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Correlates of care relationship mutuality among Alzheimer's and Parkinson's disease carers

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Abstract

Aim—This paper presents findings from secondary analysis of longitudinal data on correlates of care relationship mutuality collected from 91 Alzheimer's disease and Parkinson's disease carers in the control group of a randomized trial of home care skill training.

Background—Many family members and other informal carers are reported to suffer multiple adverse social, financial, psychological, and physical caregiving outcomes. High levels of mutuality: the perception that the quality of the care relationship is positive, reportedly ameliorate these negative outcomes.

Method—Multilevel models for change were used to explore whether care recipient functional ability, carer gender, depressive symptoms, kin relation to care recipient (spouse, non-spouse), and years of caregiving experience were related to carers' perceptions of care relationship mutuality over a 12 month period.

Results—Carers who reported lower mutuality: 1) were caring for care recipients with lower functional ability 2) had less caregiving experience, and 3) had more depressive symptoms.

Conclusion—Informal carers who perceive little mutuality in their relationship with the care recipient may be more likely to terminate care early. Clinicians and researchers should explore the quality of the caregiving relationship as a critical factor in carer and care recipient outcomes. Home care skill training may need to include relationship-building skills to offset adverse carer outcomes.

Keywords

Alzheimer's disease; Carer; Mutuality; Parkinson's disease

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Conflict of Interest

No conflict of interest has been declared by the author(s).

Author contributions

BS, LLD and LRL were responsible for study conception, making critical revisions to the paper and approving the final version for submission. BS drafted the manuscript and performed the secondary data analysis under the supervision of LRL.

Introduction

Mutuality, the perceived quality of a carer - care recipient relationship, is reported to ameliorate the stress of informal caregiving and motivate family members and other informal carers to continue providing home care (Archbold *et al.* 1990, Kesselring *et al.* 2001). However, few published studies describe factors affecting carer mutuality over time. Alzheimer's and Parkinson's disease, two common progressive neurodegenerative diseases, result in non-reversible physical and cognitive loss and increased functional dependencies (Nussbaum & Ellis 2003) which may have a negative influence on carer mutuality. This paper describes factors correlated with Alzheimer's and Parkinson's disease carers' perceptions of care relationship mutuality over a 12-month period.

Background

Alzheimer's disease and Parkinson's disease Caregiving

Alzheimer's disease (AD), a type of dementia, involves loss or decline in memory and other cognitive abilities, as well as physical abilities over time (Alzheimer's association (AA) 2010). Parkinson's disease (PD) is a group of motor system disorders, involving tremor, rigidity, bradykinesia and postural instability due to a loss of dopamine producing brain cells (National Institute of Neurological Disorders and Stroke 2008). Twenty four to 31% of those with PD also have dementia in the later stages of the disease (Aarsland *et al.* 2005). In 2010, AD was the 7th leading cause of death in the United States (US) and there were more than 5 million people over 65 years old with the disease (AA 2010). More than 1.5 million were reported to have PD in the US (National Institute of Neurological Disorders and Stroke 2008). The worldwide prevalence of AD was 26.6 million in 2006 (Brookmeyer *et al.* 2007), but not well documented for PD. The National Parkinson Foundation (2010) estimates approximately 4 to 6 million people with PD across the world. Both being age-related diseases, the incidence of both diseases, is anticipated to further increase with the aging population.

Most individuals around the world with chronic degenerative disease are still cared for in the home by informal carers such as family, friends or neighbors who experience multiple difficulties (cf. AA 2010, Lee *et al.* 2007, O'Rourke & Tuokko 2003). Long term chronic illness caregiving in progressive diseases such as Alzheimer's and Parkinson's disease has been correlated with a number of negative physical, psychological, emotional, social or financial problems for families and other informal carers (Gainey & Payne 2006, George & Gwyther 1986). Studies from different countries document higher burden among AD and PD carers when compared to other chronic disease groups (Acton 2002, O'Reilly *et al.* 1996.). Dementia carers have been reported to have more depressive symptoms (Pinquart & Sorensen 2004), and higher morbidity and mortality than non-dementia carers (Shultz & Beach 1999). Both AD and PD carers are reported to involve similar length of time providing care, similar levels of distress and both more depressed than carers of other diseases (Dura *et al.* 1990).

