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**LATE-LIFE DEPRESSION: IN CONTEXT**

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by  
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## ABSTRACT

Depression is a common form of emotional distress that can significantly impact the health and well-being of older adults. Though depression has been found to be less common among older adults than younger age groups, there are certain stressful contexts where rates of depression are very high. This dissertation examines two stressful, social contexts: caregiving for a relative with dementia and the transition process to long-term care residency. A biopsychosocial approach is taken to examine biological, psychological, and social risk and protective factors that may be associated with depressive mood in these stressful contexts. Multi-level modeling is utilized to examine these risk and protective factors in association with depressive mood across time.

In Study 1, 175 older adults who transitioned from home to long-term care residency were studied across five measurement waves each spaced three years apart. Personal control variables, mastery and self-efficacy, which have previously been identified as protective factors for depression, were examined as covariates across the time-to/from transition continuum. Depressive symptoms increased linearly across the transition and the transition and adjustment periods showed significant between person differences suggesting heterogeneity following the transition. Mastery and self-efficacy significantly covaried with depressive mood across the waves such that an increase in control was associated with a decrease in depressive mood. Additionally, individuals' level of mastery prior to the transition was associated with differences in depressive mood during the adjustment period. These results suggest the importance of studying depressive mood in response to major life events and considering how risk and protective factors may influence individuals' responses to these events.

In Study 2, 164 family caregivers of individual's with dementia were examined with daily diaries assessing their mood, health, and care tasks over eight consecutive days. In addition caregivers collected five saliva samples daily. The aim of Study 2 was to assess the association of diurnal cortisol patterns with depressive mood and anger in the caregivers. In unconditional models, a blunted, mean-level cortisol awakening response (CAR) was associated with greater depressed mood and a below average variation in area under the curve (AUC) cortisol was associated with greater anger. In conditional models including daily stressors, a greater frequency of care-related stressors and poorer sleep quality were associated with depressed mood and anger. However, while the CAR association held with depressed mood, anger was no longer associated with AUC when additional predictors were included in the model. These findings indicate a strong association between the blunted cortisol patterns associated with chronic stress and negative mood in caregivers.

In conclusion, it is critical to examine biological, psychological, and social factors that may be associated with depressed mood in stressful contexts where individuals are at increased risk for the development of mental health problems. By fully understanding these contexts and associations, interventions may be forged to prevent or reverse the course of mental health problems that take away from a healthy and fulfilling late-adulthood.

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## CHAPTER 1. INTRODUCTION

### 1.1 Overview of the Problem

Thomas Sydenham (1676), an English physician, once claimed,

Nature, in the production of disease, is uniform and consistent; so much so, that for the same disease in different persons the symptoms are for the most part the same; and the self same phenomena that you could observe in the sickness of a Socrates you would observe in the sickness of a simpleton (paragraph 12).

While this statement holds a lot of validity, and much of the world's physical and mental disorder classification system is built around this premise, it may not be entirely correct to look at mental disorder in this way (Goldberg & Huxley, 1992). When studying mental illness, there are two levels of knowledge that need to be considered: knowledge about the brain, its physiology, mechanics, and etiology and knowledge about humans as social beings who interact within their environment. Patients present themselves to a physician because of experienced distress or dysfunction, and not the underlying etiology (Goldberg & Huxley, 1992). While it is commonly held that mental illness has an underlying neurochemical pathway that is likely consistent for many individuals, its expression is brought out by social factors and the symptomology may be perceived differently across social contexts, cultures and ages.

The debate over whether depression is a disease or form of psychological distress continues today. If one considers it simply a disease, then interest in remission and recovery is pursued and individuals are viewed as either having major depression or not. This pathological viewpoint which looks for organic or metabolic symptoms tends to be the stance to which psychiatrists subscribe. Social scientists, on the other hand, view depression commonly as a compilation of symptoms both physical and emotional. Symptom counts may be used to determine severity and while patterns of symptoms may exist, they are not necessarily universal (George, 2011). Depression is one such mental illness where the examination of both biological

and social factors is critical in understanding depression's etiology and symptom presentation as either a unitary or varying phenomenon.

In this dissertation I will suggest that depression should be examined from a biopsychosocial perspective given that it is a varying phenomenon in terms of predisposing risk and protective factors, etiology, and symptom presentation in late life. Risk and protective factors of late-life depression, specifically, will be examined in two papers. Further, each paper looks at middle aged to older adults in a distinct, stressful social context and follows the change in depression across different time continua. The first study follows older adults transitioning to and residing in a long-term care facility over a period of years, with an emphasis on the role two protective factors, an individual's level of mastery and self-efficacy, play in the development of depression. The second paper examines family caregivers (ranging in age from midlife to late adulthood) for an individual with dementia across eight days and highlights the role that cortisol, the stress hormone, in addition to other daily stressors, plays in influencing daily mood. In this introduction chapter, a review of late-life depression is presented first, followed by a discussion of the origins and predisposing factors of late-life depression, with particular emphasis placed on social-contextual predictors. Though the caregiving sample includes child caregivers in the middle adulthood years, the sample also includes older spousal caregivers and our long-term care transitioning sample exclusively includes older adults. Thus depression in the later adulthood years will receive the primary focus of the following literature review. Additionally it should be noted that while studies on clinical depression and depressive symptomatology will be reviewed below, the two empirical studies in this dissertation utilize depressive symptom scales and thus we can only make inferences about depressive mood and not diagnosable disorder.

## **1.2 Background and Literature Review**

Depression, which is characterized by a depressed mood and/or loss of interest or pleasure, is the most common cause of emotional distress in older adults and it has a profound impact on individuals' quality of life (Blazer, 2003; American Psychiatric Association, 2000). Rates of major depressive disorder among older adults in Western community samples range from 1 to 5 percent with rates of significant symptoms higher at about 10 to 25%. Rates are even higher in hospitalized and institutionalized settings (Beekman et al., 1995; Blazer, 2002b, 2003; Zarit & Zarit, 2007). Depression leads to immense personal suffering, possible social isolation and disruption of family relationships, disability, worse or more complicated outcomes for many medical disorders such as diabetes and cardiovascular disease, and it has been associated with weight loss in older adults (Alexopoulos, 2005; Blazer, 2003; Blazer & Hybels, 2005; Haynie, Berg, Johansson, Gatz, & Zarit, 2001). Individuals with late-onset depression, in particular, have been found to have greater medical morbidity, mortality, and neuroradiological abnormalities (Alexopoulos et al., 1997; Blazer & Hybels, 2005; Schulz, Drayer, & Rollman, 2002). Importantly, late life depression is thought to be a "causal" risk-factor of suicide with particularly high rates among Caucasian men (Blazer, 2003; Blazer & Hybels, 2005; Charney et al., 2003). Even minor depression may lead to problems with physical functioning, greater disability, poorer self-rated health, high health service use, high absenteeism from work responsibilities, poor perceived quality of life, and more suicidal ideations (Beekman, Deeg, Braam, Smit, & van Tilburg, 1997; Blazer, 2003; Meeks, Vahia, Lavretsky, Kulkarni, & Jeste, 2011).

Evidence of varying symptom and risk patterns can be found in examining depression across age of onset (Nelson, 2001; Zarit & Zarit, 2007). Though current DSM-IV criteria characterize depression with the same criteria of either depressed mood or loss of interest or

pleasure across all contexts and age groups; some studies have found that symptoms vary by age group (American Psychiatric Association, 2000). Late-onset depression, more often than early-onset, is associated with high apathy, agitation, pessimism, cognitive dysfunction (primarily difficulties with executive functioning, concentration, and mental processing speed), hypochondriacal symptoms, psychomotor disturbances, melancholia, guilt and feeling that life is not worth living (Alexopoulos, 2005; Blazer, 2003; Charney et al., 2003; Corruble, Gorwood, & Falissard, 2008; Gallagher et al., 2009; Zarit & Zarit, 2007). Individuals with late onset depression have also been found more commonly to have delusional symptoms (a psychotic feature), although this may have to do with the prevalence of psychotic depression seen in hospitalized older adults (20 to 45 percent) (Blazer, 2003; Meyers, 1992; Zarit & Zarit, 2007).

In addition to varying symptom pathology, there is speculation among researchers that the etiology of late life depression may be different in late-onset in part due to varying brain pathology. This belief is argued by those proposing the vascular depression hypothesis (depression as a result of vascular lesions in the brain) (Alexopolous, 2005; Alexopolous et al., 1997). Individuals with late-onset may have different risk factors than individuals with early onset (for example, biomedical risk factors such as family history are more prevalent for early onset cases) (Nelson, 2001; Zarit & Zarit, 2007). Furthermore, late-onset depression has been associated with cerebral atrophy, deep white matter changes, cognitive impairment, comorbidity with medical illness, and higher mortality than that of early onset (Nelson, 2001).

While theories regarding the etiology of depression often conclude that biological risk factors play a role, there is no consensus that one single factor common to all depression has been identified. Current research therefore often uses a biopsychosocial theoretical approach to examine multiple risk factors leading to depression. Many researchers endorse this framework

claiming that the onset and continuation of depression is a result of complex interactions between biological, psychological, environmental, social, and physical factors (Areán & Reynolds, 2005; Blazer & Hybels, 2005; Kuo, Chong, & Joseph, 2008). For example, psychological theories stress the loss of reinforcement and negative beliefs, which may be consequences of social stressors and loss, but can also enhance the effects of stress and loss on the development of depression (Blazer, 2002a). Given that it is multidimensional, the biopsychosocial approach covers all ages and cultures and therefore encompasses the study of late life depression in all social contexts. The biopsychosocial approach is also transactional; specifically, an individual's underlying biology may interact with social stressors and lead to depression, and whereas a pattern defining depression for one may be different for another individual.

The contribution of psychological, biological and social factors may be conceptualized using the developmental terms equifinality and multipotentiality (Gottlieb, 1996). Equifinality refers to a single outcome being derived from multiple pathways. For example, many different social stressors and life experiences, in combination with neurological and biological pathways, can lead to the same result of a depressive episode. Additionally, it is important to recognize the impact of multipotentiality, whereby one starting point may lead to many outcomes. For example, one stressor such as bereavement can lead to pronounced feelings of loss and depression that are difficult to recover from for one older adult and provide relief and the opportunity for growth leading to resilience to another (Bonanno, 2004). These terms help to exemplify the potential heterogeneity in depressive risk profiles. Given the belief in an interaction of underlying biology and psychological processes with social stressors, an examination of social contexts' impact on the development of depressive symptomatology within a biopsychosocial framework is justified.

