

Caregiver Neuroticism Extends Longevity in Alzheimer's Disease©

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ABSTRACT

Introduction: Caregiving characterized by wishful-intrapsychic coping (WIC) has been found to be associated with a shorter survival time of persons with Alzheimer's disease (AD), holding constant care-recipient impairments. We investigated whether this relationship was a spurious product of the caregiver personality trait neuroticism or whether WIC mediated the relationship between neuroticism and survival. *Methods:* We conducted a mail survey of 180 caregivers of persons with AD in their homes. Caregiver personality was measured by the NEO Five-Factor Personality Inventory. *Results:* Cox regression analysis showed that WIC mediated the relationship between neuroticism and survival. Thus, the relationship between WIC and survival is not a spurious product of caregiver neuroticism. Independently of WIC, however, caregiver neuroticism was significantly related to longer survival time of the person with AD. *Discussion:* We hypothesize that when WIC was partialled out of caregiver neuroticism, neuroticism was associated with longer survival due to the hypervigilance of these caregivers.

Key Words: Alzheimer's disease, dementia caregiving, nursing home, survival, personality.

INTRODUCTION

Despite extensive research into the etiology of Alzheimer's disease (AD), available treatments provide only limited symptomatic relief, and they are unable to prevent, stop, or cure the disease (National Institute on Aging, 2004). Although the progression of the disease is inexorable, the length of time from onset of AD until death varies greatly, with a reported range from 2 to 18 years and a mean of 7 years (Clark, 2000).

Efforts to understand the variation in survival among persons with AD have focused on the characteristics of the diagnosed person. Older age, male gender, early age of onset, greater cognitive impairment, longer duration of illness, more severe behavioral problems, and greater dependency in activities of daily living (ADLs) have been found to predict earlier mortality for persons with AD (Aneshensel, Pearlin, Mullan, Zarit, & Whitlatch, 1995; Brodaty, McGilchrist, Harris, & Peters, 1993; Newcomer, Covinsky, Clay, & Yaffe, 2003; Stern et al., 1997; van Dijk, Dippel, & Habbema, 1991). Thus, factors that decrease life expectancy even without dementia (i.e., older age and male gender) and factors associated with the progression of AD (i.e., duration and severity of impairments) are strongly predictive of shortened survival time. However, these factors do not tell the whole story.

Because persons with AD require increasingly more assistance from others with daily living as their disease progresses, variations in the caregiving environment may also have an impact on survival. The cessation of in-home caregiving by way of long term care (LTC) placement was found to be associated with shortened life expectancy in AD (Aneshensel, Pearlin, Mullan, Zarit, & Whitlatch, 1995; Aneshensel, Pearlin, Levy-Storms, & Schuler, 2000; van Dijk, van de Sande, Dippel, & Habbema, 1992; McClendon, Smyth, & Neundorfer, 2006). However, the longer LTC placement was delayed, the less it shortened survival (McClendon et al., 2006). Characteristics

of in-home caregiving that have been found to be related to increased life expectancy include being cared for by a daughter in comparison to a spouse (Newcomer, Covinsky, Clay, & Yaffe, 2003), caregiver resilience (Gaugler, Kane, & Newcomer, 2007), and low caregiver psychological distress and participation in a training program (Brodaty, McGilchrist, Harris, & Peters, 1993). Caregiving that emphasized a wishful/intrapsychic coping (WIC) style was associated with earlier care-recipient death (McClendon, Smyth, & Neundorfer, 2004) suggesting a potentially effective caregiver intervention.

Before planning interventions that would focus on reducing the use of WIC, however, it is important to consider a potential source of spuriousity in the association between WIC and survival, namely, caregiver personality. Several studies using a wide variety of samples have documented correlations between personality and coping styles (Fleishman, 1984; McCrae & Costa, 1986; Pearlin & Schooler, 1978; Zautra & Wrabetz, 1991). Particularly germane are studies that have shown a relationship between neuroticism and wishful/escape coping (Costa & McCrae, 1992; Hooker, Frazier, & Monahan, 1994; Lutzky & Knight, 1994; Patrick & Hayden, 1999; Rose, Strauss, Neundorfer, Smyth, & Stuckey, 1997). For example, among caregivers of persons with dementia, greater neuroticism was associated with greater use of emotion-focused coping (Hooker et al., 1994). While a considerable body of literature supports the linkages of caregiver neuroticism to wishfulness coping, in the only study that has examined the relationship between caregiver neuroticism and dementia survival, neuroticism was not significantly related to survival (Brodaty et al., 1993).

