Hispanic dementia caregivers in New York City also found that acculturation was not associated with caregiver burden or depression (Luchsinger et al., 2015). Additionally, Harwood and colleagues (2000) did not identify any relation between acculturation (as measured by length of stay in the United States) and the role of positive or negative appraisals of the caregiving experience (Harwood et al., 2000). A study by Coon et al. (2004) using REACH I data did not find differences in depressive and anxious symptoms among differentially acculturated Latina caregivers. These results may be explained by the finding that less acculturated Latinas

tended to report more positive aspects derived from caregiving that may help counterbalance caregiving stressors and acculturative stress (Coon et al., 2004).

One can speculate regarding reconciling the effect of acculturation on caregiver bother but not burden and depression. Caregiver bother appears to have more to do with the tangible and observable behaviors of care recipients that are then judged to be upsetting or bothersome to the caregiver. For example, the CAFU asks about the activities of daily living that require help from the caregiver, and how upsetting it is for the caregiver to provide these tangible supports. For those who are more independent or who have less familial obligation, as indicated by higher acculturation, providing this tangible support may be bothersome and upsetting. Caregiver burden on the other hand, has more to do with a global or overall feeling of strain or burden – more psychological or emotional in nature (i.e., “Do you feel angry when you are around your relative;” “Do you feel that you have lost control of your life since your relative’s illness?”). The original Zarit Burden Interview (ZBI: Zarit, Orr, & Zarit, 1985) was characterized by a two-factor solution that incorporated items relevant to role strain and personal strain. Thus, the measure of burden in this study was more relevant to activities and areas outside the immediate caregiving situation (e.g., “Do you feel stressed between caring for your relative and trying to meet other responsibilities (work/family)?” Similarly, the CES-D measures a psychological construct – and perhaps psychological and emotional health as a result of caregiving is not impacted differentially by acculturation.

The findings should be considered within the limitations of the study. First, although length of time in the U.S. has often served as a proxy of acculturation level, the results of this study would be further strengthened by the inclusion of well-validated measures of acculturation. Although it is commonly used and accepted, years in the U.S. as a proxy is relatively crude and, especially for an older population that largely came to the U.S. as adults, may not fully reflect changes in attitudes and beliefs that happen over the life course.<sup>2</sup> Although REACH I included a well-validated measure of acculturation, REACH II did not. It may be that different acculturation measures have varying effects on psychosocial outcomes (Black, Markides, & Miller, 1998). However, Miranda and colleagues demonstrated that the three acculturation proxies used in their study (language proficiency, length of time in the U.S., place of residence during formative years) all acted similarly in relation to the health outcomes studied (Miranda, Gonzalez, & Tarraf, 2011). The authors suggested that while the proxy acculturation measures may differ, they were reasonably comparable. Nevertheless, there are several well-validated acculturation measures that future research should utilize in addition to length of time in the U.S, such as language. Although the intervention was available in English and Spanish, we were unable to access that data for the current study. Another limitation of the current study was that the reduced burden effect was only present for those who were very high and very low acculturated (see Figure 1), limiting the number of individuals that the effect was present was applicable for. Latinos came from only three sites in REACH II; although these sites represent the largest and most well-established U.S. Latino populations (U.S. Census, 2015), study findings may not be generalizable to individuals in other parts of the country. Additionally, we were unable to include site in our

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<sup>2</sup>In addition to the acculturation proxy reported in this manuscript (years in the U.S.), we also tested age of arrival in the U.S. as a proxy of acculturation (arrived in the U.S. before or at the age of 12 years old versus after 12 years old); similar results emerged.

analyses because it was confounded with country of birth (e.g., all Mexicans came from the Palo Alto site). Lastly, although it would have been valuable to examine subgroup differences (e.g., Mexican, Cuban) and acculturation, small sample sizes prevented us from conducting these analyses. These limitations reflect the difficulty of conducting research with aging Latino populations, currently small in number but rapidly growing (Ortman, Velkoff, & Hogan, 2014).