The heart of the biopsychosocial model is the interplay between broad dimensions that give us a better understanding of a phenomena such as depression. Multiple processes and dimensions are associated with the risk for development of depression and studying only one dimension does not provide a complete perspective of this interplay. This dissertation takes the biopsychosocial approach in that both biological (measures of the stress hormone, cortisol), psychological (self-efficacy and mastery), and social (social stressors, social-demographic characteristics) factors are considered as predictors of depression in late-life. Both dissertation papers focus on a sample of adults in a distinct and stressful social-context: transition to long-term care residency (**Study 1**) and the caregiving for a relative with dementia (**Study 2**). Given this emphasis on studying depression in the context of two stressful settings, models and theories of the social, contextual origins of late-life depression will next be discussed in detail.

**1.2.1 Social Origins of Late-Life Depression.** It is widely accepted that social stressors and a lack of social support, without denying biological and psychological factors, are key predictors of late-life depression (Blazer, 2002a). Mental health is entrenched in a hierarchy of social systems from micro systems such as interpersonal, family, and social networks and macro systems such as social structures and culture at a higher level (Angel & Williams, 2000). These systems may have a profound impact on the development and expression of mental disorder. An understanding of bio-medical processes of mental health is certainly needed in making determinations, yet not sufficient alone to address the topic (Goldberg & Huxley, 1992).

In particular, a focus on social stressors as a type of social risk factor of late-life depression is commonly pursued for several reasons. First, older adults may experience a depressive episode for the first time following a social stressor. For example response to a significant loss has been discussed for many years as a primary risk factor for depressive illness

(Blazer, 2002a). Additionally, older adults experiencing a first episode of depression are less likely than younger adults to have had a family history of mental illness so it is believed that social factors and age related biological and neuropathological changes are the most probable causes (Blazer, 2002a). Older adults face unique changes and transitions in late life that may predispose them to risk for depression. For instance, although older adults have faced a lifetime of adapting to social stressors, there are particular events or stressors to which older adults' adaptability is challenged. Though older adults tend to experience less life events than younger adults, they are privy to specific types of life events and chronic stressors such as bereavement, chronic illness onset, caregiving for a relative with a chronic illness, and the transition to long-term care residency. Finally, older adults might be differentially susceptible to the effects of stress (Blazer, 2002a) and may experience heightened reactivity to these stressors (Almeida & Horn, 2004; Charles, 2010).

Social risks, life events, chronic stressors, and daily stressors are not specific to older adults. These stressors occurring in late adulthood, though, are a major cause of stress exposure and may precipitate the development of depressive symptoms (George, 2011). Social characteristics and roles are linked with stressors such as life events which can overwhelm mental and physical capacity of individuals, challenge coping ability, and lead to illness onset (George, 2011). Life events are distinct changes in an individual's life that can challenge one's ability to adapt and may lead to psychological distress (such as a transition to long-term care or loss of a loved one) (George, 2011). Chronic stressors are long-term situations that lead to extended difficulties with which individuals must cope (such as caregiving or living in poverty) (George, 2011). Daily stressors are normal hassles that come about in daily living that can be immediately stressful and lead to cumulative effects over time (such as care-related stressors that

come about in caring for an individual with dementia or having technical difficulties with a computer) (Almeida, 2005).

Both of the stressful, social contexts to be examined in this dissertation have elements which may allow them to be considered a negative life event, chronic stressor and/or containing daily stressors. For example, caregiving for an older adult relative with dementia is the most studied chronic stressor of late adulthood. As individuals often live with dementia for many years, caregivers find themselves in the care role for an extended period of time and must face the emotional toll the care role compounded with the loss of a close relative takes on a daily basis (Charles, 2010). Additionally the care they provide over time for their relative consists of many care-related stressors such as managing the behavioral and emotional problems of the individual with dementia on a day to day basis. The transition to residency in a long-term care facility may be viewed as a negative life event as individuals are facing the loss of their home environment in conjunction with loss of health and physical and cognitive capabilities (though it could also be viewed positively given the individual's perspective), or as a chronic stressor if the individual is not able to adjust adequately to his or her surroundings and feels as though his or her independence and autonomy is compromised. Before both social contexts are elaborated upon, a brief review of the association of negative life events, chronic stressors, and daily stressors with depressive symptoms, and an encompassing social precursor stage model, will be provided.

Empirical work has found that social risks and stressors predispose individuals to psychological stress. For example, the total number of life events an individual experiences over a span of time, as well as the total number of daily hassles confronted, has been found to be associated with depressive symptoms (Blazer & Hybels, 2005; Kraaij, Arensman, & Spinhoven,

2002). There may be no difference in the number of life events between depressed individuals and those without depression, though, individuals with depression tend to report a more negative impact of the events (Devanand, Kim, Paykina, & Sackeim, 2002). When a single life event is examined in relation to depression, effects may be more modest than when a count of total life events is compiled. Older adults (in comparison with young and middle aged adults), however, may experience heightened reactivity to these stressors (Almeida & Horn, 2004; Charles, 2010) making single life events important to study individually and not just as a total count. Additionally, the more the older adult views the event to be traumatic, uncontrollable, undesirable, disruptive, and enduring, the greater the possibility it will increase the presence of depressive symptoms due to conjuring feelings of hopelessness and fear (Bruce, 2002). It is unclear however, whether the greater reported impact of life events among depressed older adults is due to individuals making more negative events for themselves, experiencing actual vulnerability, or retrospectively expressing bias in reporting events (Devanand et al., 2002).

Limited research has examined within-person trajectories of change involving negative life events and depression as the majority of studies utilize cross-sectional data. Between-person analyses using cross-sectional data can only tell us whether individuals who have more negative life events have more mental health symptoms than individuals with less negative life events, whereas within-person analyses can display whether individuals who experience negative life events subsequently become more depressed (George, 2011). One study by Lynch and George (2002), however, assessed “loss events” (a death or serious illness of a close friend or family member) over six years in conjunction with trajectories of depressive symptoms. They found that an increase over time in loss events predicted an increase over time in depressive symptoms. In a similar vein, Bonanno (2004) found that some individuals displayed very little immediate

effects of bereavement or showed great resilience, while others became and stayed depressed. More research is needed utilizing within-person analyses in various negative life event or “loss event” contexts.

Though life events have been studied most extensively, acute/daily stressors and chronic stress have also been associated with psychological distress, daily mood and depression (Almeida, Wethington, & Kessler, 2002; Hammen, 2005; Hayden & Klein, 2001; Pillow, Zautra, & Sandler, 1996; Riso, Miyatake, & Thase, 2002; Rojo-Moreno, Livianos-Aldana, Cervera-Martinez, Dominquez-Carabantes, & Reig-Cerbrian, 2002). For example, family caregiving for an individual with dementia, which will be considered in the second study, is a commonly studied chronic stressor and also is a context filled with daily stress. Behavioral and emotional problems of the individual with dementia, a type of care-related daily stressor, are frequently cited by caregivers as distressing and have been associated with daily mood (Schulz, O’Brien, Bookwala, & Fleissner, 1995; Teri, 1997). Additionally, it has been found that older adults in comparison with younger adults have a stronger association between negative affect and daily stress (Mroczek & Almeida, 2004). As suggested previously, older adults may be more reactive to these stressors in comparison with younger adults (Almeida & Horn, 2004; Charles, 2010; Mroczek & Almeida, 2004).

**1.2.2 Social Precursors of Mental Illness: A Stage Model.** A number of theories exist regarding the development of depression and symptom patterns that lend credence to the study of late life depression in social context. While several theories relating to specific contexts will be discussed with the associated dissertation paper (e.g. theories of control), as previously stated, each of the stressful contexts to be examined carry social risk. The responsibility of family caregiving and the transition to long-term care may both be considered stressful life events

and/or chronic stressors which put individuals at increased risk for the development of depressive symptoms. Both Blazer (2002a) and George (2004) have proposed a similar stage model regarding social precursors of mental illnesses, such as depression, of which life events and chronic stressors are included. In George's model she presents six stages: demographic variables, early events and achievements, later events and achievements, social integration, vulnerability and protective factors, and provoking agents and coping efforts, with each subsequent stage a more proximate precursor of mental illness.

***I. Demographic Variables:*** The first stage consists of demographic factors, most commonly age, gender, and race, which have shown associations with depression and may serve as proxies for other social factors and may also relate to biological risk factors (George, 2004).

***II. Early Events and Achievements and III. Later Events and Achievements:*** Early events and achievements are any social experiences before the time of measurement, for example a childhood traumatic experience and educational attainment. Low levels of education, as an example, have been associated with more depressive symptoms in older adults (Kubzansky, Berkman, & Seeman, 2000; La Gory & Fitzpatrick, 1992; Mitchell, Mathews, & Yesavage, 1993) and may serve as a better indicator than income as the causal direction is clearer. Early negative life experiences such as childhood trauma may lead to more stressful life experiences in adulthood. Later events and achievements that have been associated with depression include family relationships, economic achievements, socioeconomic status, and marital status (George, 2004). Low social economic status (SES) and social stature, for example, can lead to reduced access to resources and greater stress exposure. Individuals from a low social status may also have lower levels of psychological resources leading to greater vulnerability to stress (George, 2011). Lower education attainment and SES are also predictive at all age levels (though better

predictors at midlife than late-life) (Blazer, 2003; Blazer & Hybels, 2005; Koster et al., 2006; Kraaij et al., 2002; Vink, Aartsen, & Schoevers, 2008).

**IV. Social Integration:** Social integration may include an individual's personal relationship with formal parts of social order such as religious affiliation or social integration at the more aggregate level such as neighborhood stability and economic conditions. Lack of integration can create stress and inhibit an individuals' ability to cope (George, 2004).

