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Stress and Depression Among the Oldest-Old: A Longitudinal Analysis

Hae-Sook Jeon¹ and Ruth E. Dunkle²

¹ Kyungpook National University, Daegu, SOUTH KOREA

² University of Michigan, Ann Arbor, MI, USA

Abstract

Stress and psychosocial resources play a crucial role in late-life depression. While most studies focus on predominantly those who are young-old, this study used a sample aged 85 and older. The authors' study aims to examine three research questions: (1) What are the trajectories of depression and its associated factors such as types of stress and psychosocial resources among the oldest-old? (2) What are the longitudinal relationships among the changes in stress, psychosocial resources, and depressive symptoms? (3) Are the effects of the changes in stress on depression trajectory mediated by changes in psychosocial resources? The study used a convenience sample of 193 community-dwelling elders aged 85 and older with four interviews every six months from 1986 to 1988. Using multilevel modeling analyses, longitudinal results showed that changes in positive life events, daily hassles (worries), and mastery were significantly associated with changes in late-life depression among the oldest-old.

Keywords

oldest-old; depression; daily hassles; life events; mastery; longitudinal study

Elders aged 85 and older are more vulnerable to stress and depression than other age groups (Blazer 2000; Dunkle, Roberts, and Haug 2001) due to increasing stressors with age resulting from declining health and dwindling social relationships (Borson et al. 2001). Diminishing psychosocial resources with increasing age further contribute to increasing depression (Dunkle et al. 2001; Long and Martin 2000). This is an important consideration as psychological and social resources act as protective factors to depression by contributing to decreasing depression directly or mediating the impact of stress on depression (Hobfoll et al. 2003; Holahan et al. 1999; Lazarus and Folkman 1984; Pearlin 1989). Researchers suggest that there are significant individual differences in available psychosocial resources that influence the relationship between stress and depression. Some individuals have greater resources than others, and these may fluctuate over time. Yet, little is known about the stressors the oldest-old face, what resources they have, and how these influence their depression. Furthermore, there is not much known about how these relationships fluctuate over time.

Corresponding Author: Ruth Dunkle, School of Social Work, University of Michigan, 1080 S. University, Ann Arbor, MI 48109-1106, USA, redunkle@umich.edu.

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One theoretical perspective that aids our understanding of how stressors and resources are associated with depression is the stress process model. The stress process model consists of three key factors: stress, psychosocial resources, and outcome variables (e.g., depression). This model proposes that psychosocial resources directly influence depressive symptoms. By contrast, the indirect effect (i.e., mediating effect) in the stress process suggests that the effect of the stress on depressive symptoms is mediated by psychosocial resources (George 1989; Pearlin 1989; Pearlin et al. 1981). To date, the changing role of psychosocial resources in the stress process among the oldest-old has not been addressed (Hobfoll 1998).

While the stress process model examines the crucial role of psychosocial resources in stress research, several issues have not been addressed adequately that are particularly relevant to the oldest-old. First, most studies have paid little attention to possible variations in the types of stress experienced by different age groups, with little work on stress with the very old. With advancing age, elders experience certain types of stressors such as death and health problems more often than younger people. Hassles are also significant stressors for the very old and are strongly associated with depressive symptoms (Dunkle et al. 2001; Roberts, Dunkle, and Haug 1994). Recognizing that stress is multidimensional, this study included multiple stress variables and allows examination of a variety of types of stressors among elders in this very old age group. Knowing what stressors are prevalent in this age group can facilitate mental health intervention.

Second, the dynamics of change in stress and psychosocial resources in relation to change in depressive symptoms have been overlooked in most research on stress and depression (e.g., Glass, Kasl, and Berkman 1997; Jang et al. 2002; Roberts et al. 1994). Due to limited research on the central role of psychosocial resources using longitudinal data, little is known about how changes in stress and resources are associated with changes in depressive symptoms in later life. Few studies have employed appropriate research methodology such as multilevel modeling analysis to address how changes in stress and resources affect depressive symptoms. Understanding how stress and resources affect depressive symptoms would facilitate mental health intervention.

While there are a few longitudinal studies on the relationships among stress, psychosocial resources, and depression among the oldest-old (e.g., Dunkle et al. 2001; Johnson and Barer 1997; Roberts et al. 1994), these studies did not examine the association at the individual level. Individuals differ in the ways they handle the stressors in their lives (Turner and Roszell 1994) and chronological age may be a significant factor. For instance, the oldest-old show poorer physical health than do younger age people (Kulminski et al. 2007). Baltes and Smith (2003) found a high prevalence of dysfunction and a reduced capacity for improvement among people 85 year of age and older; a state that makes them very different than all other age groups. Examining these unique qualities of people in this age group is important in understanding the relationship of stress and depression.

Third, existing studies have paid little attention to the psychosocial resources of the oldest-old. Psychosocial resources vary depending on the individual and the conditions of life that the person has experienced (Turner and Roszell 1994). Many cross-sectional studies found that older adults experience decline in psychosocial resources (Ajrouch, Antonucci, and Janevic 2001; Ben-Zur 2002; Shaw and Krause 2001), and it is a general notion that this decreasing trend in psychosocial resources will continue in the very late life stage. The oldest-old population, however, is not included or folded in with those participants 65 years of age or older in the majority of research studies examining the change in psychosocial resources and its underlying mechanism in the stress process. In addition, the physiological as well as psychological resources of the oldest-old differ in some respects from the younger

old (Baltes and Smith 2003). Whether the findings from the previous research generalize to the oldest-old is not clear and requires further investigation.

Literature Review

This review will highlight the associations among key factors of the stress process: (1) types of stress and depression, (2) psychosocial resources and depression, and (3) psychosocial resources as a mediator in the relationship between stress and depression.