As a whole, this literature supports the notion that caregiver personality may be important in understanding the relationship of WIC to care-recipient survival. However, it is unclear whether personality is a source of a spurious relationship between WIC and survival, or whether WIC

mediates any effect of personality on survival (Figure 1). We evaluated these alternative hypotheses in this study.

Here we report the results of an analysis elaborating on the possible role of caregiver personality in the survival of persons with AD. In addition to personality, in our analysis we included several caregiver characteristics identified in the preceding literature review as related to survival, namely, coping styles (including WIC), psychological distress (i.e., depression), relationship to care recipient, and placement of the care recipient in LTC. We also included caregiver characteristics found to affect LTC placement (subjective stress, [i.e., overload and role captivity], self-rated health, and race) and care-recipient characteristics found to affect survival (age, gender, duration of illness, ADL dependency, cognitive status, and behavioral problems). In addition to prior empirical support for the relevance of these caregiver and care-recipient variables, they are also key components of the stress-process model for dementia caregiving (Pearlin, Mullan, Semple, & Skaff, 1990; also see Aneshensel et al., 1995). Our covariates represent well the major categories of the stress-process model: background–context factors (care-recipient age, gender, race, and relationship to caregiver); primary objective stressors (care-recipient ADL, cognitive status, and problematic behaviors); primary subjective stressors (caregiver overload and role captivity); caregiver resources or moderators (coping styles); and caregiver outcomes (depression and self-rated health).

METHODS

Sample

The study sample consisted of 332 persons with AD living at home and their primary family caregivers who joined an Alzheimer's Disease Research Center (ADRC) from November, 1992

through 1998. The ADRC collected data on the variables used in this analysis at entry and subsequent annual visits for as long as possible until the person with AD died or entered LTC. This design resulted in a variable number of data points per care recipient-caregiver dyad. The number of data points per dyad ranged from 1 to 10, with a mean of 2.5 per caregiver and 3.8 per care recipient. We used as many data points per person as were available to estimate rates of change for the independent variables except static demographic variables such as date of birth, gender, and race.

During 1997 and 1998 the NEO Five Factor Inventory of personality (see below) was administered to as many of these caregivers as possible on a one-time basis. Of the sample of 332 caregivers, 58 had missing data on the personality instrument because they left the study before 1997 due to the death or LTC placement of the person with AD, 63 caregivers had missing data because they dropped out of the study prior to 1997, and 30 caregivers had missing data because they failed to return the NEO personality instrument, giving a total of 151 caregivers with missing NEO data. This left a sample of 181 caregivers with valid personality data.

Although this sample is a subset of the samples used in two previous publications, (McClendon et al., 2006; McClendon et al., 2004) the personality data has not been previously used and has been introduced to clarify prior results.

Measures

Diagnosis of Alzheimer's disease was based on NINCDS-ADRDA criteria (McKhann et al., 1984).

Date of death. For 37% of the deaths in the sample with valid personality data, the date was determined as part of the ADRC's procedures for arranging an autopsy following death. For

those families that had not agreed to autopsy, family members typically contacted the ADRC when their relative died or informed us of the death when contacted for the yearly evaluation. For care recipients not reported as deceased, we searched the on-line obituaries of the Cleveland daily newspaper and the Social Security Death Index (SSDI) to determine date of death. After using these sources, 61% were known to be deceased by the study cutoff date of September 24, 2003.

Survival time was calculated as the time in years from onset of disease symptoms (as reported by the caregiver) to the date of death, or to the date last known to be alive if not known to be deceased. Of the 180 dyads used in our regression analysis (see Statistical Methods), 159 made a second visit to the ADRC and reported a second estimated date of onset. There was no significant difference between the means of the first and second estimates and the correlation between the first and second estimates was .92. The mean survival time of the 109 persons with AD who were deceased by the cutoff date was 9.1 years and ranged from 2.8 to 19.0 years.

Long-Term-Care (LTC) included both nursing homes and assisted living. LTC placement was determined by either caregiver reports during the course of the study or in a post-cutoff date survey by mail and telephone of 161 caregivers who had not previously reported an LTC placement. In the end, 118 (66%) care recipients were known to have been placed in LTC (82% nursing home, 18% assisted living), 43 (24%) were known to have not been placed, and 19 (11%) were missing placement information.