**V. Vulnerability and Protective Factors:** Vulnerability and protective factors are an individual's vulnerabilities and assets that can affect one's probability of developing mental illness. Chronic stressors such as poverty, chronic illness, disability, and family caregiving are common examples of vulnerabilities (George, 2004). As an example, caregiving for a friend or relative with dementia is a chronic stressor that many older adults inhabit which has consistently been shown to be associated with depressive symptoms and Major Depressive Disorder (MDD) (Cuijpers, 2005; George, 2011; Pinqiart & Sorensen, 2006). Family members who are called upon to care for a relative with dementia find themselves living in an emotionally turbulent atmosphere of ups and downs as they must commonly care for their relative with dementia for many years. Researchers have found that emotional difficulties are more problematic as an issue for caregivers than financial or physical aspects of the care role (Gallagher, Wrabetz, Lovett, DelMaestro, & Rose, 1989). For example, research on family caregivers has revealed that they often suffer from decreased well-being, anger, depression, anxiety, guilt, a sense of being trapped, a feeling of loss, and health and medical problems (Aneshensel, Pearlin, Mullan, Zarit, & Whitlatch, 1995; Hinrichsen & Zweig, 1994; Zarit, 2008). In fact, caregiving is likely the most studied chronic stressor in relation to depression (George, 2011). Two recent meta-analyses showed that between 22 to 33 percent of caregivers meet criteria for major depressive disorder

themselves, with an even greater number of caregivers reporting non-clinical, but high levels of depressive symptoms. These rates are significantly higher than rates found in the general population (Cuijpers, 2005; Pinqart & Sorensen, 2006).

Social support, on the other hand, is the most widely studied protective factor (operationalized as the size and structure of the network, actual instrumental support provided, and/or an individual's perceptions of the support they received). In contrast, older adults who are less socially engaged are likely to be more depressed (Blazer, 2002a; Blazer, 2003; Charles, 2010). Social support can also be a risk if the support is suddenly taken away, such as through the death of a spouse or close friend (Blazer & Hybels, 2005; Vink et al., 2008), as is discussed in the next and final stage of George's model.

***VI. Provoking Agents and Coping Efforts:*** Finally provoking agents include sudden stressors such as life events. Thus this final level in the social precursor stage model is more specific and proximate relating to risk of developing depression than the prior stages which are more general. The total number of life events and specific life events have both been examined. Specific events include bereavement which is believed to place individuals at a particularly high risk for depression, particularly if it is a traumatic event and leaves the older adult isolated (Areán and Reynolds, 2005; Bruce, Kim, Leaf, & Jacobs, 1990; Green et al., 1992; Surtees, 1995) and the cessation of driving (Fonda, Wallace, & Herzog, 2001). Additionally, coping efforts are more specific than protective factors in that they are targeted towards a particular social stressor.

Though social stressors at higher levels of the stage model are believed to be more proximate in leading to depression, social stressors at varying levels may interact to lead to depression. For example, factors like education and income may help individuals attain adaptive

coping styles or may expose individuals to certain unhealthy or risky environments that may impact the development of mental illness. Additionally, chronic stressors and life events may impact an individual's social support. Retirement, for example, may include a physical relocation in addition to a change in daily routine and facing chronic disease may impair an individuals' ability to interact socially with friends in addition to the physical toll it takes (Kahn, Hessling, & Russell, 2003). This dissertation primarily focuses on chronic stressors, life events, and daily stressors which are found at the more proximal vulnerability and provoking agent stages of the social precursor model, but also considers the impact of social factors at earlier stages such as demographic characteristics, as well as psychological and biological risk and protective factors.

Given the prevalence of depression in the lives of many older adults and the negative impact of depressive symptoms on their mental and physical health, it is critical to consider how various contexts in which older adults may reside and interact are impacting symptom development risk. In particular, this dissertation will look at depression in two highly stressful, social contexts as they may affect and apply to the aging population: first, how mastery and self-efficacy are associated with change in depressive symptoms across the transition to long-term care residency (**Study 1**); and the relation of a biomarker of the stress process, cortisol, with and psychological responses among family caregivers for individuals with dementia (**Study 2**). **Study 1** will examine longitudinally individuals transitioning from home into long-term care residency in the Netherlands, and assess how mastery and self-efficacy may covary with the change in depression across this transition. **Study 2** will utilize daily measurements of salivary cortisol and self-reports of mental health symptoms to see the association of depression and anger with trajectories of cortisol and care-related stressors across eight days among family

caregivers of individuals with dementia. Each chosen social context may be considered stressful for a variety of reasons and the prevalence of depressive symptoms amongst older adults within these settings has been found to be high (Dura, Stukenberg, & Kiecolt-Glaser, 1991; Gallagher, Rose, Rivera, Lovett, & Thompson, 1989; Parmelee, Katz, & Lawton, 1992; Schulz, O'Brien, Bookwala, & Fleissner, 1995; Watson, Garrett, Sloane, Gruber-Baldini, & Zimmerman, 2003). Each context will be introduced in greater detail with its' associated study.

Both of these contexts presents unique risk and protective factors, in addition to risk and protective factors inherently brought to the context by the individual, that may as a consequence be leading to or protecting individuals from the development of late-life depression. With a clearer understanding of social contexts and the various risk factors associated with them and to the development of depressive symptoms, we can better know whether standard treatment and intervention models for older adults with depression should be supplemented with context specific interventions that regard the unique risk and protective factors of these settings. Ultimately if the social context is not fully understood and considered in treatment models, older adults may not be able to permanently recover from the symptoms they are experiencing. This dissertation critically considers research regarding depression amongst older adults in various cultures and contexts with the aim of shedding light on how depression varies over time and across stressful, social contexts.

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## CHAPTER 2. STUDY 1

### The Association between Control and Depression across the Transition to Long-Term Care

#### Abstract

The current study examines the association of mastery and self-efficacy with depressive symptoms in older adults transitioning to a long-term care institution across a time-to/from the transition continuum. Older adults in long-term care settings have been found to have high rates of depressive symptoms, and the transition to residency has been cited as a particularly critical period for mental health adjustment. While mastery and self-efficacy are commonly viewed as protective factors for depression, they may be jeopardized in long-term care settings where little personal control may be asserted. Utilizing a multiphase growth curve model, we examined the change in depressive symptoms across the time-to/from the transition, and how within-person fluctuations in control and between person differences in pre-transition perceptions of control were associated with this change. This approach may further help to link personal control with changes in depression across an extended period of time and a critical transition trajectory. The association of mastery, self-efficacy and depressive symptoms was examined for individuals (N=175) transitioning from home into a long-term care institution across five waves of measurement each separated by three years. Participants were primarily female (65%) with a mean age of 77.44. First a growth curve model was run with depressive symptoms (assessed by the CES-D) predicted by three time slopes: linear time across the transition with the wave closest following the transition centered at zero, and two dummy coded variables for the effect of the transition and the adjustment period. Next within-person levels of mastery and self-efficacy were included at level 1, and finally a conditional model including both within-person and between-person levels of mastery and control, in addition to demographic control variables were included. The fixed effect linear slope for time was significant such that change in depressive symptoms across the transition was best defined by a steady increase, though there was significant between-person variation in the effects for the transition and adjustment periods. Mastery and self-efficacy significantly covaried with depressive symptoms across waves. Finally, the pre-transition level of mastery was associated with the level of depressive symptoms at the transition and change across the adjustment period such that individuals with lower

mastery prior to the transition were more likely to be depressed at the transition and have a steeper increase in depressive symptoms across the adjustment period. Findings indicate that on average depressive symptoms begin to increase long before the transition to long-term care and may continue to increase after the transition, although there is between-person variability. Furthermore, consistent with vulnerability theories of depression, mastery and self-efficacy have strong associations with this change suggesting that interventions should target these beliefs both prior to and following the move to a long-term care setting. Future work should consider additional factors that influence mastery and self-efficacy both pre- and post- placement into a long-term care facility. These associations suggest a need to study major life transitions and events over an extended period of time and consider how risk and protective factors may differentially impact individuals across the event/transition trajectory.

***Keywords:*** depressive symptoms, mastery, self-efficacy, long-term care, transition, adjustment

## 2.1 Background and Literature Review

Developmental theorists have often suggested that human development may be defined by the occurrence of major life events and transitions, rather than by chronological age alone (Baltes & Nesselroade, 1979; Birren & Cunningham, 1985; Elder, 1985; 1998). One major transition faced by many individuals in late life is from familiar home environments to a long-term care residence. There are numerous factors that may play a role in the decision to transition to long-term care such as increased disability, impaired cognition, loss of a spouse or lack of other family support, the desire for convenient health care and promise of a secure future environment (Acheterberg, Pot, Kerkstra, and Ribbe, 2006; Lee, Woo, & Mackenzie, 2002). Both qualitative and quantitative studies have found the transition and adjustment process to long-term care to be associated with reduced independence, lower quality of life, and increased depression (Acheterberg et al., 2006; Lee et al., 2002; Pot, Deeg, Twisk, Beekman, & Zarit, 2005; Wilson, 1997).

Although depressive symptoms have typically been found to be lower among older adults than younger age groups, rates of symptoms are much higher among residents of long-term care institutions (such as nursing homes and assisted living facilities). In institutional populations, major depression has a prevalence of 12 to 14% and minor depression/clinically significant symptoms have a prevalence of 17 to 35% (Alexopoulos, 2005; Blazer, 2003; Parmelee, Katz, & Lawton, 1992; Smalbrugge, Jongenelis, Pot, Beekman, & Eefsting, 2005). Pot et al. (2005) found that individuals who were institutionalized scored 79% higher on the Center for Epidemiologic Studies Depression Scale (CES-D) compared to individuals receiving no care. Those receiving professional home care scored 39% higher and those receiving informal care

scored 7% higher compared with individuals receiving no care. These findings suggest the interplay of disability, loss of control, and institutionalization on depression.

In a longitudinal study over the course of one year, Parmelee and colleagues (1992) found that 32% of their sample of nursing home and “congregate” housing residents had some symptoms of depression at baseline (half of the sample was newly admitted and half had lived in the facility for at least six months at the baseline interview) with twice as many nursing home residents displaying major depression than individuals living in the “congregate” home/apartments. Of the sample, 7.6% developed major depression one year later (this incidence was higher among individuals with minor depression at baseline). Additionally, 6.3% had developed minor depression leading to an overall incidence rate of 11.9%. Interestingly, there was no significant difference in incidence among nursing home residents and congregate housing residents, though congregate housing residents depressed at baseline were significantly more likely to show remission of symptoms one year after the baseline interview (Parmelee et al., 1992).