Types of stress and depression

Various meanings of stress have been measured in different ways, for example, major life events including both negative life events and positive life events (Holmes and Rahe 1967) and daily hassles (Kanner et al. 1981; Lazarus and Folkman 1984). Although life events inventories measure stressful situations objectively by asking respondents to indicate whether a specific event occurred during a certain period of time, the life events scale has been criticized for not taking into account the individual's appraisal in determining whether or not the situation is stressful (Aldwin 1994; Lazarus and Folkman 1984). Measures of hassles are more likely to emphasize individual variations in perceiving stress (Lazarus and Folkman 1984). Hassles are defined as the irritating or frustrating demands that frequently happen in an individual's everyday transactions with their environment (Kanner et al. 1981).

Researchers who focused on negative life events to predict depression (Glass et al. 1997) found that these events (e.g., as loss of friends due to a move, death of a close relative/friends, illness of a close relative, loss of a hobby, victimization in a crime, admission to a nursing home, and hospitalization) are significantly related to increased depressive symptoms among noninstitutionalized elders aged 65 and older. De Beurs and colleagues (2001) also found that negative life events (e.g., death of a partner or other relatives, illness of one's partner, a major conflict with others, income loss, being a victim of crime and relocation) were closely related to the onset of depressive symptoms among community-dwelling elders aged 55 and older. Although these two studies included longitudinal data, they only assessed between-person differences in the associations between stress and depression, which limited understanding of the long-term patterns within individuals.

Examining another type of stress, daily hassles, Catanzaro, Horaney, and Creasey (1995) found that these were associated with higher levels of depressive symptoms among community-living older adults aged 55 and older. Even though the authors examined the impact of minor stress on depression, the findings were limited by using predominantly young-old participants in a cross-sectional analysis. Kraaji, Arensman, and Spinhoven (2002) examined daily hassles as well as negative life events, finding a strong association with depressive symptoms among the older populations for both types of stressors. One recent study found that hassles were significantly related to depression among the oldest-old using longitudinal data (Jeon, Dunkle, and Roberts 2006). This study, however, failed to examine longitudinal associations on the individual level. Thus, it is not known about the long-term change in the associations between daily hassles and depression among the oldest-old. By contrast, another type of stress, positive life events, has received limited attention by gerontologists. One study by Krause (1988) found that positive life events were significantly associated with depressive symptoms among older adults. Many researchers found that both life events and daily hassles are associated with negative mental health outcomes, especially depression, for older people (Catanzaro et al. 1995; De Beurs et al. 2001; Glass et al. 1997; Jeon et al. 2006).

To look at longitudinal characteristics of stress in existing literature, it is helpful to examine the relationship between age and stress. In terms of the associations between age and stress,

even though the nature and types of stressors vary depending on age and life course stage (Pearlin and Skaff 1996), substantial evidence shows that older adults experience fewer life events and appraise them as less stressful than younger age groups (Aldwin et al. 1996; Folkman et al. 1987; Murrell, Norris, and Grote 1988). Because these studies have been conducted at the between-person level, longitudinal within-person variability of stressors among the oldest-old is not known.

For change over time in depression, a number of researchers have examined the relationship between age and depression, but the findings are inconsistent. Some researchers found a curvilinear relationship between age and depression, showing that the youngest age groups and the oldest age group reported greater depressive symptoms than other age groups (Gatz and Hurwicz 1990; Kessler et al. 1992; Newmann 1989). Including only older adults, Haynie and colleagues (2001) found that depressive symptoms were negatively associated with age in very late life. By contrast, other research found that the old-old tended to have higher levels of depressive symptoms than the young-old (Blazer et al. 1991; Stallones, Marx, and Garrity 1990), indicating that depressive symptoms are positively associated with age in later life. Even though many studies examining the relationship between depressive symptoms and age have been conducted, little is known about the trajectory of depressive symptoms among the oldest-old.

In summary, although there is abundant research on stress among older adults, the oldest-old have not received much attention. In addition, gerontologists tend to use only one type of stressor at a time. Given that stress is multidimensional, this study included multiple stress variables, negative life events, positive events, and hassles using a sample of very old elders. In addition, this study examines the relationship of stress and depression over time.

The direct effect of psychosocial resources and depression

Psychosocial resources are defined as the factors in the internal and external environment that directly deter negative outcomes or mediate the impact of stress on the outcome (Ensel and Lin 1991). Mastery and social support have been considered as crucial types of psychosocial resources (Ensel and Lin 1991; Hobfoll 1998; Pearlin et al. 1981). Psychosocial resources such as mastery and social support have been considered protective factors against depression (Badger 2001; Dunkle et al. 2001; Jang et al. 2002; Pearlin et al. 1981). In a study by Jang et al. (2002), elders aged 60 to 84 with a higher level of mastery reported lower levels of depressive symptoms. Badger (2001) found that mastery was significantly related to lower depression among community-dwelling elders aged older than 75. These researchers divided their sample of elders into two groups, mildly depressed and severely depressed. Results showed that severely depressed elders reported lower levels of mastery than their mildly depressed counterparts. In addition to mastery, social support was also associated with depressive symptoms (e.g., Antonucci, Fuhrer, and Dartigues 1997; Taylor and Lynch 2004). Antonucci and colleagues (1997) in a cross-sectional study of French elders (mean age = 75) found that those with extensive social networks who were satisfied with their quality of support reported lower levels of depressive symptoms. By using a random coefficient (growth) model, Taylor and Lynch (2004) found that the trajectory of perceived social support was significantly associated with the trajectory of depressive symptoms among older adults. This study, however, showed long-term change in social support and depressive symptoms among elders aged 65 and older, thus limiting the understanding for the oldest-old population.

A few researchers have examined how psychosocial resources have changed over the life span and the associations with other outcome variables (e.g., depression). Regarding change over time in psychosocial resources, a number of studies showed that mastery and social network size declined with age (Ajrouch et al. 2001; Ben-Zur 2002; Shaw and Krause

2001). Although the studies contributed to understanding of psychosocial resources in later life, it should be noted that most studies have been conducted cross-sectionally. More recently, even though longitudinal studies were conducted (e.g., Shaw et al. 2007; Wolinsky et al. 2003), the findings were drawn based on either cross-sectional analysis or used predominantly young-old as participant. Accordingly, little is known about longitudinal intraindividual changes over time in psychosocial resources among the oldest-old.