Mutuality

Mutuality is concerned with the degree of caring, affection, intimacy, mutual concern and overall relationship satisfaction experienced by those involved (Steadman *et al.* 2007). Caregiving has a high interpersonal stress component, so the manner of interaction and use of interpersonal relationship strategies that build and sustain mutuality are suggested to be very important (Kramer 1993a). Kramer describes positive carer relationship strategies as negotiation, compromise, considering the other person's limitations, empathy, and compassion. Negative relationship strategies involve criticizing, ignoring, confronting, or minimizing communication.

A sense of positive mutuality reportedly ameliorates the negative effects of caregiving (Archbold *et al.* 1990). In the existence of cognitive decline, mutuality has been noted to be the ability of the carer to find gratification from the relationship by perceiving the demented family member to reciprocate by virtue of their existence (Hirschfeld 1983). For instance, high mutuality before dementia onset was found to be related to less carer depression (Kramer 1993b), less potentially abusive behaviors towards the care recipient (Williamson *et al.* 2001), significantly less stress, less reactivity to problem behaviors, better problem solving skills and more effective communication skills with care recipient (Steadman *et al.* 2007). In PD as well, increased mutuality was associated with less PD severity, less carer burden and less depression of both the spouse and PD care recipient (Tanji *et al.* 2008). Previous studies suggest that both care recipient and carer factors influence carer mutuality and thus impact carer outcomes.

Care Recipient Factors that influence Mutuality

Care recipient factors reported to influence mutuality are the care recipient's level of cognitive or physical functional ability. Cognitive impairment has been reported to negatively impact carer mutuality in several studies (Lawrence *et al.* 1998, Williamson *et al.* 2001). This may be due to the loss of shared common memories and interactions or changes in personality and troubling problem behaviors such as paranoia and delusional ideation, hallucinations, aggressiveness, affective disorders, and wandering associated with AD (AA, 2010). Increasing cognitive impairment associated with AD also makes it more difficult to maintain high levels of mutuality as the disease progresses. While the correlation of cognitive loss on carer mutuality has received little attention, the reported 6–10% loss of cognitive function in AD each year (Doraiswamy & Kaiser 2000) justifies exploring this linkage.

In PD, mutuality has been reported to decline as the disease progresses and begins to involve both sides of the body i.e. a score of 2 or higher on the 5-point Hoehn and Yahr PD screening measure (Carter *et al.*, 1998). Mutuality has also been reported to decline over time in carers of the frail elderly (Lyons *et al.* 2007) and post bypass surgery adults (Kneeshaw *et al.* 1999). In frail older adults, physical disability has also been reported to have significant negative effects on carer mutuality (Lyons *et al.* 2007). These researchers found that worsening care recipient health was related to declines in carers' perceptions of mutuality over a 20 month period.

Carer Factors that influence Mutuality

Perceived relationship mutuality reportedly differs between men and women. In a study comparing AD and PD spousal carers, only AD female carers showed worse mental health outcomes, possibly due to loss of reciprocity and mutuality compared to males (Hooker *et al.* 2000). There were no differences between PD wives and husbands. On the other hand, among 118 caregiving couples, Wallsten (2000) found husband carers to consistently report higher mutuality towards their wives although wives had more social support from others around caregiving. Although literature identifies differences among carer characteristics by age and race (Connell & Gibson, 1997), mutuality has not yet been revealed to differ by these factors. Because the association of these factors to mutuality is unknown they were included in initial analyses.

The carer-care recipient kin relationship influences mutuality as well. Husband-wife, child-parent, friend-friend dyads are reported to result in different expectations from the care recipient and different interactions with the care recipient, thus resulting in different care situations and interactions (Raschick & Ingersoll-Dayton 2004, Gerdner *et al.* 2007). Spouses may report different levels of mutuality than non-spouse carers. Published reports

indicate spouses experience greater emotional, physical and financial stress from caregiving than adult children (George & Gwyther, 1986), which may have a more negative impact on mutuality.