High rates of depressive symptoms are partially a consequence of physical and functional disability. While disability and disease are common predictors leading to depression and may be a primary reason why the transition to long-term care is initiated (Acheterberg et al., 2006), there are a number of other factors which influence the high prevalence of mental disorder and symptoms seen in institutions. For example, aspects of admission to and residency in long-term care facilities may put older adults at particular risk for depression. These transition-related feelings and experiences include a loss in autonomy and faith in personal abilities, loss of possessions such as one’s home and familiar environment, abandonment by one’s family, a reduction in the pleasant activities experienced, and feelings of vulnerability, dependency or

displacement (Achterberg et al., 2006; Lee et al., 2002, Patterson, 1995). Accordingly, seminal theorists Lawton and Simon (1968) suggest that as competency declines with aging, behavior may be accredited more to environmental, rather than personal variables and thus the institutional environment may have particular salience and implications for mental health and well-being among older residents (Pruchno & Rose, 2000). Several aspects of the transition process to long-term care may lead to increased risk of depression among older adults.

### **2.1.1 The Transition and Adjustment Process.**

Depression an initial risk factor for long-term care admission and the transition may trigger or exacerbate depressive symptoms (Hoover et al., 2010). Effects of the transition to long-term care residency on mental health may be seen as soon as anticipatory thoughts about long-term care begin, when the decision is made for placement, and through 3 to 6 months into the adjustment period of residency (Patterson, 1995). Older adults who were on waiting lists for admission had less emotional responsiveness, poorer cognitive facilities and a lower self-image. Anticipatory fears were also expressed regarding the quality of care, their quality of life, the cost of care, the role of their family in the new facility, and social stigma (Lee et al., 2002).

Past research on assisted living and nursing home facilities has suggested that this period from anticipation to six months into residency is of greatest importance for successful adjustment, mental health, and well-being (Lee et al., 2002; Patterson, 1995). Snowdon and Donnely (1986), for example, found that scores on the Geriatric Depression Scale (GDS) were significantly higher for individuals who had been in a nursing home less than 3 months in comparison with individuals residing from 3 months to 2 years, and more than 2 years. One study (Boyle et al., 2004) found that of individuals who weren't depressed pre-admission, twelve percent had depression shortly after admission with another study finding an incidence rate of 20

percent over the first year of residency (Hoover et al., 2010). Hoover found that the incidence was greater at 1 to 3 months of residency than at 10 to 12 months, providing additional support for the initial months of residency as a critical period. Similarly, Acheterberg and colleagues (2006) found that among residents of long-term care institutions in the Netherlands, the prevalence of more than three depressive symptoms was 26.9% for all newly admitted residents and was highest for individuals coming from their own home (34.3%) as opposed to residents coming from another care setting or hospital. For residents relocating from their own home, this transfer may be viewed as a “downgrade” in living arrangements and a forfeiture of one’s independence. Individuals transferring from hospitals or other facilities, on the other hand, may view their stay as only a temporary relocation (Achterberg et al., 2006).

Transitioning to long-term care involves discontinuities to one’s lifestyle such as changing one’s home environment, daily routine, and leaving social support networks (Lee et al., 2002). These discontinuities may lead to a destabilization of routine and support that was once protective of the development of mental illness. In contrast, Keister (2006) found that cognitive appraisal of the transition may also serve as a protective factor. If individuals viewed the transition as a challenge and as a way to grow, it was associated with lower anxiety and depression symptom scores upon residency.

Finally, adjusting to institutional living and the institutional setting itself may put residents at risk for depression. Adjustment is the term for how successfully individuals can work through the demands of the transition and become thriving members of the new care home community (Lee et al., 2002). Unfortunately, many institutional settings have ingrained qualities which make the adjustment period difficult. In many institutions, new residents must still adjust to the public aspect of care facilities and a lack of privacy, the amount of new restrictions to their

free choices, difficulties with staff, a sense of powerlessness or loss of autonomy and increased dependency on others (which will be further described), and possible deficiencies in the care they receive (Lee et al., 2002; Pot et al., 2005; Snowdon & Donnelly, 1986). Loss in these ways leads to a disruption in the continuity and validation of self, lower self-esteem, and increases the risk for depression (Snowdon & Donnelly, 1986). Having time to assert one's preferences in selecting a facility and the degree to which the institution meets the individuals' expectations, on the other hand, have been associated with greater well-being and adjustment (Keister, 2006). Despite the above listed issues prevalent in long-term care institutions today, it is important to note that these facilities are not "one size fits all" and many outstanding institutions exist which encourage culture change, individualized care, and psychological well-being. Psychological constructs of autonomy, independence, and control may further impact this transition process for older adults.

### **2.1.2 Autonomy, Independence, and Control**

A concern regarding the care of older adults presented by gerontologist Robert Kahn (1975) who conducted seminal research in the area is the disruptiveness to one's independence that care often causes. Based on this premise, he proposed "the principle of minimum intervention" claiming that the most effective type of treatment would be that which interferes as little as possible with an individuals' typical and ordinary level of functioning. Based on this principle, institutional models which commonly hold a "medical" rather than an "individualized" model of care may be viewed as leading to great interference to one's ordinary functioning and as a consequence reduce autonomy and increase dependence.

Following suit, autonomy and independence play a large role in contemporary theories of depression. Autonomy and independence have been closely linked with personal control in late

life (personal control taking on many names including primary and secondary control, locus of control, mastery, and self-efficacy) (Skinner, 1995; Zarit & Braungart, 2007). In the current study, the constructs of mastery and self-efficacy will be examined. In particular, mastery has been defined by Pearlin and Schooler (1978) as an individual's belief in his or her capacity to control the circumstances of one's life as opposed to them being controlled by others or outside the individual's control. Similarly, self-efficacy relates to an individual's belief that he or she has the capacity to achieve desired goals and activities (Bandura, 1997; Rowe & Kahn, 1998). Both an individual's belief in his or her control over circumstances and desired goals/activities may be challenged in the wake of increasing individual disability and a transition to a care environment where individuals have little opportunity to assert their independence.

A psychological theory that helps relate these concerns to long-term care residency is Lawton's (1986) theory of person-environment fit. Lawton asserts that individuals need an environment that matches their capabilities. The theory has two major hypotheses: that congruence between environment and competencies allows for optimal behavior and that this person-environmental fit leads to greater well-being and psychological adjustment (Lawton, 1986; O'Connor & Vallerand, 1994). If the demands of the environment are too high for an individual's capabilities, the individual will not be able to meet the demands and this frustration will lead to increased stress and depression. Additionally if demands are too low for an individual's abilities (such as an institution that over-structures care allowing little freedom to assert one's own capabilities), boredom and negative affectivity may result (Lawton, 1986).

Relating to person-environment fit within an institutional setting, Parmalee and Lawton (1990) developed a principle around long-term care facilities termed "the autonomy-security dialectic". Parmalee and Lawton argue that both autonomy and security are basic human needs,

but due to regulations at institutions, there tends to be a greater focus on ensuring institutional security at the cost of an individual's independence and control. This lack of balance, however, between autonomy and security is harmful for an individual since a fundamental need of autonomy is not being fulfilled.

Furthermore, Seligman's (1975) theory of learned helplessness and depression argues that an individual's perception of lacking control over environmental events leads to passivity and dysphoria, based on the belief that action would be futile. Thus Seligman believed that hopelessness was the fundamental factor leading to depression (Blazer, 2003; Maiden, 1987). Similarly Pearlin, Nguyen, Schieman, & Milkie (2007) have found that the most challenging stressors are those which are unrelenting and in the areas most significant to the individual's life. Such a stressor may include increased dependency and helplessness formed from a lack of control in an institutional setting. Developmental psychology has emphasized that autonomy and control are fundamental elements contributing to well-being (Parmalee & Lawton, 1990; Zarit & Braungart, 2007). The loss of control in adjustment to institutionalization leads to increased mortality in addition to other negative outcomes (Schulz & Brenner, 1977). Furthermore, all of the aforementioned theories suggest that a lack of autonomy and independence, in parallel with increased dependency will lead to problems in adjusting psychologically to the institutional environment. Empirical studies lend credence to these claims.

Foundational theorists Brown and Harris (1978) and Goldberg and Huxley (1992) list low levels of mastery and self-efficacy as personality vulnerability variables leading to risk for depression. For example, negative experiences are most predictive of depression when they relate to a perceived personal vulnerability (Blazer, 2003). Similarly in an application of Baltes' Selective Optimization with Compensation theory (which posits that older adults face aging

declines by selecting goals, optimizing their ability to meet those goals, and developing strategies to compensate for their decline; Baltes & Baltes, 1990), Lockenhoff and Carstensen (2003) found that individuals may give up control in some areas so they can maintain control in their most valued areas thereby averting as much vulnerability as possible. Blazer (2002) proposes the promotion of self-efficacy as a primary prevention strategy for depression in older adults. In correspondence with these theories it is believed that the ability to exert control on one's behaviors and surroundings is an adaptive behavior associated with greater psychological well-being (Zarit & Braungart, 2007).

O'Connor and Vallerand (1994) found that nursing home residents who were highly self-determined had better psychological adjustment when their nursing home allowed them more autonomy and choice in their daily life, than they did in nursing homes that did not emphasize self-determination. O'Connor and Vallerand suggest that care facilities should keep the level of environmental challenge slightly higher than one's motivation such that autonomy is encouraged without creating too much disparity in person-environment fit. In correspondence with this suggestion, at one week post-relocation to a nursing home, Keister (2006) found that both level of anxiety and depression were significantly predicted by mastery and challenge appraisal. Thus individuals with greater mastery and a view of the move as a challenge were less depressed.

Finally, in comparing the prevalence of anxiety and depression among nursing home patients to studies of community samples of older adults, Smalbrugge and colleagues (2005) found a higher prevalence of depression and lower prevalence of anxiety disorders. The researchers suggest that the nursing home environment may explain these differences. For example, the nursing home structure and high level of care may make residents feel safer and thus less anxious, however, at the same time the environment may stifle feelings of control and

activity thus leading to feelings of depression (Smalbrugge et al., 2005). In conclusion, both theoretical assumptions and empirical findings suggest that individuals with greater autonomy and control in the institutional setting are protected from negative outcomes such as depression, though the loss of control in these settings may put them at increased risk for symptom development.