The mediating effect of psychosocial resources on depression

Many studies have examined the mediating model of psychosocial resources in the relationship between stress and depression and helped to identify the mechanisms through which stress affects depressive symptoms (George 1989; Hobfoll et al. 2003; Pearlin et al. 1981). For example, Hobfoll and colleagues (2003) found that loss of mastery and social support mediated the impact of stress on depressive mood among single parents in young adulthood. Similarly, people aged 18 to 65 reported that life events had a less negative impact on depressive symptoms when they had a high sense of mastery (Pearlin et al. 1981). To date, no one has examined this mediating relationship between stress and depression among elders older than age 85. Our study examines the mediating effect of psychosocial resources on the relationship between stress and depression (Hobfoll et al. 2003; Pearlin et al. 1981) among an oldest-old population and the mediating effect of changes in psychosocial resources on the relationship between trajectories of stress and depression.

In sum, despite numerous studies on stress and mental health among older adults, there are several gaps to be addressed. First, previous research has paid little attention to the influence of stress and depression among the oldest-old. Second, many previous studies have employed between-person and cross-sectional research designs, thus limiting the understanding of the nature of long-term change in the stress process. Third, stress as a multidimensional factor is not reflected in previous research. To address these limitations, our study aims to address the following research questions:

Research Question 1: What are the trajectories of depression and its associated factors such as types of stress and psychosocial resources among the oldest-old?

Research Question 2: What are the longitudinal relationships among the changes in stress, psychosocial resources, and depressive symptoms?

Research Question 3: Are the effects of the changes in stress on depression trajectory mediated by changes in psychosocial resources?

Method

Data Set

The data set used for this article is unique in that it is comprised of four waves of data from elders 85 years and older. Having four waves of data is a significant strength that allows for multilevel analyses necessary to advance research on the stress process. Although these data were gathered 20 years ago, they still provide a unique opportunity to examine the relationship between stress and depression among oldest-old elders and explore the impact of change in stress as well as resources on depression. No other data set exists that allows for the longitudinal examination of stress, resources, and depression in elders 85 year of age and older.

Sample

This longitudinal study used a convenience sample of 193 elderly people aged 85 and older living independently in the Midwest. Participants were recruited from a variety of

noninstitutional settings. Waiting lists of two multilevel care facilities where the oldest-old lived independently were used for recruitment, as well as nutrition sites and Golden Age Senior Centers. This mixture of sites was chosen to ensure adequate diversity on key control variables such as socioeconomic status and race. The sample for this study was compared to a random sample obtained from Medicare list (1975) for the geographic area of Cleveland, Ohio, and its suburbs from which our participants were drawn. The sample in the present study was representative of this age group. It was also compared to a random sample of elders living in the city of Cleveland (Ford et al. 1992). Our sample had fewer males and African American elders than the urban sample. Participants were interviewed five times over a nine-year period. The first interviews were conducted in 1986. Three follow-up interviews (Wave 2–Wave 4) were conducted over an 18-month period between 1986 and 1988, and the fifth interview (Wave 5) was conducted in 1995. The analyses are based on data from Waves 1, 2, 3, and 4. The data from Wave 5 was excluded from the analyses because only 23 individuals participated in the Wave 5 interview. A more detailed description of the sample can be found elsewhere (e.g., Dunkle et al. 2001; Roberts et al. 1994).

Attrition—In Wave 1, the sample consisted of 193 elders living in the community. In Wave 2, the sample consisted of 180 elders as 7 participants died and 6 were not interviewed (2 refused; 2 reported behavioral problems; 1 reported health problems; 1 moved beyond a 50-mile radius from the study site). Of the remaining 180, 164 elders were interviewed in Wave 3; 9 people died and 7 were not able to participate in the study due to refusal ($n = 2$), behavioral problem ($n = 1$), sickness ($n = 1$), moving ($n = 2$), and other ($n = 1$). In Wave 4, 155¹ elders participated; 8 died and 2 were not able to be interviewed in Wave 4 (1 moved beyond a 50-mile radius and 1 gave invalid responses).

Measures

Depression—Depression was measured using the SCL 90 Depression Scale (Derogatis, Rickels, and Rock 1976). This scale consists of six items: (1) hopeless about future, (2) thoughts of ending your life, (3) thoughts of worthlessness, (4) nervousness inside, (5) feeling fearful, and (6) feeling tense. It should be noted that these items are reflective of symptoms of emotional distress. Ratings were made on a 4-point Likert scale with a range of 0 (*not at all*) to 4 (*extremely*). The scale was constructed by summing six items on depressive symptoms. The range of scores is from 0 to 24 (Cronbach's $\alpha = .87$). The descriptive statistics of the original depression scale presented distribution problems, which contributed to an estimation difficulty in multilevel modeling. Although there is no clear consensus, in general, Kurtosis between -1 and 1 is regarded as excellent and Kurtosis between -2 and 2 is regarded as acceptable. Specifically, Wave 1 depression scores and Wave 3 depression scores presented severe Kurtosis, Wave 1 depression Kurtosis = 4.72 and Wave 3 depression Kurtosis = 7.44 , which were considered too great to run a multilevel model.

To address this distribution problem of excessive Kurtosis, the depression scale was modified to permit multilevel modeling. If participants presented any depressive symptom item, it was coded as one; if not, the item was coded as zero. Specifically, each item was coded either 0—no symptom or 1—having symptoms. Therefore, the scores of the new depression index ranged from zero to six, with high scores indicating more depressive symptoms. The new depression index solved the distribution problem presented in the original depression scale. That is, the Kurtosis range of the new index presented from Wave 1 and Wave 4 ranged between $-.37$ and $.56$, which is acceptable for multilevel modeling.