Various investigators have reported lower mutuality predicts higher number of depressive symptoms for carers (Lawrence *et al.* 1998, Williamson *et al.* 2001). Depressive symptoms can lead to deterioration in couples' interpersonal behavior and interactions (Williamson *et al.*, 2001). Lyons and colleagues (2007) reported that not only was higher mean depression related to lower mean mutuality, but increasing depressive symptoms predicted declining mutuality. Although the temporal sequence of depressive affect and relationship mutuality is unclear, that is, whether depressive symptoms results in lowered mutuality or lower mutuality causes an increase in depressive symptoms, the two have been closely related for informal carers.

Project ASSIST (The Parent study)

Data for this secondary analysis were from Project ASSIST (*Assistance, Support and Self-health Initiated through Skill Training*), a 5-year, prospective, longitudinal, 2-group randomized trial (NR RO1 008285) designed to increase caregiving preparedness, reduce depressive symptoms and care burden for informal carers of older adults with Alzheimer's or Parkinson's disease.

ASSIST participants were recruited from memory clinics, general geriatric clinics, private medical practices and home care agencies and support groups in two regions of the United States.. After informed consent was obtained, baseline data was collected and carers were randomly assigned to either the intervention group (ASSIST training) or the control (social call) group. The intervention group received intensive skills training and information, while the control group received 3 monthly short social phone calls to talk about neutral or casual topics. Participants of the control group were given the option to receive the intervention, after the 1 year study period. Key carer and care recipient measures were repeated during home visits at 6 and 12 months after baseline in both groups.

The Study

Aim

The aim of the secondary analysis was to explore whether selected carer or care recipient factors that are related to change in mutuality over time. This information can provide researchers with information on the critical time points and factors of change in carer mutuality. Specifically, we examined whether mutuality differed by care recipient factors (level of physical and cognitive ability) or carer factors (age, gender, race, kin relation to care recipient, depressive symptoms, years of caregiving).

Sample

A total of 187 dyads (102 AD and 85 PD dyads), of whom 80% were women, 79% White, and 71% were spousal carers, participated in Project ASSIST, the parent study. Project ASSIST's AD carers had been caregiving for a duration mean of 4.5 years, and the PD carers 8.8 years. One hundred and fifty two carers (81%) completed the 12-month participation protocol and final assessment. Among these carers, data on the 91 carer-care recipient dyads in the control (social call) group who completed the study were used for the current secondary analysis.

Instruments

The dependent variable of interest for this secondary analysis was carer mutuality and the independent variables were care recipient functional ability, carer age, gender, race, kin relation to care recipient, years of caregiving, and depressive symptoms. Variables that do not change over time were collected at baseline with a demographic questionnaire. Variables that change over time, such as carer mutuality, care recipient physical and cognitive dependence and level of depressive symptoms were collected by the following measures at all three time points.

Dependent Variable

Mutuality was measured by ‘The Mutuality Scale of the Family Care Inventory’ (Archbold *et al.* 1990). This tool includes 15 items. Sample items are “How close do you feel to him or her?”, “To what extent do the two of you see eye-to-eye?”, and are measured on a 5-point Likert scale from 0 “*not at all*” to 4 “*a great deal*”. The individual score is calculated by the mean across all item scores, ranging between 0 and 4. The tool has been shown to have good stability over time (Archbold *et al.* 1990) and internal consistency as reflected in Cronbach’s alphas at .90 to .95 in carer populations (Archbold *et al.* 1990, Carter *et al.* 1998, Kneeshaw *et al.* 1999). In the parent study, internal consistency for the mutuality scale at baseline was .93.