Caregiver personality was assessed with the NEO Five Factor Inventory (NEO-FFI), (Costa & McCrae, 1992) a 60-item self-administered measure of five domains of personality: Neuroticism, Extroversion, Openness, Agreeableness, and Conscientiousness, each measured with 12 items. Special-purpose software is used to enter responses to the NEO-FFI and calculate

T scores for each of the five domains. In a sample of employees of a large national organization, Cronbach's alphas for the five factors were .86, .77, .73, .68, and .81 (Costa & McCrae, 1992). The reliabilities were as high or higher for caregivers in our ADRC database: alpha was .86 for Neuroticism, .78 for Extroversion, .74 for Openness, .72 for Agreeableness, and .85 for Conscientiousness.

Caregiver coping was assessed with three subscales of a 16-item instrument: Instrumental (5 items, e.g., *Made a plan of action and followed it.*); acceptance (4 items, e.g., *Made the best of it.*); and wishfulness/intrapsychic (7 items, e.g., *Wished you could change the way you felt and Had fantasies about how things might turn out.*) Subscale scores (the mean of the items) ranged from 1 to 5 (McClendon et al, 2004; Pruchno, Burant, & Peters, 1997), and alpha reliabilities were .83 (instrumental), .78 (acceptance), and .79 (wishfulness/intrapsychic) (McClendon, Smyth, and Neundorfer, 2006).

Caregiver depressive symptoms were assessed with the 20-item Center for Epidemiological Studies-Depression (CES-D) scale (Radloff, 1977). We computed the scale score as the mean of the items with valid responses (Cronbach's alpha .89).

Subjective caregiver stress was measured by two scales, *Overload* and *Role Captivity*. (Pearlin, Mullan, Semple, & Skaff, 1990). Scale scores were computed as the mean of the items. Cronbach's alpha was .83 for overload and .85 for captivity.

Cognitive status of the care recipients was measured with the Mini-Mental State Examination (MMSE) (Folstein, Folstein, & McHugh, 1975).

Activities of daily living (ADL) were measured with the 35-item Cleveland Scale for Activities of Daily Living, (Patterson et al., 1992) consisting of both basic and instrumental

ADLs. Scores were calculated as the mean of the items with valid values, if there were at least 20 (alpha .94).

Behavioral problems of the care recipient were measured with the Behavior Rating Scale for Dementia (BRSD), (Tariot et al., 1995) a 45-item instrument that taps depressive symptoms, inertia, vegetative symptoms, behavioral dysfunction, irritability, and psychotic symptoms, coded 1 if it occurred in the prior month and 0 if not. A composite score was calculated as the mean of all items with valid values (alpha .84).

Demographic characteristics included care-recipient gender, race, age at baseline, and duration of illness at baseline, plus caregiver age, gender, relationship to care recipient (1 = spouse, 0 = child/other), and caregiver self-reported health on a 5-point scale from excellent to poor.

Statistical Methods

We used Cox proportional-hazards regression to conduct survival analyses of time to death of the care recipients. Persons not known to be deceased by the cutoff date (i.e., censored cases) were treated as alive at the date of last contact. One case was excluded by the Cox regression program (SPSS) because the time from onset to last contact was less than the shortest time until death. This resulted in a sample of 180 cases on which the descriptive statistics and survival analyses were computed.

Under the proportional-hazards assumption, the risk of death associated with each covariate was assumed to be constant across all time points. We tested this assumption by including an interaction between each covariate and the natural log of time to death in the regression equation (i.e., $X \times \log[\text{time}]$). If an interaction term was significant, it would mean that the association between the covariate and the risk of death changes across time—a positive coefficient would

indicate an increase across time in the risk of death associated with the covariate and a negative coefficient would indicate a decrease over time in the risk of death associated with the covariate. Thus, the attribute represented by the covariate might have become more risky or less risky as time passed.

We used growth curve modeling to compute rates of change for the repeated-measure covariates. We used mixed-effects software (MLwiN) to estimate a rate of change and a baseline value for each repeated-measure covariate. Baseline values and rates of change that varied significantly between persons were included as covariates in the Cox regression, along with the fixed demographic variables.