¹One participant was not interviewed at Wave 3 but participated in Waves 1, 2, and 4.

Therefore, the new depression index was used in the current study. The reconstructed SCL 90 Depression Scale used in this study did not represent the severity of depressive symptom but indicated the numbers of depressive symptoms.

Stress—Three types of stressors were included in the study, negative life events and positive life events using the Geriatric Scale of Recent Life Events (Kahana, Fairchild, and Kahana 1982) and daily hassles using the Geriatric Hassles Scale (Kanner et al. 1981). Scales were modified to more accurately reflect events that older people were more likely to experience. The Geriatric Scale of Recent Life Events (Kahana et al. 1982) was employed to measure discrete life events such as negative and positive life events using the checklist of stressful life events. The scale included 23 items of the Social Readjustment Scale (Holmes and Rahe 1967) and 32 items relevant to the life experiences of the older population. This scale was reduced to 29 items with the elimination of questions seemingly irrelevant to the oldest-old (e.g., marriage of child, retirement, etc.). In Wave 1, the participants were asked whether they had experienced the events in the last year. Participants in subsequent waves (2, 3, and 4) were asked whether they experienced the events in the last 6 months. To examine the impact of negative life events and positive life events on depression separately, two measures were constructed by adding the number of negative and positive life events, respectively. Negative life events included 25 negative and ambiguous items as shown in Table 1. The scale score ranged from 0 to 25, higher scores meaning more negative life events. The four positive life events included birth of child in family, marriage in family, personal achievement of family members, and improvement in a family member's health. The score ranged from 0 to 4, with a higher score meaning more positive life events. Daily hassles were measured with the Geriatric Hassles (worries) Scale (Kanner et al. 1981; Lazarus and DeLongis 1983). This scale consists of 23 items that identified type of worry and also assessed severity of worries about the health and the mental health of the elderly themselves and other family members and worries about their neighborhood. The participants were asked to rate how much they were concerned about each of the 23 items, summarized in Table 1. Originally, the ratings of severity of hassles were made on a 4-point Likert scale with a range from 0 (*not at all*) to 3 (*a great deal*). A higher score indicated more concern about daily hassles. At the initial interview, Cronbach's alpha was .84. It was determined that some items (e.g., forgetting things, inner conflict, not enough personal energy) might be confounded with depressive symptoms. To address this issue, the Geriatric Hassles Scale was modified by counting the numbers of items that the person was concerned about. Thus, the range of the new hassle index was 0 to 23, with higher scores indicating more daily hassle experiences. Cronbach's alpha was not computed when the scale was converted to a count of hassles.

Psychosocial resources—Psychosocial resources were assessed by measuring mastery and social support. Mastery was assessed by a seven-item measure using the Pearlin Mastery Scale (Pearlin and Schooler 1978). The items included: There is no way to solve problems I have; I feel that I am being pushed around in life; I have little control over the things that happen to me; I can do just about anything I really set my mind to do; I often feel helpless in dealing with the problems of life; what happens to me in the future depends mostly on me; and there is little I can do to change many of the important things in my life. Mastery was measured using a 4-point Likert scale (0 = *strongly disagree*, 1 = *somewhat disagree*, 2 = *somewhat agree*, 3 = *strongly agree*). The scores for the items "There is no way to solve problems I have," "I feel that I am being pushed around in life," "I have little control over the things that happen to me," "I often feel helpless in dealing with the problems of life," and "There is little I can do to change many of the important things in my life" were reversed before summing. The score ranged from 0 to 21. A higher score indicates greater feelings of mastery. Cronbach's alpha at each wave was .64, .67, .66, and .61.

Social support was assessed by measuring available social support as well as frequency of social support. Available social support was measured using items from the Older Americans Resources and Services (OARS) instrument (Duke University Center for the Study of Aging and Human Development 1978). Elders were asked (1) if they have someone they can trust, (2) if they have someone who takes care of them indefinitely, (3) if they have someone who can provide short care, (4) if they have someone who can provide occasional care, and (5) if they see relatives and friends as often as they want. This measure reflected the extent of the social network rather than the support actually received. The scale was constructed by adding the five items (0 = *no*, 1 = *yes*). Scores ranged from 0 to 5. A higher score indicates more available social support.

Frequency of social interactions with others was measured using a subscale from the Older Americans Resources and Services instrument (Duke University Center for the Study of Aging and Human Development 1978). Originally, OARS consists of four items: (1) the number of friends they knew well enough to visit (0 = *none*, 1 = *one to two*, 2 = *three to four*, 3 = *five or more*), (2) the number of phone contacts during the past week (0 = *not at all*, 1 = *once a week*, 2 = *two to six times a week*, 3 = *once a day and more*), (3) the number of visits during past week (0 = *not at all*, 1 = *once a week*, 2 = *two to six times a week*, 3 = *once a day and more*), and (4) the extent to which they got along with others. To measure frequency of social interactions, the fourth item was excluded. The scale was constructed by adding the items ranging from 0 to 9. High scores mean more frequent interaction.