## **2.2 Research Questions**

The current study focuses on the longitudinal change in depressive symptoms across the transition to long-term care institutions. We aim to see whether change in depressive symptoms may covary with an individuals' level of control using five waves of data from the Longitudinal Aging Study Amsterdam (LASA). The current study provides a new and more comprehensive approach to the study of longitudinal change in depressive symptomatology by examining changes that unfold before, closely following, and long after the transition to long-term care, and whether the context of a long-term care transition affects these change processes. This paper also builds on Brickman & Campbell's (1971) hedonic adaptation model which posits that an individual's well-being declines in the face of misfortune, but is restored once he or she adapts to the situation. Further based on the prior theoretical and empirical review, it is expected that individuals who are lower in mastery and self-efficacy would have a higher levels of depressive symptoms. However, it may be that individuals with high pre-transition control have higher CES-D scores at the time of the institutional care transition, where control is most threatened but necessary for continued well-being.

Two main research questions are proposed. First, *how do depressive symptoms change along a time-to/from the transition to long-term care axis?* Using 5 waves of longitudinal data assessing older adults in the Netherlands, a multiphase growth curve model will be applied to

examine changes in depressive symptoms in the years before the long-term care transition, the years around the transition (i.e., the occasion of measurement at which a care transition was first reported), and in the years following the care transition. Given past research on depression surrounding the long-term care transition, it is hypothesized that depression will increase prior to the transition to long-term care through the time of transition, and level off in the following years as individuals adjust to their new residence.

Second, *how are within-person variations and between-person differences in control factors, namely mastery and self-efficacy, associated with long-term care transition-related change in depressive symptoms?* Mastery and self-efficacy are targeted because they are known protective factors for depression, yet may be compromised in institutional settings where individuals are unable to assert full control of their environments. Similar to O'Connor and Vallerand's (1994) findings on individuals with high self-determined motivation adjusting more poorly in nursing homes that don't allow opportunity for personal choice, it may also be that individuals with high mastery and self-efficacy prior to the transition have greater depression following the transition to an institutional environment where little autonomy is offered. Both between-person and within-person associations of mastery and self-efficacy with depressive symptoms will be examined to test this research question. If mastery and self-efficacy are found to be associated with individuals' depressive symptoms (i.e. CES-D scores) across the care transition trajectory, interventions may promote these psychosocial resources (Blazer, 2002). In this way it may be shown that not all individuals must face a decrease in well-being in correspondence with the "misfortune" of a care transition as Brickman & Campbell's hedonic adaptation model suggest. A promotion of self-efficacy and mastery may help individuals adjust

across the transition trajectory and reduce the increase in depressive symptoms commonly seen in the transition to long-term care.

## **2.3 Methods**

### **2.3.1 Sample**

Participants in this study were drawn from the ongoing Longitudinal Aging Study Amsterdam (LASA) that examines cognitive, emotional, physical and social functioning among a nationally representative sample adults aged 55 to 85 (in the baseline interview) (Deeg, Knipscheer, & van Tilburg, 1993; Huisman et al., 2011). Participants were drawn from three geographic regions to ensure true representation of the older population and were recruited using information from population registries. More detail on sampling procedures can be found in previous publications (Beekman et al., 1995; Beekman, Deeg, van Limbeek, Braam, & De Vries, 1997; Pennix et al., 1999). All participants gave their informed consent prior to the study per The Netherlands legal requirements. At the time of the initial main interview (1992-1993), the sample was age and gender stratified and consisted of 3,107 older adults. Participants were re-interviewed every three years with 5 measurement occasions currently being available.

Given the current study's focus on changes in depressive symptoms across individuals' transition to long-term care, we only examine individuals who moved into a form of long-term care during wave two through five, so pre-transition levels of depressive symptoms could be included in analyses. Participants were included in the sample if they moved from an independent residence into a residential home ("home for the aged"; a type of institutional care offering ADL care but less medical care than a nursing home) or nursing home (somatic and psychological) during wave two, three, four, or five. After narrowing the sample, participants were further excluded if they indicated moving back to a non-institutional setting following an

institutional transition ( $n = 8$ ). After applying the eligibility criteria, 175 participants were included in analyses. At baseline, sample participants were on average 77.44 years of age ( $SD = 5.89$ ), 65.1% were women, 99.4% were of Dutch nationality, and 74.1% had received a lower vocational education or less (i.e. elementary education or elementary education not completed). Individuals moved across the four waves of measurement with 30.3% at wave two, 28.0% at wave three, 21.7% at wave four, and 20.0% at wave five.

Selectivity effects were examined by using t-tests and chi-square tests to compare the subsample of 175 participants against those in the sample who did not make a housing transition at baseline. See Table 1 for a full sample comparison. The analyses showed that participants who experienced a housing transition did not differ in nationality, but did differ on gender, age, and education level. The subsample of individuals who transitioned to long-term care and were used in this study consisted of more female, older and less educated individuals. The samples also differed in regards to CES-D score, mastery, and self-efficacy at baseline. The transitioning group had higher initial depressive symptom scores, and lower mastery and self-efficacy scores. These significant differences likely are impacted by the large sample size and the fact that as more disabled individuals are most likely to transition into long-term care, it is possible that increasing disability and poor health were already affecting scale scores.

### **2.3.2 Measures**

**Outcome.** *Depressive symptoms* were measured at each wave using the Center for Epidemiologic Studies Depression (CES-D) scale (Radloff, 1977). This self-report scale consists of 20 items (e.g. *I thought my life had been a failure, I felt sad*) on a 4-point scale (from 0 = rarely or none of the time to 3 = most or all of the time) with a total score range from 0 to 60 with a higher score indicating more depressive symptoms. The CES-D has been used

extensively with older populations and has been found to have good reliability and validity (Beekman, Deeg, Braam, et al., 1997; Berkman et al., 1986; Foelker & Shewchuk, 1992; Radloff & Teri, 1986). The reliability was also strong in the current sample ( $\alpha=.87$  at baseline).

**Covariates: Within-Person (Wave Specific).** *Mastery* was assessed at each wave using a 5-item (all negatively worded) abbreviated version of the Pearlin Mastery scale (e.g. *I have little control about things that happen to me, Some of my problems I can't seem to solve at all.*) (Pearlin & Schooler, 1978). Participants rated the extent they felt in control of their life using a 5-point Likert scale (1 = strongly agree to 5= strongly disagree) such that a higher score indicates greater mastery ( $\alpha=.61$  at baseline). An item analysis was run for the scale to see if the removal of a particular item would improve the scale alpha, however, removing an item did not improve the reliability and thus the full measure was used.

*Self-efficacy* was assessed at each wave using the Dutch version of the General Self-Efficacy Scale (GSES-12), the ALCOS (Bosscher & Smit, 1998; Sherer et al., 1982). Based on pilot work by Bosscher, Laurijssen, and Boer (1992), the LASA study excluded five items from the original GSES due to unclear wording. Sample items include: *If I make plans, I am convinced I will succeed in executing them and even with unpleasant tasks I hold on until I am finished.* Participants rated their ability to execute behaviors and achieve specific goals on a 5-pt Likert scale (1 = strongly disagree 5= strongly agree). Negative scale items were recoded such that a higher score equals more positive self-efficacy (range 12-60) ( $\alpha=.69$  at baseline). Both mastery and self-efficacy were included as person-mean centered scores at the within-person level. The mastery and self-efficacy scales were correlated at .45 ( $p < .01$ ).

**Covariates: Between-Person (Person Specific).** Mastery and self-efficacy were included as between-person predictors specifically at the pre-transition level (wave -1) to assess

whether control prior to the transition predicted the level of depressive symptoms at the transition. Three demographic variables which have previously been found to be associated with depression were also included as covariates in the analysis: age at the time of transition, gender, and highest level of education (education consisted of 9 categories increasing in level from 1 = no education to 9 = an advanced degree). Female gender and lower education have been associated with risk for depression. Studies examining age and depression are mixed with some showing a negative association and others reporting a curvilinear association with the oldest-old being at greater risk for depression than the young-old (Akhtar-Danesh & Landeen, 2007; Cole & Dendukuri, 2003; Haynie, Berg, Johansson, Gatz, & Zarit, 2001; Koster, 2006). All between-person covariates were grand-mean centered scores.

**Time metric of time-to/from-placement.** At each wave of the study, participants indicated whether they had moved since the last interview and the type of housing in which they were currently residing. CES-D scores were realigned in regards to the wave most closely following their move (i.e. centered around the transition with wave 0 closest following the transition point) such that changes in depressive symptoms could be examined prior to and following the transition. It is important to note that participants may have moved any time during the 3 year interval between measurement waves. On average, participants moved 13.69 months prior to the interview wave they reported a change in housing ( $SD = 10.14$ , range 0 – 38 months). Therefore, measurement error exists as participants were not measured at their exact time of relocation. To control for this in the analyses, months since relocation (grand-mean centered with a higher number indicating a transition closer to the interview) will be used as a between-person (level 2) covariate.

### **2.3.3 Analysis Plan**

A primary goal of this paper is to establish a transition model regarding within person changes in depressive symptoms, yet that also examines between-person differences in longitudinal change (see Fauth, Gerstorf, Ram, & Malmberg, 2012; Infurna, Gerstorf, & Zarit, 2012). To analyze the change in individual's depressive symptoms in a time continuum to-/from the transition, we utilized a multi-phase growth curve model. Growth curve models are a beneficial approach in examining longitudinal change as they take into account individuals' trajectories as opposed to mean values at each measurement occasion. Furthermore, given the commonality of missing waves of data among individuals in longitudinal measurement, growth curve models utilize all waves of data that are available for an individual in the model (Raudenbush & Bryk, 2002; Singer & Willett, 2003).