We used one variables in the regression equation to represent whether or not LTC placement occurred (coded 1 for placed and 0 otherwise) and a second to indicate whether or not there was missing data for LTC (coded 1 for missing and 0 for not missing). With both variables in the equation, the coefficient for LTC placement contrasts the survival time of those placed in LTC with those *not* placed whereas the coefficient for LTC missing contrasts the survival of those missing LTC data with those not placed in LTC. The advantage of retaining the cases with missing LTC information is that it increases sample size from 161 to 180, and thus maximizes the power of the significance tests for the personality and WIC variables, which are more germane to the focus of the study than LTC.

The LTC-placed variable was also coded as a *time-varying covariate* to test whether or not a change from home care to LTC is related to the risk of death. At each point prior to a care recipient's placement at which a death occurs, the care recipient is coded as living at home, but at each point after the care recipient is placed that a death occurs, the care recipient is coded as being in LTC. Thus, the care recipient's score on the LTC variable may change over time from 0

to 1, if and when they are institutionalized. The score of a person who remained at home from baseline to follow-up or who was in LTC from baseline to follow-up remained 0 or 1, respectively, at each point in time. We also tried using the other repeated-measure predictors (e.g., caregiver depression, ADL, and MMSE) as time-varying covariates, but because the fit of the model with time-varying covariates was not as good as for the model containing baseline values and rates of change, we did not report the results for the time-varying covariates.

We conducted a three-step hierarchical Cox regression to investigate whether the personality factors were associated indirectly with survival by way of caregiver coping and LTC placement. First, we estimated the equation with personality and all other variables except for CG coping and LTC placement included. We then added CG coping to the equation to see how the coefficients for the personality variables changed after controlling for CG coping. In the third step we added the LTC placement and missing LTC placement variables to see if controlling LTC placement produced any further changes in the coefficients for the personality factors.

RESULTS

We tested for differences in study variables between dyads with valid NEO FFI data ($n = 181$) and those with missing NEO FFI data ($n = 151$). Caregivers who were missing data scored higher on depression, role overload, role captivity, and wishful/intrapsychic coping than those with valid data. Care recipients of caregivers with missing data were more likely to be deceased and to be missing LTC status than those with valid data. The two groups did not differ significantly in care recipient ADLs, behavioral problems, age, race, gender, duration of dementia, LTC placement, or relationship to the care recipient (spouse or not). Possible implications for our results due to missing data are described in the Discussion .

Descriptive statistics for the 180 care recipients used in the Cox regression analysis are given in Table 1. These care recipients had a mean duration of illness of 4.4 years, a mean age of 73.2 years, a mean ADL score of .81 (on a scale of 0–3), and a mean behavioral problems score of .28 (on a scale of 0–1). Of these, 46% were male, 89% were White, 66% were placed in LTC, and 11% were missing data on LTC placement (Table 1). Of the caregivers, 32% were male, 73% were a spouse, and the mean age was 65. The means of the personality factors showed that Neuroticism was lowest, Extraversion and Openness were intermediate, and Agreeableness and Conscientiousness were highest.

In the regression analysis we retained only those variables that were significant at $p < .05$, plus four nonsignificant personality variables. To test the proportional hazards assumption, we included an interaction for each of the non-fixed variables with the natural log of time to death ($X \times \log[\text{time}]$) in the equation and performed a backward step-wise regression analysis on the interaction terms. The only interaction retained in the equation was Duration \times log(time).

In Equation 1 of our Cox regression analysis (Table 2), the greater the duration of illness at baseline, the less was the risk of death. As indicated by the interaction of duration and time, however, the effect of duration diminished over time. Older persons and males were more at risk of death than were younger persons and females, respectively. The greater the ADL dependency at baseline and the greater the rate of increase in dependency, the greater was the risk of death. Care recipients with more behavioral problems at baseline and those with a higher rate of increase in problems had shorter life expectancies than those with fewer problems and a lower rate of increase. None of the personality constructs were significantly related to time of survival.

When the three caregiver coping variables were added to the analysis in Equation 2, only WIC was significantly related to survival. The higher the score on wishful/intrapsychic coping,

the shorter the survival time. With WIC controlled, the association of Neuroticism with survival was significant; the more neurotic the caregiver, the longer the care recipient lived. The fact that the effect for Neuroticism was larger and significant in Equation 2 than in Equation 1 indicates that Neuroticism had an indirect effect on survival through WIC.