A strength of the current study is that it uses data from REACH II, the only multisite, randomized controlled trial of caregiver interventions in the U.S funded by the National Institutes of Health. Latinos are the fastest growing ethnic group in the U.S. and a population at risk for significant socioeconomic and health disparities (Dominguez et al., 2015). REACH II is a multicomponent psychosocial and behavioral training intervention for caregivers of patients with Alzheimer's disease or dementia. Thus, it allows for a rigorous study of the influence of within-group diversity on caregiving outcomes and contributes to our understanding of the influence of acculturation differences in psychosocial outcomes for dementia caregivers.

### Implications

The diversity of Latinos, with their extensive variation in origins, generational status, languages, and acculturation level, must be taken into account in designing interventions, health care services, and creating policy to address the needs of those individuals and families affected by dementia (Gurland et al., 1999). As indicated in the current study, although bilingual and bicultural adaptations are necessary, very low acculturated caregivers may benefit from further cultural adaptations. Interventions that take into account acculturation level may be more effective by providing researchers and clinicians with an idea of what core values are important in reducing caregiver distress and burden. Awareness of acculturation level might also provide some information about family relationships and dynamics, thus providing researchers with a better idea of how to approach the family in regards to the intervention. This will help engage caregivers and their family members in interventions and address potential barriers to intervention participation.

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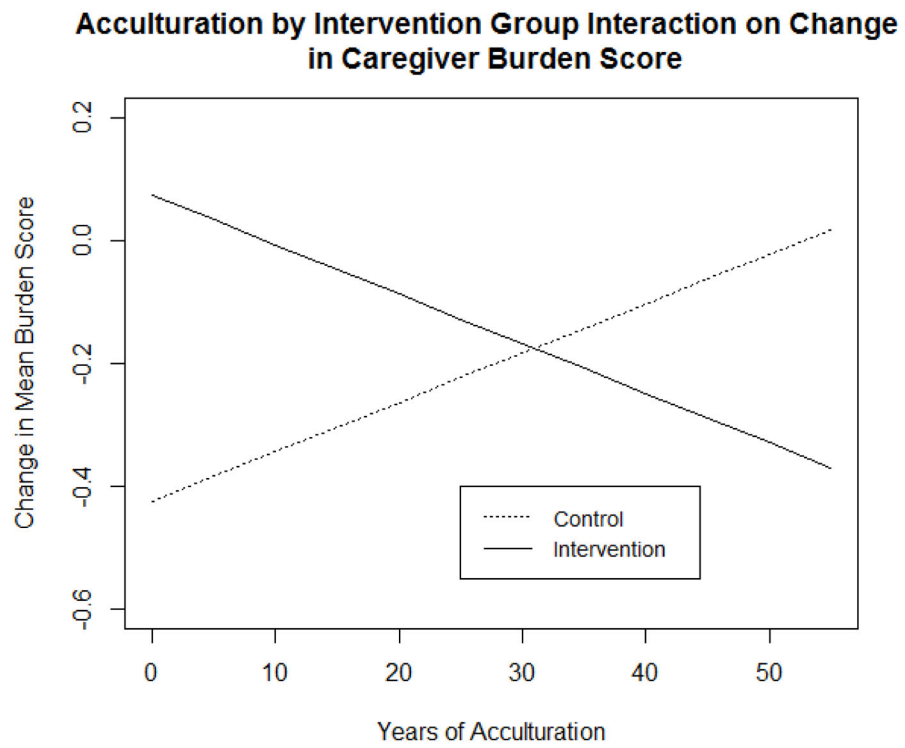
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**Figure 1.**

Interaction plot between time, acculturation and treatment for caregiver burden adjusting for covariates. Change in mean burden score was computed as 6-month follow-up – baseline for intervention group ( $B = -0.008$ ,  $SE: 0.00496$ ) and control group ( $B = 0.008$ ,  $SE: 0.00541$ )



**Table 1**

Summary Statistics of Demographic Variables and Outcomes by Treatment Arm at Baseline.