Independent Variables

Care Recipient Functional ability—The Lawton Instrumental Activities of Daily Living Scale (IADL) is often used to measure physical and cognitive dependence in dementia individuals. The IADL scale measures the care recipient’s level of cognitive, motor and decision making ability (Lawton & Brody, 1969). Research has reported IADL scores to be highly associated to physical ability (Judge *et al.* 1996) and cognitive impairment (Cromwell *et al.* 2003). Item scores range from 0 “*unable to do at all*” to 2 “*needs no help*”. Total scores range from 0 to 16, with lower scores indicating higher level of disability or dependence. Sample items include “using the telephone”, “taking medications” or “managing money”. The IADL scale is commonly used in carer studies in different countries with Cronbach’s alphas ranging from .85 to .93 (Gitlin *et al.* 2003, Izal *et al.* 2005) and also demonstrating good stability over time at .73 (Lawton 1988). In the parent study, internal consistency at baseline was .86.

Carer Depressive symptoms—The Center for Epidemiologic Studies Depression Scale (CES-D; Radloff 1977) measures depressive symptoms by 20 items on a 4-point Likert scale or 0 “*rarely or none of the time*” to 3 “*most or all of the time*”. Total scores range from 0 to 60 with higher scores indicating more depressive symptoms. The CES-D scale has been widely used in carer research and Cronbach’s alphas ranged from .85 to .89 (Beeson 2003). This scale also demonstrated good stability over time at .74 (Lewinsohn *et al.* 1997). In the parent study, internal consistency was .86 at baseline.

Ethical considerations

Human subjects’ procedures for Project ASSIST were reviewed and approved by University Institutional Review Boards (IRB) in the two states that data were collected. All consent procedures were conducted as approved, participant confidentiality was protected and data were kept secure.

Procedures

For the secondary analyses, data from the AD and PD control group dyads of project ASSIST, for baseline, 6 months, and 12 month assessments were stripped of identifiers and merged into one dataset.

Data Analysis

Pearson correlations were estimated for all carer and care recipient variables of interest to identify variables significantly related to mutuality. Multilevel (mixed) regression models were then used to estimate the relationships between potential predictors and mutuality at baseline and over time (Singer & Willett 2003). With a multilevel model for change, a level 1 model of each subject's individual growth trajectory on the repeated measures of the dependent variable is obtained. The level 2 model further describes how these trajectories differ across people by each independent variable of interest. Mixed models have the advantage of allowing for missing values, correlated error terms, and measurements taken at unequal intervals (Singer & Willett 2003). All models were estimated using SAS PROC MIXED (SAS, version 9.2; SAS Institute; Cary, NC).

Given the small number of cases (91) and the large number of potential predictors (17 including product terms), we decided to screen predictors using initial bivariate models to maintain at least 10 cases per predictor (Harrel et al, 1984), and avoid potential collinearity and overfitting of the sample data. Potential predictors entered into these bivariate models included gender, age, ethnicity, education, spouse/non-spouse relationship, logged years of caregiving, time-varying carer CESD, and time-varying care recipient IADL. Each bivariate model tested the main effect of a predictor and its interaction with time. Based on initial diagnostic tests for normality and linearity, years of caregiving was skewed toward fewer years, and the log value was used in the analyses. The final regression model took the form: $Y_{ij} = \mu_0 + \mu_1(\text{Logged years of caregiving}) + \mu_2(\text{CESD}) + \mu_3(\text{IADL}) + \mu_{10}(\text{time}) + \mu_{11}(\text{Logged years of caregiving} * \text{time}) + \mu_{0i} + \mu_{1i}(\text{time}) + \mu_{ij}$. For the final model, variance inflation factor (VIF) scores for all variables were below 10, with the highest value being 2.695. (High VIF scores indicate high multicollinearity and instability of coefficients).

Analyses included an analysis of 'missingness' to ensure that missing data were missing at random. The analysis of missingness assessed for a relationship between independent variables of carers lost to attrition. Any measures in which missingness was a potential confounder were to be included in the final model as a covariate.