Equation 3 indicates that the LTC placement variable and the missing LTC variable had significant positive relationships with death. The coefficients for Neuroticism and WIC remained significant in Equation 3 and differed only modestly from those in Equation 2. The interpretations of the results for Equation 3 are: 1) The odds ratio for the LTC variable indicates that among those cases *without* missing data on LTC ($n = 161$), those who were placed in LTC were 4.0 times more likely to die than those who remained in their homes; 2) those with missing LTC information were 2.4 times more likely to die than those who were not placed; and 3) the odds ratio for Neuroticism changed very little (from .95 to .94) when the LTC variables were added to the equation, indicating that the relationship of Neuroticism to survival is not due to LTC placement (it is not an indirect “effect” through LTC). The results of a Cox regression that omitted the 19 cases with missing LTC data (not shown) were essentially the same as those that included these cases.

When WIC was regressed on the baseline variables, Neuroticism had a significant positive effect on WIC (Beta = .59) that was much stronger than any of the other covariates (Table 2). This result, along with the difference in the Neuroticism coefficient between Equation 1 and Equation 2 of the Cox regressions indicates that Neuroticism had a positive effect on WIC, which in turn increased the hazard of death. Thus, Neuroticism *indirectly* increased the hazard of death through WIC. The *direct* relationship of Neuroticism to survival with WIC controlled,

however, was to decrease the hazard of death. These direct and indirect relationships are diagrammed in Figure 2.

DISCUSSION

We have shown that caregiver personality matters for the survival of persons with AD. The effects that we found, however, were relatively intricate and somewhat surprising. First, our results indicate that the association of WIC with survival is not a spurious product of personality; WIC increased the hazard of death independently of five dimensions of personality. Neuroticism had an indirect effect on survival through WIC that shortened life expectancy. Neuroticism, however, also had an unexpected direct effect on survival independent of WIC that increased the life expectancy of the person with AD.

Why was neuroticism associated with risk of death? While six facets of neuroticism are measured in the full 240-item NEO (Anxiety, Angry Hostility, Depression, Self-Consciousness, Impulsiveness, and Vulnerability), the shorter 60-item version we used does not provide a separate measure of each facet. The vulnerability facet of neuroticism may account for the relationship that previously has been found between neuroticism and poor coping mechanisms (including escapist fantasy) (Costa & McCrae, 1992) and WIC in our sample. Thus, the neurotic caregiver may be more vulnerable to stress because of poor coping, which we found adversely affected the care recipient's survival. When we controlled WIC in the regression analysis, we may have held constant the vulnerability facet of neuroticism. The residual variance in neuroticism (variance unrelated to WIC) that was positively related to care-recipient survival in our study may have reflected the anxiety facet. Ongoing anxiety about the care recipient's well-being may have been protective of the care recipient.

Why would caregiver anxiety be protective? Caregivers of persons with AD have been characterized by their vigilance, defined as continual oversight of the care recipient's activities (Mahoney, 2003). Neurotic caregivers may be especially vigilant, or *hypervigilant*. A person who is hypervigilant is extremely anxious and worried that something bad will happen and thus is excessively aware of his/her surroundings so as to "catch" the harm that is approaching (Bigatti, Hillix, & Cronan, 2003). Although not from a dementia caregiver, a mother's description of caring for her impaired son reflects this facet of neuroticism..

It's the hypervigilance that is killing me. I try to always be on top of everything as far as R is concerned. I am always scanning the environment, looking to see where he leaves his stuff--his books, his cards, his shoes, his toothbrush, his pillows, his everything. I am scanning for things that will upset him, I am scanning his plate and cup to see when he may be hungry and what he has eaten so I know what he will possibly want next. I am always trying to be one to seven steps ahead, so I may be able to head off impending stress, or so that when he does get upset, I have some idea why. ... So I watch. And my mind never sleeps. And I am so tired (Trisha, 2005).

This example suggests that although hypervigilance can be very stressful to the caregiver, it may provide a high level of protection for the care recipient.

If hypervigilance lead neurotic caregivers to notice symptoms earlier in the disease than non-neurotic caregivers, that might lead to an invalid or partially invalid association between higher neuroticism and longer survival. However, our multivariate models control for any correlation between personality and date of first symptoms. Thus, when we control for duration of symptoms at entry, we are statistically removing any such bias from our results.