Control variables—Given that sociodemographic characteristics variables (i.e., gender, race, and education) and functional health measures were found to be associated with depression as well as psychosocial resources (Cochran, Brown, and McGregor 1999; Gatz, Kasl-Godley, and Karel 1996; Mills and Henretta 2001; Nolen-Hoeksema 1990; Williamson and Schulz 1992; Zunzunegui et al. 1998), these variables were included as control variables. Gender was dichotomized, 1 = *female* and 0 = *male*. Race was assessed in two categories, 1 = *White* and 0 = *Black*; there was no participant of other races in the sample. Education was measured based on years of education (0–4 years of education = 1, 5–8 years = 2, 9–11 years = 3, high school = 4, post-high school = 5, 1–3 years of college = 6, college = 7, and postcollege = 8). Education was dichotomized for the multilevel modeling analysis, 0 = *respondents who finished up to a high school degree* and 1 = *respondents who received a post-high school education and more*. Functional health was assessed using two instruments, basic activities of daily living (ADLs) measured by the Katz Index of ADL (Katz et al. 1963) and instrumental activities of daily living (IADLs) measured with items from the Older Americans Resource Survey (Duke University Center for the Study of Aging and Human Development 1978). The ADL Scale consists of six items, including the ability to eat and dress, taking care of appearance, walking, getting in and out of bed, and taking a bath alone. Each item was measured using a 3-point Likert scale (0 = *unable*, 1 = *some help*, 2 = *able*). The score ranged from 0 to 12, with a higher score indicating better functioning. The Cronbach's alpha at each wave was .54, .66, .64, and .59. The IADL scale consists of seven items: using the telephone, traveling alone on public transportation or driving, shopping for groceries or clothing, preparing own meals, doing own housework, taking medicine, and handling own money. Ratings were made on a 3-point Likert scale with a range from 0 (*unable*) to 2 (*able*). The range of possible total scores of IADL was 0 to 14, high score indicating better functioning. Cronbach's alpha at each wave was .74, .83, .81, and .80. Regarding attrition, participants who took part across all four waves (coded 0) were compared to those who did not participate in all four waves (coded 1).

Data Analysis

To address the proposed research questions, we used a multilevel modeling method, MIXREG (Hedeker and Gibbons 1994; Hedeker and Mermelstein 1996), to estimate individual change for each person across time and to capture longitudinal associations between variables. Random effects models were developed for depression and its associated factors to answer the first research question, What are the trajectories of depression, stress, and psychosocial resources among the oldest-old? To examine the trajectory of depression over four time points, three random effects were needed—namely, intercept (individual differences at Wave 1), linear change (individual variation in the linear trajectories), and quadratic change (individual differences in the curvilinear changes). The results from the random effects model of depression indicated that the modeling intercept and linear changes fit the data better than modeling all three random effects. That is, the quadratic trajectory was not significant. Therefore, the quadratic change was excluded from the model, leaving two random effects (i.e., intercept and linear change) in the final random effect model. To examine how the initial levels and the rate of linear change in the depression trajectory were associated with the initial levels and the rate of changes in the trajectories of other variables of interests (e.g., control variables, stress, psychosocial resources), other time-varying variables were modeled for linear trajectories as well.

The final Level 1 model is expressed as follows:

$$Y_{it} = \alpha_i + \beta_i X_{it} + \varepsilon_{it},$$

where Y_{it} is repeated measures of depression for individual i at time t , α_i is the intercept parameter of the repeated measure, β_i is the linear trajectory parameter, X_{it} is time t in months for individual i , and ε_{it} is the errors for individual i at time t . The Level 2 model can be expressed as follows:

$$\begin{aligned}\alpha_i &= \mu_\alpha + \zeta_{\alpha i}, \\ \beta_i &= \mu_\beta + \zeta_{\beta i},\end{aligned}$$

where α_i is the intercept of the repeated measure for individual i , μ_α is the mean of intercepts, $\zeta_{\alpha i}$ is errors in intercepts for individual i , β_i is the linear slopes of the repeated measure for individual i , μ_β is the mean of slopes, and $\zeta_{\beta i}$ is errors in slopes for individual i . The combined model can be expressed as follows:

$$Y_{it} = (\mu_\alpha + \zeta_{\alpha i}) + (\mu_\beta + \zeta_{\beta i})X_{it} + \varepsilon_{it}.$$

The subsequent analysis for Research Question 2, what are the longitudinal relationships among the changes in stress, psychosocial resources, and depressive symptoms, was conducted through the addition of the two types of predictors: (1) time-invariant control variables (e.g., attrition, gender, race, and education) and (2) time-varying predictor variables (e.g., health, stress, and psychosocial resources). To examine Research Question 3, are the effects of the changes in stress on depression trajectory mediated by changes in psychosocial resources, variables were entered in the model in a hierarchical fashion.

Results

Descriptive Data of the Oldest-Old

The mean age of the participants was 87.73 in Wave 1 and 89.37 in Wave 4. With regard to gender, the sample was predominantly female and White at all waves. In terms of education, on average, participants graduated from high school in four waves. Table 2 identifies sociodemographic characteristics of the participants.

Table 2 showed descriptive statistics for depression and its associated factors across the four time points. For depression, means and variability increased slightly over time. For other time-varying predictors such as health, negative and positive life events, hassle, mastery, and social support measures, the means and variability fluctuated across the four time points. Descriptive statistics are presented to give an overview of the data and facilitate understanding the results of multilevel modeling analyses presented later.

Research Question 1—Trajectories of Depression, Stress, and Psychosocial Resources

The trajectory of each time-varying variable included in the analysis was summarized in Table 3.

The results of the unconditional model indicated that the oldest-old were likely to have increased depressive symptoms with age and that the number of depressive symptoms varied among the participants at Wave 1.

The results of the unconditional model on negative life events indicated that negative life events did not change across the four time points ($b = -.00$, $SE = .01$, ns), whereas the oldest-old were likely to experience more positive life events ($b = .01$, $SE = .00$, $p < .05$) and daily hassles ($b = .15$, $SE = .02$, $p < .001$) over time across four time points.

The results of the analysis of the unconditional model for psychosocial resources indicated that the sense of mastery among the oldest-old increased across four time points ($b = .04$, $SE = .02$, $p < .05$), while social support did not significantly change across four time points.

Research Question 2—What Are the Longitudinal Relationships Among the Changes in Stress, Psychosocial Resources, and Depressive Symptoms?

Table 4 summarizes the results of the conditional model examining the two components of Research Question 2.

As shown in the Stress Model column, trajectories of positive life events ($b = -.17$, $SE = .07$, $p < .05$) and daily hassles ($b = .13$, $SE = .01$, $p < .001$) were significantly associated with the depression trajectory, indicating that elders who reported a slower increase in positive life events and a faster increase in daily hassles experienced a faster increase in depressive symptoms. However, negative life events were not significantly associated with depression ($b = .02$, $SE = .02$, ns), suggesting that there were no substantial individual differences in the associations between negative life events and depression.