Results

Fifteen carers from the control group (16%) dropped out by T3. They did not significantly differ from those who remained in carer gender, race, education, depressive symptoms, years of caregiving, kin relation to care recipient or care recipient functional ability. They did however have a trend ($p=0.09$) of being younger in age.

The characteristics of the 91 carers in the control group and their care recipients are shown in Table 1. Approximately half of the participants were caring for those with Alzheimer's disease, and the other half Parkinson's disease. Additional mixed models revealed there were no significant changes over time in carer mutuality, depressive symptoms (CESD scores), or care recipient functional ability (IADL scores).

Pearson correlations for variables of interest at baseline were estimated for all 187 carers of the parent study to identify variables related to mutuality (Table 2). Mutuality was significantly related to care recipient functional ability, carer depressive symptoms, being female, and the length of caregiving. In order to determine which variables to include in the

final model, bivariate mixed models analyses were performed between each variable and mutuality.

Table 3 presents the results of bivariate and multivariate mixed models for the effects of each predictor on mutuality. Two types of coefficients are presented in column 1 for each bivariate predictor. The coefficients in the upper panel give its effect on baseline mutuality while the (coefficient by time) product terms in the lower panel indicate whether the effect of time (trajectory of change over time) varied across levels of that predictor. For example, logged years of caregiving was associated with an increased mutuality (.309**). However its interaction with time in the lower panel (-.002) was not significant, indicating that change in mutuality over time did not vary with logged years of caregiving. Carer depressive symptoms and care recipient functional ability also had significant effects on baseline mutuality, but not on change in mutuality over time. Given our limited sample size, only significant bivariate effects were included in the multivariate model (column 2), where the effects of each predictor are estimated controlling for one another. For time logged years of caregiving, including its (non-significant) interaction with time in our multivariate model enabled us to estimate its effect on baseline mutuality. For carer depressive symptoms (CESD) and care recipient functional ability (IADL), non-significant product terms were dropped in order to estimate their time-changing effects on mutuality, averaged over time. This differential handling of time-invariant and time-changing predictors is consistent with recommended practice (Singer & Willett 2003).

Results from the multivariate model show that logged years of caregiving was associated with a mean increase of .278 in mutuality at baseline. Higher average recipient IADL score was associated with higher mutuality (.026) at each time point, while higher average carer CESD score was associated with lower mutuality (-.010).

Discussion

Study limitations

Findings from this study should be interpreted within the context of study limitations. As in any secondary analysis, variables or measures that can be analysed are limited to those of parent study. Also, in order to prevent potential effects of the intervention on mutuality, the parent study intervention group was excluded from analysis. The control group received monthly social calls for the first three months after recruitment during the one year data collection period. This retention strategy was considered unlikely to affect carer mutuality.

A longer study period may have captured significant changes in mutuality. However even the 12-month follow-up period provides longitudinal data variables reported to influence mutuality. Future studies should include data collection with larger, samples over longer periods of time to provide a better understanding of factors that influence changes in mutuality among carers of degenerative diseases.

Discussion of Findings

Longitudinal studies provide information on trajectories of change over time on variables of interest, and enable a closer look into causal relationships between variables (Taris 2000). Using longitudinal analysis methods, we were able to investigate individual trajectories of mutuality over time, and then whether these trajectories differed based on care recipient functional ability, carer gender, kin relation to care recipient and years of caregiving. These analyses focused on factors reported to influence carers' perceived mutuality among these 91 AD and PD carers. Findings indicated factors related to lower mutuality for these carers were, lower functional ability in the care recipient, shorter length of caregiving, and higher levels of depressive symptoms for carers.

In this secondary analysis, mutuality did not significantly decline over time. This may be because one year was not sufficient enough to capture change, or care recipients did not experience significant degeneration during the 12 month period. Previous research show conflicting results. Using a retrospective method, PD spousal carers' mutuality declined in Stage 2 of the disease (Carter *et al.* 1998) and Kneeshaw and colleagues (1999) reported that mutuality declined over a 6 month period of time in carers of patients discharged from bypass surgery. However Lyons and colleagues (2007) found that carers of frail older adults' mutuality did not significantly decline over a 20 month period. More research with longer periods of data collection is needed to determine whether mutuality actually changes over time in degenerative diseases and why.