As an initial step, we calculated an unconditional means, no-growth model including no predictors of depressive symptoms over time. From this model we can determine the amount of variability in depressive symptoms at the between-person level and within-person level (an intraclass correlation statistic; ICC). The unconditional means, no-growth model is specified as:

$$\begin{aligned} \text{Level 1: Depressive symptoms}_{it} &= \beta_{0i} + e_{it} \\ \text{Level 2: } \beta_{0i} &= \gamma_{00} + u_{0i} \end{aligned} \quad (\text{Model 0})$$

Where person  $i$ 's level of depressive symptoms at time  $t$ , is a function of an individual-specific intercept parameter,  $\beta_{0i}$ , which represents individuals' average level of depressive symptoms, and residual error,  $e_{it}$ . Based on standard multilevel or latent growth modeling and model selection procedures (e.g., McArdle & Nesselroade, 2003; Ram & Grimm, 2007; Singer & Willett, 2003), individual-specific intercepts,  $\beta_{0i}$ , were modeled where  $\gamma_{00}$  is the sample mean, and  $u_{0i}$  are individual deviations from the sample mean (i.e., Level 2 model) which are assumed to be normally distributed, correlated with each other, and uncorrelated with the residual errors,  $e_{it}$ .

As a second step, we ran a model of change that includes three components of time in order to examine change in individuals' depressive symptoms across the transition. Three change periods are defined: time to/from transition, the effect of the transition, and the period of adjustment to the transition. The time to/from transition assesses a linear rate of change in depression surrounding the transition to long-term care with possible data for waves -4, -3, -2, and -1 prior to the transition, 0 at the wave closest following the transition, and 1 and 2 for waves post-transition. The effect of the transition is measured using a dummy coded variable whereby a 0 is assigned for all years prior to the transition and a 1 is assigned for the wave after which the transition occurred and all waves following the transition. The period of adjustment to the transition is also measured using a dummy coded variable where a 0 is assigned for all waves leading up to and including the transition wave and a 1 is assigned for the two possible waves following the transition wave. The multi-phase growth curve model is thus specified:

$$\text{Level 1: Depressive symptoms}_{it} = \beta_{0i} + \beta_{1i}(\text{time-to/from- transition}_{it}) + \beta_{2i}(\text{effect of transition}_{it}) + \beta_{3i}(\text{adjustment}_{it}) + e_{it}$$

$$\text{Level 2: } \beta_{0i} = \gamma_{00} + u_{0i}$$

$$\beta_{1i} = \gamma_{10}$$

$$\beta_{2i} = \gamma_{20} + u_{2i}$$

$$\beta_{3i} = \gamma_{30} + u_{3i} \quad (\text{Model 1})$$

where person  $i$ 's level of depression at time  $t$ , depressive symptoms $_{it}$ , is a function of an individual-specific intercept parameter,  $\beta_{0i}$ , that represents an individuals' level of depressive symptoms at wave 0 (i.e., at the wave following the transition to long-term care); an individual-specific slope parameter,  $\beta_{1i}$ , that captures rates of linear change across the transition; an individual-specific effect of transition parameter,  $\beta_{2i}$ , that represents the individuals' reaction to

the transition; an individual-specific adjustment period parameter,  $\beta_{3i}$ , that represents the time following the transition; and residual error,  $e_{ii}$ . At Level 2,  $\gamma_{00}$ ,  $\gamma_{10}$ ,  $\gamma_{20}$ , and  $\gamma_{30}$  are the group means for the intercept and slopes and  $u_{0i}$ ,  $u_{2i}$ , and  $u_{3i}$  are individual deviations from those means. Given that the random effect was not significant, we did not allow random variation for the  $\beta_{1i}$  slope.

To examine the association between individuals' mastery and self-efficacy across the transition with their change in depressive symptoms, we separated mastery and self-efficacy into within-person variance components (person-mean centered scores) to account for variation in individuals' mastery and self-efficacy over time. The person-mean centered scores for mastery and self-efficacy were entered into the Level 1 model:

$$\text{Level 1: Depressive symptoms}_{ii} = \beta_{0i} + \beta_{1i}(\text{time-to/from- transition}_{ii}) + \beta_{2i}(\text{effect of transition}_{ii}) + \beta_{3i}(\text{adjustment}_{ii}) + \beta_{4i}(\text{mastery}_{ii}) + \beta_{5i}(\text{self-efficacy}_{ii}) + e_{ii}$$

$$\text{Level 2: } \beta_{0i} = \gamma_{00} + u_{0i}$$

$$\beta_{1i} = \gamma_{10}$$

$$\beta_{2i} = \gamma_{20} + u_{2i}$$

$$\beta_{3i} = \gamma_{30} + u_{3i}$$

$$\beta_{4i} = \gamma_{40}$$

$$\beta_{5i} = \gamma_{50} \tag{Model 2}$$

Where  $\beta_{4i}$  is the slope parameter for individual  $i$ 's change in predicted depressive symptoms for a one unit change in mastery and  $\beta_{5i}$  is the slope parameter for individual  $i$ 's change in predicted depressive symptoms for one unit change in self-efficacy.

Finally, we added individual's mastery and self-efficacy scores at the wave prior to transitioning (wave -1), individual's age at the transition, gender, education, and the number of

months between the transition (wave 0) interview date and the actual move to long-term care, to predict between-person variability in the level of depressive symptoms at the transition ( $\beta_{0i}$ ) and the transition and adjustment effects ( $\beta_{2i}, \beta_{3i}$ ). The Level 2 predictors are grand mean centered (excluding gender where female = 1).

$$\text{Level 1: Depressive symptoms}_{ii} = \beta_{0i} + \beta_{1i}(\text{time-to/from- transition}_{ii}) + \beta_{2i}(\text{effect of transition}_{ii}) + \beta_{3i}(\text{adjustment}_{ii}) + \beta_{4i}(\text{mastery}_{ii}) + \beta_{5i}(\text{self-efficacy}_{ii}) + e_{ii}$$

$$\text{Level 2: } \beta_{0i} = \gamma_{00} + \gamma_{01}(\text{pre-transition mastery}_i) + \gamma_{02}(\text{pre-transition self-efficacy}_i) + \gamma_{03}(\text{age at transition}_i) + \gamma_{04}(\text{gender}_i) + \gamma_{05}(\text{education}_i) + \gamma_{06}(\text{months since move}_i) + u_{0i}$$

$$\beta_{1i} = \gamma_{10}$$

$$\beta_{2i} = \gamma_{20} + \gamma_{21}(\text{pre-transition mastery}_i) + \gamma_{22}(\text{pre-transition self-efficacy}_i) + \gamma_{23}(\text{age at transition}_i) + \gamma_{24}(\text{gender}_i) + \gamma_{25}(\text{education}_i) + \gamma_{26}(\text{months since move}_i) + u_{2i}$$

$$\beta_{3i} = \gamma_{30} + \gamma_{31}(\text{pre-transition mastery}_i) + \gamma_{32}(\text{pre-transition self-efficacy}_i) + \gamma_{33}(\text{age at transition}_i) + \gamma_{34}(\text{gender}_i) + \gamma_{35}(\text{education}_i) + \gamma_{36}(\text{months since move}_i) + u_{3i}$$

$$\beta_{4i} = \gamma_{40}$$

$$\beta_{5i} = \gamma_{50} \quad (\text{Model 3})$$

All models were estimated using SAS (PROC MIXED; Littell, Milliken, Stroup, Wolfinger, & Schabenberger, 2006; Little & Rubin, 1987).

## 2.4 Results

First an intraclass correlation (ICC) was estimated to determine the amount of between- and within-person variation in depressive symptoms over time. The ICC was .48 signifying that

48% of the total variance was between-persons and 52% was within persons, thus suggesting considerable variability within-individuals over time. Table 2 presents descriptive statistics showing that on average depressive symptoms increased across the time-to/from the transition whereas mastery and self-efficacy declined slightly but stayed relatively stable over time.

In regards to the first research question which asked how depressive symptoms changed across the transition to long-term care, Table 3 (Model 1) shows that the prototypical change in depressive symptoms is best represented by a significant linear increase across the transition ( $\gamma_{10}$  = an increase in 1.27 points per wave). Additionally, the residual variance parameters for the intercept ( $\sigma^2_{u0}$ ), effect of the transition ( $\sigma^2_{u1}$ ), and adjustment effect ( $\sigma^2_{u2}$ ) were reliably different from zero suggesting additional heterogeneity in between-person differences of level of depressive symptoms at the transition point and in the transition and adjustment effects. Thus some individuals are increasing in depressive symptoms, whereas others are staying stable or decreasing post-transition. Thus in regards to the first research question, we see a significant increasing linear slope across the time-to/from the transition in individuals' depressive symptoms and significant variation in individuals' depressive symptoms in level at the transition and change post-transition. Figure 1 graphically displays individual's raw CES-D scores across the time-to/from the transition and Figure 2 shows the predicted multilevel model of change in relation to the transition (Model 1).

In regards to the second research question, we examined whether individual's feelings of control significantly covaried with levels of depressive symptoms across time-to/from the transition. To do so mastery and self-efficacy (person-mean centered scores; i.e. separated from between-person variance) were added at level 1 (Model 2 in Table 3). The within-person mastery ( $\gamma_{40}$ ) and self-efficacy ( $\gamma_{50}$ ) parameters were both significant and negative, suggesting

that on waves where individual's reported more mastery they also reported lower depressive symptoms and vice versa. A one-unit increase in the variability around an individual's average reported mastery was associated with a 0.65 decrease in depressive symptoms (CES-D score). Likewise, for each one-unit increase in the variability around an individual's self-efficacy, there was a 0.31 decrease in depressive symptoms. Figure 3 shows the time series across the transition for two participants to display the correspondence of mastery and depressive symptoms with one another. Similarly, Figure 4 shows the covariation of self-efficacy and depressive symptoms for two participants.

Finally, in Model 3 (Table 3) we included between-person characteristics of the individual and their interactions with time. This further addresses the second research question regarding how pre-transition levels of mastery and self-efficacy are associated with the level of depressive symptoms at the transition and rates of change in depressive symptoms post-transition, controlling for baseline demographic factors. Gender, education level, and pre-transition mastery scores were significant between-person predictors of the intercept indicating that females, individuals with lower achieved levels of education and individuals with lower pre-transition mastery scores were likely to be more depressed at the transition point. Most important to our research question, none of the included between-person covariates were significantly associated with the effect of the transition. However, individuals reporting lower mastery scores at the wave prior to the transition experienced greater depressive symptoms during the adjustment period. Additionally, our control variable for months between the interview date and actual transition was also significant such that individuals who transitioned closer to the interview date had a steeper increase in depressive symptoms in the adjustment period. Age at the transition and pre-transition level of self-efficacy were not significant

covariates of either the intercept or post-transition slopes. Therefore the tests of the second research question show first that mastery and self-efficacy significantly covary with depressive symptoms across the time-to/from the transition to long-term care. Additionally, individuals with lower pre-transition levels of mastery were more likely to be depressed at the transition and have a larger increase in depressive symptoms during the adjustment period.