Because of our unexpected finding that neuroticism increased survival, it is important to attempt to replicate this finding in another study. It would also be valuable to administer the full 240-item NEO form to caregivers in order to use the measures of the six facets underlying neuroticism to test our hypotheses that it is the vulnerability facet of neuroticism that increases WIC and the anxiety facet of neuroticism that enhances survival. It is possible that one or more of the other facets (Angry Hostility, Depression, Self-Consciousness, Impulsiveness) may be related to survival instead of or in addition to vulnerability or anxiety.

Ours is the first study to show a relationship between caregiver personality (i.e., neuroticism) and the survival of AD care-recipients. In the single previous study of caregiver personality and care-recipient survival, neuroticism (measured by Eysenck Personality Inventory) was not significantly related to survival (Brodaty et al., 1993). The difference between Brodaty and our study might be due to: The sample size used by Brody was 91 and thus provided less power than our sample (n = 180); Brodaty controlled for a caregiver training program but did not include measures of coping styles used by caregivers; other dimensions of personality were not controlled; neuroticism was tested with and without measures of change in dementia severity and nursing home admission whereas our analysis included changes in ADL and behavioral problem. Our analysis did not find neuroticism to be significant without WIC in the model. In sum, the main differences between Brodaty's study and our study were sample size (91 vs. 180) and the measure of caregiver coping (training program intervention vs. measure of wishful coping).

In our study, caregiver personality measurements were made on a one-time basis up to six years after the baseline measures. The varying lag times are not a problem if, as is often assumed, personality is relatively stable. However, there is evidence that small- to medium-sized changes in personality, including neuroticism, occur over the life course (Roberts, Walton, &

Viechtbauer, 2006). Therefore, it would be valuable for future studies to administer the personality test at baseline and again after a 3-year followup, for example, to investigate the effect of any personality changes on survival.

Our research, of necessity, was nonexperimental. It is not possible or ethical to randomly assign caregivers to different personality characteristics, to LTC versus home care, or to many other important caregiver and care-recipient characteristics. Thus, it is necessary to be cautious about making causal inferences.

We must also be cautious about overgeneralizing our results. Strictly speaking, because we didn't have a random (i.e., representative) sample from the population of all persons with dementia that were being cared for in their homes, we cannot generalize our results to all caregiving dyads.

There is some concern regarding the power of these analyses given the sample size and the number of predictor variables. Power, however, is not a problem for relationships that are found to be significant. Lack of sufficient power results in true associations not being found to be significant. The key relationships in our analysis were statistically significant.

Dyads with missing data on the caregiver personality measures, who were excluded from our sample, had greater caregiver stress (i.e., greater depression, overload, and role captivity) and shorter care-recipient survival than those with personality data. Because caregiver stress was related to neuroticism (not shown), neurotic caregivers may have been underrepresented. Because survival time was shorter in dyads with missing personality data, the observed relationship between neuroticism and survival may have been biased.

It is important to remember that our research focused on care-recipient outcomes instead of caregiver outcomes. Although personality measurement is relatively time consuming, it is

important to have a good grasp of all the variables that impact care-recipient survival to make the best recommendations for practice. Furthermore, we have tested caregiver factors that are often targeted outcomes (i.e., depression, burden/stress, and coping) and found only one type of coping, namely WIC, was related to survival. Therefore it is important to look at additional traits (e.g., personality) to those usually targeted. Although replication is needed, our findings suggest that caregiver personality must be evaluated to understand care-recipient outcomes in dementia care. They also add support to the increasing call for making caregiver assessment an integral part of clinical management of persons with dementia (Family Caregiving Alliance, 2006).

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CONFLICT OF INTEREST

The authors have no financial, intellectual property, or other conflict of interest with this work.