Study findings identified differences among carers by length of caregiving. Carers who had been caregiving for longer periods of time had significantly higher mutuality. The Alzheimer's Association (2010) reports that about one third of dementia carers care for more than 5 years. The present study shows that these carers had significantly higher mutuality than those with short lengths of caregiving, supporting earlier reports that high mutuality is an important motivator for continuation of care (Archbold *et al.* 1990, Caron & Bowers 2003). Another explanation may be that high mutuality lessens the likelihood that carers will institutionalize the care recipient (Kesselring *et al.* 2001). Caron and Bowers (2003) suggest the relationship between the carer and care recipient is a critical factor for the decision to continue care. Feelings of gratitude, love, trust or responsibility towards the care recipient may motivate carers to initiate and continue care. On the other hand, carers with lower mutuality may relinquish care earlier in the experience.

Carers of individuals with low functional ability perceived significantly lower mutuality towards their care recipient. These results are consistent with previous literature. Low functional ability indicates that the care recipients have more difficulty independently executing tasks that require normal cognitive and physical function. In both AD and PD, unpredictable, non-reversible decline in cognitive and physical ability occurs with disease progression. Individuals with AD have personality changes, or loss of memory and communication skills which may decrease the carers' perceived mutuality. Severe physical dependence has also been reported to decrease mutuality in frail older adults (Lyons *et al.* 2007).

Our findings are consistent with previous studies reporting a significant relationship between carers' depressive symptoms and mutuality (Lawrence *et al.* 1998, Williamson *et al.* 2001). While Lyons and colleagues (2007) reported more depressive symptoms increased declines in mutuality, we did not see these results in this analysis. This may be because the carers in the parent study were not highly depressed (mean CESD scores range from 12.5 to 14).

In summary, this study suggests that high carer mutuality increases the likelihood of carers to continue care. Longer length of caregiving was correlated with greater mutuality in this study. Furthermore, mutuality was negatively affected by low care recipient functional ability and more carer depressive symptoms. These study results have important research and clinical implications. Although we may not be able to change perceived mutuality itself, as suggested by Kramer (1993a) positive relationship strategies (negotiation, compromise, considering the other person's limitations, empathy, and compassion) can promote better health outcomes among carers of degenerative diseases. By providing accurate information and understanding about the disease progression, clinicians can enable the carer to set realistic expectations and be more empathetic towards their care recipient. On the other hand, negative relationship strategies such as confronting, criticizing, ignoring or minimizing can damage relationships further. Herbek and Yammarino (1990) found that empathy building and interaction improvement training on formal carers (nurses), was not

only effective in building empathy towards patients, but also seemed to improve the nurses' job satisfaction. Testing the efficacy of interventions where informal carers can be taught empathy-building skills and positive relationship focused coping strategies can provide carers with tools for a more positive caregiving experience. Also, mutuality essentially being a concept between at least two people, should probably be investigated in all parties involved. The mutuality scale from the parent study was developed to measure the carer's perception of the relationship quality with the care recipient. As relationship quality may be perceived differently by each party, future studies should also include the care recipient's perception of the relationship when possible.

Conclusions

Findings from these secondary analyses indicate that the carer's relationship mutuality is an important factor in long-term caregiving for an individual with a progressive chronic disease such as AD or PD. Given that carers' perception that the care relationship continues to have a positive quality, despite the functional losses of the care recipient and the increasing challenges of caregiving, there is strong support for developing and testing nursing interventions that promote or enhance care relationship quality. Not only can this potentially prevent premature institutionalization, but it also may enhance the caregiving experience for both carer and care recipient over time.

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SUMMARY STATEMENT

What is already known about this topic

- Many carers across the world suffer multiple physical, psychological, social and financial burdens around chronic caregiving in progressive, degenerative diseases such as Alzheimer's and Parkinson's disease.
- High levels of care relationship mutuality (care relationship quality) are reported to ameliorate caregiving burden and motivate carers to continue care.