In terms of psychosocial resources, the trajectory of mastery was negatively associated with the trajectory of depression ($b = -.05$, $SE = .02$, $p < .01$), indicating that for those whose mastery increased at a slower rate, their depressive symptoms increased faster. Interestingly, available social support ($b = -.02$, $SE = .06$, ns) and frequency of social support ($b = .02$, $SE = .03$, ns) were not significantly associated with depression among the oldest-old over the four time points.

Research Question 3—Are the Effects of the Changes in Stress on the Depression Trajectory Mediated by Changes in Psychosocial Resources?

As shown in Table 4, significant portions of depression changes explained by the changes in positive life events shown in the stress model ($b = -.17, p < .05$) were explained by mastery change ($b = -.05, p < .05$). Previously, significant positive life events become less significant ($b = -.12, p < .10$) as shown in the resource model. Following Baron and Kenny's (1986) mediation paradigm, additional analyses indicated that the changes in positive life events were significantly associated with changes in mastery over time ($b = .40, p < .05$). These results indicate that the association between trajectories in positive life events and depressive symptoms was mediated by the trajectory in mastery. That is, a faster increase in positive life events was associated with a faster increase in sense of mastery, by leading to a slower increase in depressive symptoms among the oldest-old. For other types of stress, psychosocial resources had no mediating effects as there were no statistically significant changes in the associations between stress and depression after adding psychosocial resources.

The attrition variable, sociodemographic variables, and functional health variable were included in the analysis as control variables because these variables were associated with depression in other studies. As shown in Background Model, gender predicted the level of depression at Wave 1, indicating that female elders presented more depressive symptoms than male elders at Wave 1 ($b = .61, SE = .22, p < .01$). Race was marginally associated with depression at Wave 1, indicating that White elders reported a higher level of depression at Wave 1 than Black elders ($b = .45, SE = .24, p < .10$). Neither gender nor race was significantly associated with the rate of change in depressive symptoms. In terms of functional health, the results indicated that elders with a lower level of functional ability in IADLs reported a higher level of depression at Wave 1. The rate of change in ADLs was negatively associated with the rate of change in depression, indicating that elders who reported a faster decline in ADL abilities exhibited a faster increase in depressive symptoms.

Discussion

This study extends the scope of research on stress and depression by examining the longitudinal relationships among changes in stress, psychosocial resources, and depressive symptoms for elders older than the age of 85. To date, these relationships have only been examined cross-sectionally, not allowing an understanding of the effect of changes in stressors and resources on changes in depression over time. This research makes two significant contributions: First, by examining stress as a multidimensional factor, we discovered that changes in positive life events and daily hassles were significantly associated with changes in depression. Even though previous research has taken into account negative life events among the older adults (De Beurs et al. 2001; Glass et al. 1997; Kraaij et al. 2002), our study suggests the importance of positive life events in predicting depression among the oldest-old. Because measures of positive life events included items related to family members (e.g., birth of child in family, personal achievement of family members, and improvement in family member's health), our findings suggest the importance for the oldest-old to maintain contact with family members and to stay informed about important family matters to lower depressive symptoms.

Our findings with the oldest-old respondents showed that negative life events did not influence depressive symptoms. Previous studies including exclusively young-old showed that older adults who experienced negative life events reported more depressive symptoms (De Beurs et al. 2001; Glass et al. 1997). Possibly the oldest-old may normalize the negative life events such as death of family members or relocation to nursing homes. Or, they might not even remember the negative life events that occurred at least six months ago.

Increasing daily hassles were also significantly associated with increasing depressive symptoms. As prior investigators suggested (McGonagle and Kessler 1990), continuing threats such as chronic stressors are more likely to influence depressive symptoms than life events such as changes in sleep, changes in eating, and so on. Ongoing daily hassles such as worries about health, not enough energy, falling, or taking medication (Dunkle et al. 2001) are ongoing persistent annoyances that could have cumulative effects leading to an increase in depressive symptoms.

Second, the results of the longitudinal analysis showed that sense of mastery played a protective role against depressive symptoms among the oldest-old participants, implying that the oldest-old are resilient. Through multilevel modeling, this study adds the findings of within-person changes in the relationship between mastery and depressive symptoms to the literature. For the trajectory of mastery, the finding was not consistent with other cross-sectional studies including both young adults and older adults (Ben-Zur 2002; Mirowsky 1995; Shaw and Krause 2001). Although well-developed research showed that a declining sense of mastery across the life span, from younger adulthood to older adulthood, the current data on the oldest-old suggest that generalizing these findings to this age group is inappropriate. This inconsistent finding might be explained by a selectivity effect. That is, people with a lower sense of mastery might not survive to very late life, which is likely to confound other risk factors (e.g., physical illness or depressive symptoms). For example, the oldest-old who have a relatively high sense of mastery might have higher physical and psychological well-being compared to those with a lower sense of mastery, in turn living to very late life. As it is not possible to test this hypothesis with the current data of only oldest-old, further study is needed.

Third, following the stress process model (Pearlin 1989; Pearlin et al. 1981), we expected that psychosocial resources would play a crucial role in the stress process by mediating the impact of stress on depression. Given that many studies found this mediating effect in the relationship between stress and depression, it is perplexing that we did not find this consistently with both social and psychological resources using a sample of oldest-old elders. While we did not find this with social resources, we did find this when examining psychological resources. One possible reason for the lack of mediation using social resources may be related to measurement issues. That is, social support was measured by asking whether an individual had available social support for a certain occasion (e.g., short-term or long-term care), instead of measuring the network size (e.g., numbers of persons providing social support) as other studies report (e.g., Hobfoll et al. 2003). The inconsistent mediating role of mastery, another psychosocial resource, in the relationship between stress and depression might be due to the nature of stress. A faster increase in positive life events was associated with a faster increase in sense of mastery, leading to a slower increase in depressive symptoms among the oldest-old. For other types of stress (negative life events and hassles), psychosocial resources had no mediating effect. For example, positive life events that are focused on family matters affect personal control in a positive way. By contrast, possibly because hassles are ongoing and cumulative daily experiences, mastery may not be an appropriate coping mechanism with this type of stress. Our inconsistent findings suggest that the underlying mediating mechanism in stress process among the oldest-old may differ from those among individuals in other age groups.