Variable	Mean $\pm$ SD	
	Intervention	Control
Age	58.80 $\pm$ 14.16	58.66 $\pm$ 13.73
Gender <i>n</i> (%)		
Female	85 (80.19)	89 (84.76)
Years of education	11.42 $\pm$ 4.13	10.30 $\pm$ 3.96
Marital status <i>n</i> (%)		
Married	65 (61.32)	69 (65.71)
Not currently married	41 (38.68)	36 (34.29)
Country of birth <i>n</i> (%)		
U.S.	18 (16.98)	23 (21.90)
Other	88 (83.02)	82 (78.10)
Years lived in U.S.	31.96 $\pm$ 14.80	32.36 $\pm$ 14.59
Bother (CAFU)	0.53 $\pm$ 0.75	0.57 $\pm$ 0.75
Bother (RMBPC)	0.574 $\pm$ 0.41	0.60 $\pm$ 0.47
Burden	1.55 $\pm$ 0.88	1.56 $\pm$ 0.91
Depression	10.37 $\pm$ 6.95	10.44 $\pm$ 7.19

Ranges of variables: years lived in U.S.: (1 – 68); age: (23 – 85); burden: (0 – 4.00); CAFU: (0 – 3.27); RMBPC: (0 – 3.00); depression: (0 – 30).

Table 2

Bivariate Correlations Among Study Variables.

Variable	Age	Education	Acculturation	Burden	RMBPC	CAFU
Age						
Education	-0.204**					
Acculturation	0.338***	0.108**				
Burden	-0.056	0.208**	0.077			
Bother (RMBPC)	-0.048	0.202**	0.169*	0.526***		
Bother (CAFU)	-0.080	0.222	0.105**	0.414**	0.491***	
Depression	0.181**	0.064	0.016	0.558***	0.382***	0.331***

\*  $p < 0.05$ ;\*\*  $p < 0.01$ ;\*\*\*  $p < 0.001$ .

**Table 3**

Parameter estimates based on mixed models with interactions between treatment and acculturation for burden, bother, and depression.

Variable	Burden		Bother (CAFU)		Bother (RMBPC)		Depression	
	Estimates	SE	Estimates	SE	Estimates	SE	Estimates	SE
(Intercept)	1.269 <sup>***</sup>	0.277	0.602 <sup>**</sup>	0.215	0.664 <sup>***</sup>	0.133	7.484 <sup>**</sup>	2.160
Time	<b>-0.159<sup>*</sup></b>	0.077	-0.057	0.074	<b>-0.083<sup>*</sup></b>	0.039	<b>-1.091<sup>†</sup></b>	0.587
Age 46-60	-0.153	0.170	-0.12	0.129	-0.086	0.081	-0.015	1.333
Age 61-69	<b>-0.341<sup>†</sup></b>	0.197	-0.263	0.149	-0.123	0.094	0.935	1.544
Age ≥70	-0.139	0.204	-0.032	0.155	-0.046	0.098	<b>4.415<sup>**</sup></b>	1.600
Education (in years)	<b>0.039<sup>**</sup></b>	0.015	<b>0.022<sup>†</sup></b>	0.011	0.014	0.007	0.149	0.116
Female	0.027	0.091	0.042	0.084	0.002	0.046	0.346	0.699
Married	<b>-0.248<sup>*</sup></b>	0.121	-0.165	0.092	<b>-0.178<sup>**</sup></b>	0.058	<b>-1.862<sup>†</sup></b>	0.952
Acculturation	0.009	0.007	<b>0.01<sup>†</sup></b>	0.005	<b>0.006<sup>†</sup></b>	0.003	0.013	0.054
Intervention	-0.062	0.122	-0.068	0.096	-0.079	0.059	-0.332	0.955
Born in the US	0.254	0.188	-0.09	0.143	-0.025	0.09	1.371	1.474
Acculturation by time	0.008	0.005	0.002	0.005	0.001	0.003	0.057	0.042
Acculturation × Intervention <sup>1</sup>	0.000	0.008	-0.009	0.007	-0.002	0.004	-0.021	0.065
Intervention × Time	-0.033	0.108	-0.111	0.105	0.035	0.055	-0.849	0.822
Intervention × Acculturation × Time <sup>2</sup>	<b>-0.016<sup>*</sup></b>	0.007	-0.001	0.004	-0.002	0.004	-0.004	0.056

Note.

<sup>1</sup>. Regression coefficient associated with acculturation effect at baseline.

<sup>2</sup>. Regression coefficient associated with moderating effect of acculturation on treatment.

\*  $p < 0.05$ ;

\*\*  $p < 0.01$ ;

\*\*\*  $p < 0.001$ ;

<sup>†</sup>  $p < 0.10$ .

Acculturation is reported as number of years in the U.S. and centered at 33. Random intercepts were specified for participants.