## **2.5 Discussion**

In this study we observed how change processes in depressive symptoms across the time-to/from the transition to long-term care are associated with changes in mastery and self-efficacy. We also observed how certain individual characteristics were associated with between-person differences in the level of depressive symptoms at the transition and change in depressive symptoms in the period of adjustment to long-term care residency. First we found that there was an increasing linear trend in depressive symptoms across the transition-to/from long-term care, though there were between person differences in the extent of this change during the transition and adjustment periods. This provides further support for prior research which suggests that the period of anticipation of placement into long-term care through the adjustment period associated with placement is a critical time frame for the mental health of older adults (Hoover et al., 2010; Lee et al., 2002; Parmelee et al., 1992; Patterson, 1995; Pot et al., 2005; Snowdon & Donnelly, 1986). This finding also stands apart from research examining the general population of older adults where a paradox is seen in which reduced depressive symptoms are commonly found over time (in comparison with middle aged and young adults), in spite of apparent increasing risk factors with age (Blazer & Hybels, 2005; Charles, 2010; George, 1992; Piazza & Charles, 2006). The transition to and adjustment into long-term care distinctly counters this trend suggesting a unique change process that is occurring across the transition. Given the extent of our

longitudinal data, our results also imply that depressive symptoms may begin to increase years before the transition to long-term care, and thus beyond the anticipation of this change. This may suggest the increasing vulnerabilities of individuals who transition to long-term care in terms of health, disability, and social support that may ultimately combine to overwhelm their coping capabilities. Additionally, the significant random effect found for the transition and adjustment periods suggests that the transition does affect individuals differently in terms of their change in depressive symptoms with some having a steeper increase than others following the transition.

**2.5.1 The Association of Mastery and Self-Efficacy across the Transition to Long-term Care.** Next, our findings are consistent with theories that suggest mastery and self-efficacy are vulnerability variables associated with the risk for depression (Brown & Harris, 1978; Goldberg & Huxley, 1992). Mastery and self-efficacy covaried with depressive symptoms across time such that on a wave where an individual reported lower mastery than their personal average, they also reported higher depressive symptoms. Prior work has suggested that mastery is a labile construct that may be impacted by one's social context (Infurna, Gerstorf, Ram, Schupp, & Wagner, 2011; Infurna, Gerstorf, & Zarit, 2013; Pearlin, 2010; Skinner, 1995). Though descriptive statistics in our study showed that on average mastery and self-efficacy were relatively stable across waves, we do find that individual's depressive symptoms were sensitive to variations around individual's average levels of mastery and self-efficacy. Thus if an individual's mastery or self-efficacy was impacted throughout this transition continuum, it is likely that their experience of depressive symptoms would also be affected. It is important to also acknowledge that this association could be in the other direction with depressive symptoms impacting perceptions of control.

In regards to between-person characteristics, we had questioned whether individuals with higher levels of mastery and self-efficacy prior to the transition might be at risk for higher depressive symptoms at the transition given the shift from a home environment to an institutional environment with reduced autonomy and opportunities for personal control. Again, however, in line with vulnerability theories of depression, the opposite result was found. Individuals who had lower mastery scores at the wave prior to the transition had higher levels of depressive symptoms at the transition. Women and individuals with lower attained education levels also had higher levels of depressive symptoms at the transition. There were no significant between-person level findings for pre-transition levels of self-efficacy.

In addition to the level of depressive symptoms at the transition, we also examined between-person predictors of the transition and adjustment effects, which were found to have significant random effects reflecting between person differences. None of the factors we considered were associated with the transition effect, suggesting that this may be an unstable and idiosyncratic period with varying impact for individuals regardless of demographic characteristics or levels of control. However, we did find that individuals with lower mastery prior to the transition had a greater increase in depressive symptoms during the adjustment phase to long-term care. This suggests that individuals' who had negative perceptions of their capacity to control life's circumstances were more likely to have a challenging time adjusting to the long-term care environment. Additionally, the control variable for months between the actual move and interview date was a significant predictor of the adjustment period. Individuals who were interviewed more closely following their transition were more likely to have a steeper rate of increase in depressive symptoms during the adjustment period. This again suggests that the time

most closely following the transition is the most critical period for changes in mental health of individuals adjusting to long-term care.

**2.5.2 Limitations.** Our study does carry some limitations. First we only had a crude measure of environment for what type of long-term care institution (i.e. type of nursing home) individuals transitioned to that we used to select our sample. Therefore we don't have institutional information regarding how the different institutions our participants resided in may or may not be fostering autonomy and opportunities for control. We do recognize that long-term care facilities may vary substantially in the type of environment they provide for residents.

Second, given that our sample is made up of a group of vulnerable older adults who moved into long-term care residency, attrition and missing data were very prevalent. Though a strength of growth-curve analysis is in its handling of missing data by utilizing all waves of data that are available for an individual in the model (Raudenbush & Bryk, 2002; Singer & Willett, 2003), the majority of our missing data came from predictors included at the between-person level. Three between-person covariates contained data from waves after the baseline measurement. When there is missing data in between-person covariates, associations are not able to be drawn. For example, some individuals were missing scores for pre-transition (wave -1) mastery and self-efficacy levels, but in particular the control variable for months between the transition and interview carried a lot of missing data. The date of transition was missing for 44 participants, reducing the Model 3 sample size to 115 individuals. Our transition measurement wave (wave 0) contained error due to the fact that the LASA data was collected in three year measurement increments, and not with a care transition as the central focus. For this reason we believed that it was important to include the difference in months between the actual transition and the measurement wave closest following that move as a control variable in our model.

Given that the months since transition variable did have a significant association with the adjustment slope, we left it in the final model. However, we also ran the model without this control variable, thereby increasing the sample size, to see if there was a difference in the structure of the findings. One difference was found. The between-person covariate for pre-transition mastery was no longer a significant predictor of the adjustment slope. This difference likely reflects a selection effect in the smaller sample. Additionally, few of our participants had data for the adjustment waves (waves 1 and 2) further increasing the possibility of a selection effect in regards to these findings. Despite the limitations of missing data and some measurement error surrounding the true transition point, having five waves of longitudinal data spanning more than 10 years gave us a unique opportunity to examine the change process in depressive symptoms across the long-term care transition over years as opposed to months as has commonly been done in prior studies.

**2.5.3 Implications and Future Directions.** Our findings suggest that interventions targeting mastery and self-efficacy in older adults, such as proposed by Blazer (2002), both prior to and following a transition to long-term care would be effective in reducing depressive symptoms among older adults. Improving individuals' beliefs about control over circumstances and desired goals/activities may be a particular challenge, however, in the face of increasing individual disability and a transition to a care environment where individuals have little opportunity to assert their autonomy. Interventions geared toward fundamental theories of aging, such as selective optimization with compensation theory (Baltes & Baltes, 1990), may help to increase perceptions of personal control by encouraging goal relevant actions. Helping older adults to modify and optimize behaviors in spite of decline may help maintain feelings of mastery and self-efficacy and thereby reduce depressive symptoms. It is additionally important

that long-term care facilities allow opportunities for residents to assert personal control. Perhaps existing interventions that increase opportunities for personalized and valued positive experiences and activities among residents in long-term care facilities (such as BE-ACTIV; Meeks, Looney, Van Haitsma, & Teri, 2008) may impact control and this should be examined. Ultimately, emphasizing personal choice and control in congruence with safety and institutional standards, as advocated by Lawton (1986), may help individual's to maintain mastery and self-efficacy while also receiving necessary care and support. Future work should consider additional factors beyond the care transition and adjustment process that may influence fluctuations in mastery and self-efficacy both pre- and post-placement into a long-term care facility. Given that both between-person and within-person associations were found between control and depressive symptoms, it is important that further longitudinal studies examine these relationships in conjunction with major life events.

In conclusion, we found that, on average, depressive symptoms increased linearly over many years in relation to the transition to long-term care residency. Perceptions of mastery and self-efficacy were strongly related with depressive symptoms across time and explained an element of between person differences in level of depression at the transition and change across the adjustment period. As one of few studies to examine this transition over an extended period of time, our results suggest the importance of studying depression in response to major life events from a longitudinal design framework. Additionally we suggest that risk and protective factors may impact individuals at the time of the major event, while also playing a critical role long before and after the visible transition occurs.

## 2.6 References

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Table 2.1

*Comparison of Sample Characteristics at Baseline for Participants who did not Transition and the Analytical Sample who made a Transition into Long-Term Care*

	Analytic Sample Experiencing a Transition ( <i>N</i> = 175)	Sample not Experiencing a Transition ( <i>N</i> = 2,932)	<i>p</i> value
Gender (% female)	65	51	< .001
Age (Mean, SD)	77.44, 5.89	70.37, 8.75	< .001
Nationality (% Dutch)	99	99	.16
Education level (Mean, SD) <sup>a</sup>	2.95, 1.90	3.42, 1.98	< .01
Depressive symptoms (Mean, SD)	9.20, 8.38	7.90, 7.76	< .05
Mastery (Mean, SD)	16.51, 3.13	17.26, 3.34	< .01
Self-efficacy (Mean, SD)	40.83, 5.40	41.88, 5.38	< .05

**Note.** Comparisons utilize t-test and chi square analyses. <sup>a</sup> = education consisted of 9 categories increasing in level from 1 = no education to 9 = an advanced degree

Table 2.2

*Descriptive Statistics across the Time Metric of Time-To/From Transition for Depressive Symptoms, Mastery, and Self-Efficacy*

Time- to/from transition	Depressive Symptoms			Mastery			Self-efficacy		
	Wave	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>
-4	35	7.31	7.19	35	16.86	2.75	35	43.20	5.29
-3	72	8.44	6.80	71	17.18	3.23	71	41.20	4.97
-2	120	10.28	9.63	120	16.63	3.46	115	40.46	5.11
-1	164	10.87	9.36	152	16.02	3.43	152	40.39	5.44
0	152	13.44	10.08	113	15.98	3.65	113	39.71	5.46
1	45	13.71	9.06	31	14.74	3.54	32	38.03	4.82
2	11	13.73	8.56	8	16.13	3.68	9	38.22	4.24

**Notes:** Wave refers to the interview in relation to the transition with -4 through -1 indicating the pre-transition phases, 0 indicating the phase of the transition, and 1 through 2 indicating the post-transition phases. For depression:  $N = 175$ , Number of observations = 599. For mastery:  $N = 173$ , Number of observations = 530. For self-efficacy:  $N = 169$ , Number of observations = 527.