There are several limitations to these findings that should be addressed. First, the study used a convenience sample of community-dwelling oldest-old. Given that the sample was collected in a Midwestern U.S. city (i.e., Cleveland, Ohio), generalization of the findings to elders living in rural areas or other metropolitan areas is limited. In addition, the sample did not include elders living in institutional or assisted living communities. By excluding these types of residents, the findings are limited to the people who live in the community and are

probably functioning better than their institutionalized counterparts. In addition, the sample was collected more than 20 years ago, which raises the issue of the relevance of the findings to today's oldest-old elders. While the items in the stress and hassle scale as well as social support are relevant to the current cohort of the oldest-old, it is not clear if this is the case without comparing the cohort from the 1980s used in this study with a current cohort of elders older than the age of 85. In addition, future research should consider including participants from heterogeneous geographical areas as well as different living arrangements to gain better representation among the oldest-old population.

Second, several measures have low reliability scores, indicating that the items included in these scales may not capture the concept that their authors originally intended to measure. Although most of the measures are acceptable for exploratory studies (greater or equal to .60; Nunnally and Bernstein 1994), they are not very rigorous. One issue might be the fact that these measures were normed using younger people and not elders who were very old. These age-insensitive measures in certain areas might limit the generalizability of the findings. For example, social support measurements might not capture the characteristics of the oldest-old, given that they were developed using a relatively younger population and were not replicated with the oldest-old population. In addition, the measure of available social support only asked if there was someone available for companionship and to provide assistance if necessary to varying degrees. In reality, this could be one person that provided the social support. Thus, future research should employ social support measurements that measure specific types of social interaction and network size.

Third, there are several issues with the measure of depression. As mentioned previously, the measure of depression was reconstructed due to a distribution problem. Because the results were based on numbers of symptoms of emotional distress, they do not reflect severity of symptoms. Furthermore, the items in the original scale reflect emotional distress and not the range of symptoms of depression. The structure of self-reported measures of depression was expanded in the 1990s and not reflected in the measure used for this article. Thus, future research should employ a measurement addressing both severity and numbers of depressive symptoms as well as a broader range of symptoms of depression.

Fourth, even though the study is longitudinal, causal relationships or directionality of the associations cannot be verified. The study examines how trajectories of stress and psychosocial resources predict a trajectory of depressive symptoms based on stress models (Hobfoll et al. 2003; Lazarus and Folkman 1984; Pearlin et al. 1981). However, it may be possible that the trajectory of depressive symptoms influenced the trajectories of stress and psychosocial resources. Further research needs to disentangle these possibly interwoven causal relationships.

Lastly, whereas previous research found a relationship between negative life events and depression, we did not. It should be noted that an alternate explanation could be that there were confounding elements within the scale that result in an insignificant relationship between negative life events and depression. Further examination using semistructured qualitative interviews to understand the background context is warranted (Brown and Harris 1982).

In spite of these limitations, the study contributes to our understanding of the stress process model and depression for a sample of very old people, with results differing from those reported by others who used older participants who were younger than the oldest-old. By employing multilevel modeling analysis methods, we discovered that stress as well as psychosocial resources and depression vary over time. Most important, when mastery increased for the oldest-old participant, depression decreased.

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Biographies

Hae-Sook Jeon is a full-time lecturer in the Department of Social Welfare at Kyungpook National University.

Ruth E. Dunkle is a professor of social work and codirector of the National Institute of Aging (NIA) training program in Social Research on Applied Issues of Aging and the Geriatric Fellowship Program at the University of Michigan.

Table 1

Items of Life Events and Daily Hassles (Worries)

	Items of life events	Items of daily hassles
Negative	Hearing loss	Concerns about health of family members
	Vision loss	Concerns about weight
	Family member's major illness	Sleep problem
	Major illness	Declining strength
	Significant injury	Not enough personal energy
	Change in sleep	Falling
	Change in eating	Declining physical ability
	Death of friend	Taking medication
	Death of family	Forgetting things
	Death of pet	Getting around
	Change in relation with relatives	Health in general
	Change in relation with child or grandchild	Physical appearance
	Give up control over money	Too much time on hands
	Change in financial status	Not enough time
	Sell house	Difficulties with friends
	Sell car	Difficulties with money
	Loss of favorite object	Difficulties with family
	Change in number of family get-togethers	Inner conflict
	Change in residence	Losing things
	Change in anyone living with you	Troublesome neighbors
	Age discrimination	Neighborhood crimes
	Change in church activity	Health of pet
	Travel	Care of pet
Change in recreation		
Stop driving		
Positive	Child birth in family	
	Marriage in family	
	Personal achievement of family members	
	Improvement in a family member's health	