What this paper adds

- Carers who report low mutuality are more likely to be caring for a care recipient with functional dependency.
- Carers who report high mutuality are less likely to be depressed and more likely to provide care for longer periods.

Implications for practice and/or policy

- Health professionals who work with chronically-ill individuals should explore the quality of caregiving relationships, especially those involving carers with limited caregiving experience, who are caring for a family member with significant cognitive or physical dependencies and who report more depressive symptoms.
- Relationship-focused skill training strategies may improve psychological outcomes for family and other informal carers.

Table 1

Carer and Care Recipient Characteristics (n=91)

Characteristics		Mean (SE)	Range	N (%)
Carer	Age	65 (12.3)	23–98	
	Years of caregiving	6.3 (6.2)	0 – 25	
	Race			
	White			74 (81)
	African American			15 (16)
	Other			2 (2)
	Female			73 (80)
	Kin Relation			
	Spouse			59 (65)
	Adult Child			24 (26)
Other			8 (9)	
Care Recipient	Alzheimer's Disease			49 (54)

Characteristics		Baseline	6 months	12 months
		Mean(SD)	Mean(SD)	Mean(SD)
Carer	Mutuality scores	2.61 (0.8)	2.61 (0.9)	2.51 (0.8)
	CESD scores	13.6 (10.0)	14 (10.3)	12.5 (9.5)
Care Recipient	IADL scores	4.2 (3.6)	4.4 (4.0)	4.0 (3.9)

CESD, Center for Epidemiologic Studies Depression Scale; IADL, Instrumental Activities of Daily Living.

Table 2

Pearson Correlations at baseline (n=187)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Mutuality (1)	1	0.37***	-0.30***	-0.23**	0.26***	0.002	-0.03	0.001	0.10
CR-IADL (2)		1	-0.03	-0.14	0.02	0.15*	-0.04	0.11	0.14
C-CESD (3)			1	0.19**	-0.12	-0.04	-0.10	0.14	-0.14
Female (4)				1	-0.11	-0.07	-0.06	-0.08	-0.23**
Years of care (5)					1	0.23**	0.08	0.12	0.06
Spouse (6)						1	0.57***	0.35***	-0.24**
C-Age (7)							1	0.34***	-0.09
White (8)								1	-0.06
CG-Education (9)									1

C, Careg; CR, Care Recipient; CESD, Center for Epidemiologic Studies Depression Scale; IADL, Instrumental Activities of Daily Living

* p<.05,

**

p<.01,

*** p<.001

Table 3

Mixed Models Results: Bivariate and Multivariate Effects of Predictors on Mutuality (n=91)

Predictor	Bivariate models		Multivariate model	
	Estimate	SE	Estimate	SE
Intercept	.. ^a		2.166 ^{**}	
Female ^b	-.260	.208		
Spouse ^b	-.011	.175		
Log(years of caregiving) ^b	.309 ^{**}	.110	.278 [*]	.106
C-CESD ^c	-.011 [*]	.005	-.010 [*]	.004
CR-IADL ^c	.035 [*]	.014	.026 [*]	.012
Age ^b	.001	.007		
White ^b	.163	.214		
Education ^b	.295	.172		
Time	-.045	.025	-.068	.067
Female * time	-.035	.067		
Spouse * time	-.031	.054		
Log(years of caregiving) * time	-.002	.036	.016	.035
C-CESD * time	-.000	.003		
CR-IADL * time	-.006	.007		
Age * time	.002	.002		
White * time	.002	.062		
Education * time	.052	.054		

C, Carer; CR, Care Recipient; CESD, Center for Epidemiologic Studies Depression Scale; IADL, Instrumental Activities of Daily Living;

^aBecause each bivariate model has a different intercept, we do not report intercepts for the bivariate models in Table 3;^bTime-invariant predictor;^cTime-changing predictor.

* p<.05,

** p<.01