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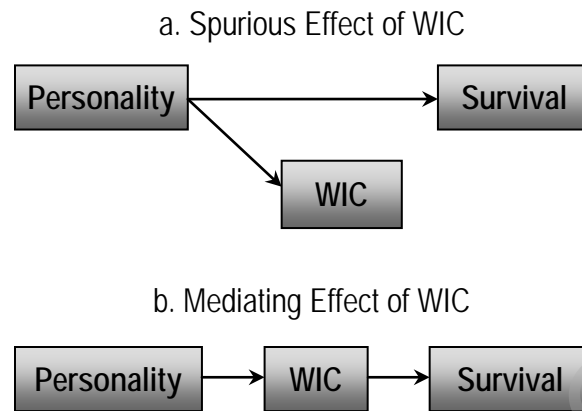
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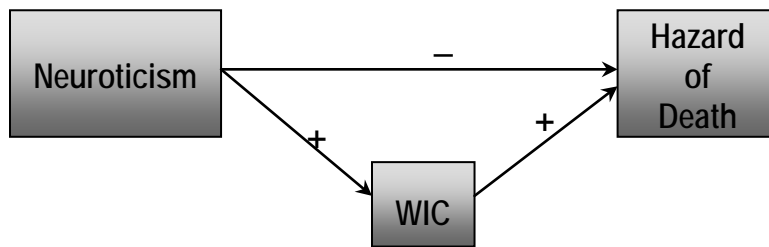
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Figure 1. Alternate Models for Relationships Between Personality, Coping (WIC), and Survival



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Figure 2. Relationships Between Personality, Coping, and Survival



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Table 1. Descriptive Statistics for Care Recipients (CR) and Caregivers (CG) at Baseline (Except LTC is at Cutoff Date), N = 180

	Mean*	Std. Deviation
Duration of illness at baseline (years)	4.39	2.88
CR Age	73.19	7.95
CR Gender (1 = male, 0 = female)	.46	.50
CR/CG Race (1 = White, 0 = African American)	.89	.31
CR ADL (0–3)	.81	.75
CR BRSD (0–1)	.28	.10
CR MMSE (0–30) (n = 130)	18.43	6.41
CG Age	65.13	10.97
CG Gender (1 = male, 0 = female)	.32	.47
CG Spouse (1 = spouse, 0 = other)	.73	.44
CG Neuroticism (0–48)	17.83	8.06
CG Extraversion (0–48)	27.40	5.92
CG Openness (0–48)	25.24	5.73
CG Agreeableness (0–48)	34.21	4.94
CG Conscientiousness (0–48)	33.24	6.08
CG Wishful/Intrapsychic coping (1–5)	2.79	.67
CG Overload (4–16) (n = 179)	9.10	2.70
CG Role Captivity (3–12) (n = 178)	5.73	2.50
CG Depression (0 – 3) (n = 179)	.56	.43
LTC [#] (1 = placed, 0 = no or missing)	.66	.48
LTC Missing (1 = missing, 0 = not missing)	.11	.31

*The mean of a dummy variable equals the proportion of cases who are coded 1.

[#]Long Term Care

Table 2. Hierarchical Cox Regression, Odds Ratios, and Ordinary Regression (N = 180)

Covariates ¹	Cox Regression						Ordinary
	Equation 1		Equation 2		Equation 3		Regression
	B [¶]	OR [#]	B	OR	B	OR	BETA**
Duration of AD	-1.758*	.172	-1.834*	.160	-1.443*	.236	-.017
Duration × log(time)	.523*	1.688	.542*	1.719	.428*	1.535	
CR Age	.043*	1.044	.050*	1.051	.045*	1.046	-.151*
CR [†] Gender	.674*	1.962	.704*	2.022	.747*	2.111	-.010
CR ADL, base	1.015*	2.759	.977*	2.657	.914*	2.494	.173*
CR ADL, rate	5.183*	178.246	5.323*	205.003	4.155*	63.756	
CR Beh. Prob., base	4.524*	92.233	3.755*	42.744	4.307*	74.248	.032
CR Beh. Prob., rate	24.376*	3.9E+10	21.327*	1.8E+09	27.211*	6.6E+11	
CG [‡] Neuroticism	-.017	.983	-.050*	.951	-.061*	.940	.590*
CG Extraversion	-.032	.968	-.042	.959	-.038	.963	.147
CG Openness	-.002	.998	.002	1.002	.002	1.002	-.052
CG Agreeableness	.002	1.002	-.007	.993	-.011	.989	-.034
CG Conscientiousness	.002	1.002	-.002	.998	-.021	.979	.060
CG WIC	...	...	.605*	1.832	.496*	1.643	
LTC [§] Placement	...	...	...	...	1.388*	4.005	
LTC Missing Data	...	...	...	...	.882*	2.417	
Squared Multiple R							.337*

* $P \leq .05$, [†]CR = Care Recipient, [‡]CG = Caregiver, [§]Long Term Care, [¶]Slope, [#]Odds Ratio, **Standardized Slope