Table 2

Descriptive Statistics for Sociodemographics and Key Variables

	Wave 1 (N = 193)		Wave 2 (N = 180)		Wave 3 (N = 164)		Wave 4 (N = 155)	
	N	%	N	%	N	%	N	%
Gender								
Female	147	76.2	142	78.9	130	79.3	124	80
Male	46	23.8	38	21.1	34	20.7	31	20
Race								
Whites	159	82.4	151	83.9	136	82.9	129	83.2
Blacks	34	17.6	29	16.1	28	17.1	26	16.8
Marital status								
Married	40	20.7	35	19.4	28	17.1	26	16.8
Not married	153	79.3	145	80.6	136	82.9	129	83.2
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Age	87.73	2.72	88.17	2.78	88.83	2.85	89.37	2.89
Education (1-8)	3.98	2.14	3.97	2.15	3.93	2.15	3.94	2.16
Depression (0-6)	1.23	1.37	1.52	1.63	1.56	1.58	1.71	1.79
ADLs (0-12)	11.38	0.97	11.28	1.11	11.34	1.09	11.3	1.12
IADLs (0-14)	11.93	1.99	11.47	2.59	11.66	2.42	11.54	2.45
NLE (0-25)	3.52	2.17	2.59	1.83	2.53	1.82	3.53	2.46
PLE (0-4)	0.60	0.77	0.46	0.65	0.42	0.63	0.87	0.90
Hassle (0-23)	3.85	3.02	3.54	3.81	4.26	3.77	6.54	5.40
Mastery (0-21)	12.27	3.44	12.88	3.32	13.58	3.83	12.99	4.00
ASS (0-5)	3.97	1.08	3.95	1.14	4.25	0.97	4.11	1.04
FSS (0-9)	6.57	1.74	6.99	1.41	7.01	1.41	6.52	1.99

Note: Education = 1 (0-4 years of education), 2 (5-8 years), 3 (9-11 years), 4 (high school), 5 (post-high school), 6 (1-3 years of college), 7 (college), 8 (postcollege), depression = (0-6, number of depressive symptoms); ADLs = Basic Activities of Daily Living (0-12, lower to higher function); IADLs = Instrumental Activities of Daily Living (0-14, lower to higher function); NLE = negative life events (0-25, number of negative life events); PLE = positive life events (0-4, number of positive life events); Hassles = (0-23, number of hassles); Mastery = (0-21, lower to greater sense of mastery); ASS = available social support (0-5, less to greater extent of social network); FSS = frequency of social support (0-9, lower to higher frequency of social support).

Table 3

Trajectories of Depression and Time-Varying Predictors

	<u>Intercept</u>	<u>Linear Change</u>
	<i>b</i> (<i>SE</i>)	<i>b</i> (<i>SE</i>)
Depression	1.27(.09)***	.03(.01)***
ADLs	11.29(.07)***	-.01(.00)*
IADLs	11.60(.16)***	-.03(.01)***
NLE	3.06(.11)***	-.00(.01)
PLE	0.57(.04)***	.01(.00)*
Hassle	3.26(.21)***	.15(.02)***
Mastery	12.78(.22)***	.04(.02)*
ASS	4.05(.07)***	—
FSS	6.77(.11)***	-.00(.01)

Note: ADLs = Basic Activities of Daily Living; IADLs = Instrumental Activities of Daily Living; NLE = negative life events; PLE = positive life events; ASS = available social support; FSS = frequency of social support.

[^]
 $p < .10$.

*
 $p \leq .05$.

**
 $p \leq .01$.

 $p \leq .001$.

Table 4

The Results of the Conditional Model

	Attrition Model	df	Background Model	df	Stress Model	df	Resource Model	df
LR: Diff of -2 × LL (df)	0.02	2	78.08	10 ^{***}	185.66	6 ^{***}	106.28	6 ^{***}
	b(SE)		b(SE)		b(SE)		b(SE)	
Random effects								
Intercept	1.27(.10) ^{***}		2.22(1.08) [*]		.96(.82)		1.57(.91)	
Linear change (LC)	.03(.01) ^{***}		.03(.02)		.01(.02)		.01(.02)	
Fixed effects								
Attrition ^a	.00(.25)		-.03(.25)		-.14(.20)		-.10(.20)	
Attrition × LC	.00(.03)		-.02(.03)		-.01(.03)		-.01(.03)	
Gender			.61(.22) ^{**}		.36(.18) [*]		.36(.18) [*]	
Gender × LC			-.01(.02)		-.00(.01)		-.01(.01)	
Race			.45(.24) [^]		.38(.20) [^]		.39(.20) [^]	
Race × LC			-.01(.02)		-.01(.02)		-.01(.02)	
Education (EDU)			-.01(.04)		-.22(.16)		-.23(.16)	
EDU × LC			.00(.00)		.01(.01)		.02(.01)	
ADL: between			.12(.11)		.09(.08)		.04(.08)	
ADL: within			-.18(.08) [*]		-.13(.07) [^]		-.12(.07)	
IADL: between			-.26(.05) ^{***}		-.16(.04) ^{***}		-.10(.04) [*]	
IADL: within			-.05(.04)		-.05(.04)		-.03(.04)	
NLE: between					-.03(.03)		-.00(.03)	
NLE: within					.02(.02)		.03(.02)	
PLE: between					-.17(.09) [*]		-.15(.09) [^]	
PLE: within					-.17(.07) [*]		-.11(.07) [^]	
Hassle: between					.28(.02) ^{***}		.25(.02) ^{***}	
Hassle: within					.13(.01) ^{***}		.08(.02) ^{***}	
Mastery: between							-.05(.02) [*]	

	Attrition Model	df	Background Model	df	Stress Model	df	Resource Model	df
LR: Diff of $-2 \times LL$ (df)	0.02	2	78.08	10^{***}	185.66	6^{***}	106.28	6^{***}
	<i>b</i> (<i>SE</i>)		<i>b</i> (<i>SE</i>)		<i>b</i> (<i>SE</i>)		<i>b</i> (<i>SE</i>)	
Mastery: within							-.05(.02) **	
ASS: between							-.04(.07)	
ASS: within							-.04(.06)	
FSS: between							-.02(.04)	
FSS: within							.01(.03)	

Note: LR = log likelihood ratio; Diff = differences; LL = log likelihood; ADLs = Basic Activities of Daily Living; IADLs = Instrumental Activities of Daily Living; NLE = negative life events; PLE = positive life events; ASS = available social support; FSS = frequency of social support; between = initial levels or status; within = individual change.

^
 p < .10.
 *
 p < .05.
 **
 p < .01.

 p < .001.