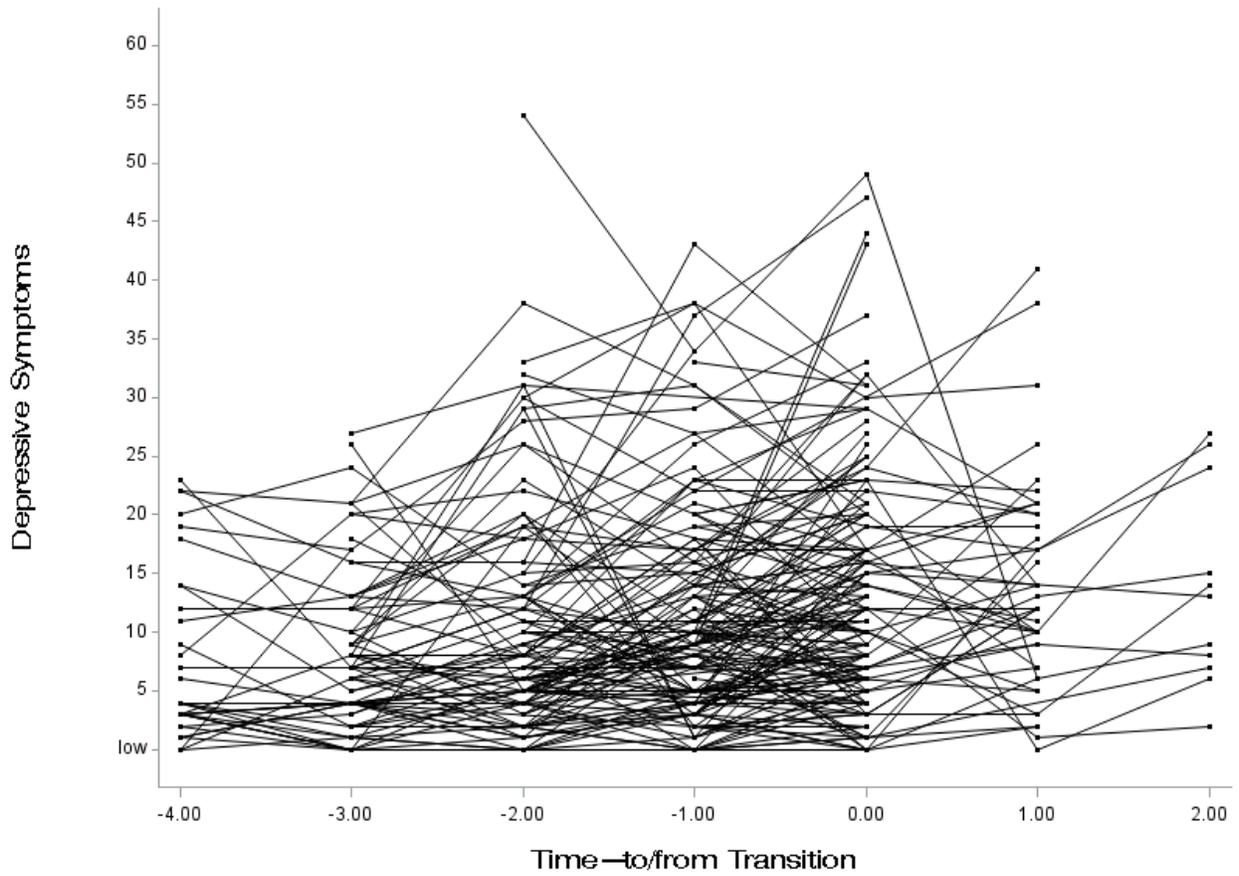
Table 2.3

*Growth Curve Model for Depressive Symptoms Over Time-To/From the Transition to Long-Term Care: The Effect of Covariates*

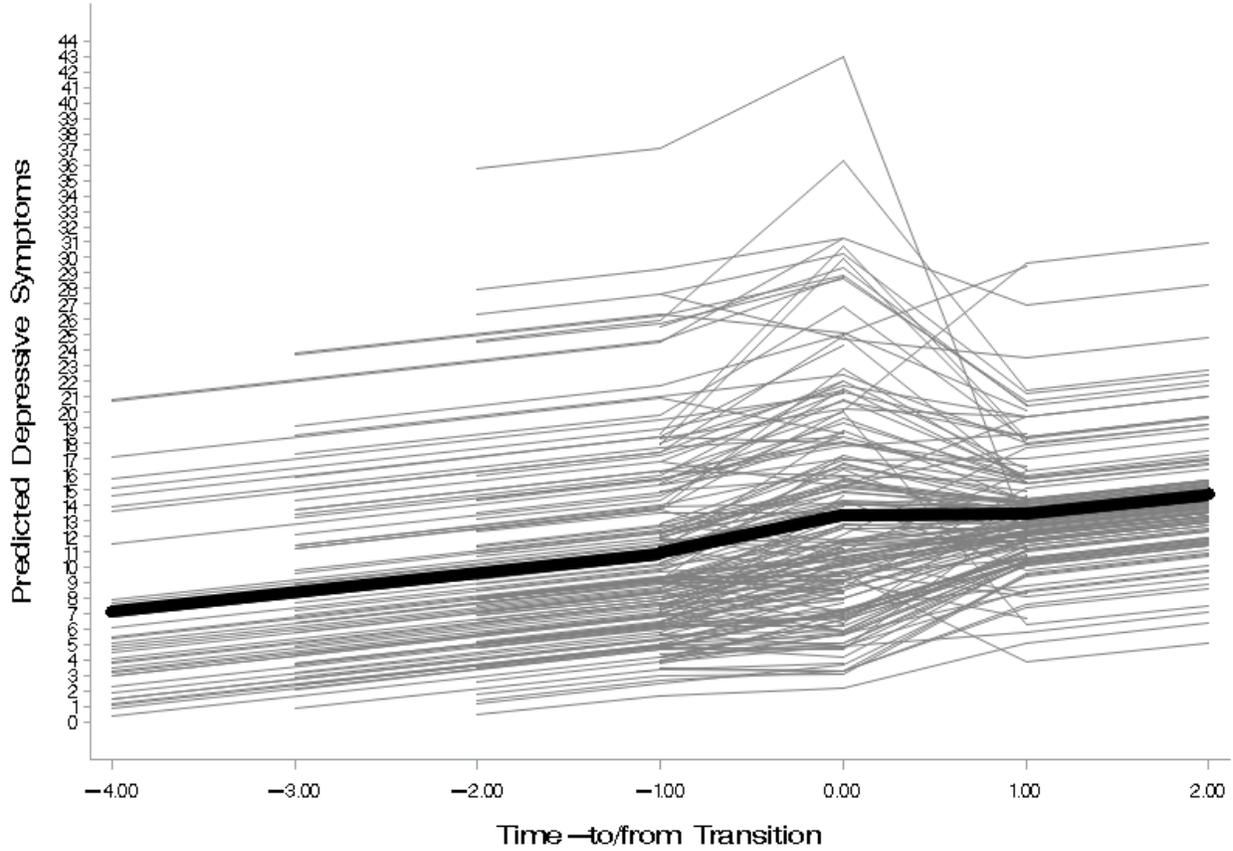
	Model 1		Model 2		Model 3	
	Estimate	SE	Estimate	SE	Estimate	SE
<b>Fixed effects</b>						
Intercept, $\gamma_{00}$	12.17***	0.83	11.45***	0.82	9.71***	1.23
Time-to/from transition, $\gamma_{10}$	1.27***	0.32	0.77**	0.31	0.83*	0.37
Effect of transition, $\gamma_{20}$	1.17	0.87	1.11	0.93	1.81	1.72
Adjustment, $\gamma_{30}$	-1.15	1.39	-1.35	1.58	3.90	3.99
Mastery, $\gamma_{40}$	--	--	-0.65***	0.12	-0.69***	0.15
Self-efficacy, $\gamma_{50}$	--	--	-0.31***	0.09	-0.28**	0.11
<i>Predictors of the intercept</i>						
Pre-transition mastery, $\gamma_{01}$	--	--	--	--	-1.23***	0.23
Pre-transition self-efficacy, $\gamma_{02}$	--	--	--	--	-0.03	0.15
Age at transition, $\gamma_{03}$	--	--	--	--	-0.13	0.12
Gender, $\gamma_{04}$	--	--	--	--	2.82*	1.30
Education, $\gamma_{05}$	--	--	--	--	-0.73*	0.35
Months since move, $\gamma_{06}$	--	--	--	--	0.03	0.06
<i>Predictors of the effect of transition</i>						
Pre-transition mastery, $\gamma_{21}$	--	--	--	--	0.38	0.35
Pre-transition self-efficacy, $\gamma_{22}$	--	--	--	--	-0.21	0.23
Age at transition, $\gamma_{23}$	--	--	--	--	-0.26	0.19
Gender, $\gamma_{24}$	--	--	--	--	-1.16	1.96
Education, $\gamma_{25}$	--	--	--	--	0.90	0.47
Months since move, $\gamma_{26}$	--	--	--	--	0.07	0.10
<i>Predictors of adjustment</i>						
Pre-transition mastery, $\gamma_{31}$	--	--	--	--	-1.75**	0.66
Pre-transition self-efficacy, $\gamma_{32}$	--	--	--	--	0.65	0.46
Age at transition, $\gamma_{33}$	--	--	--	--	-0.41	0.39
Gender, $\gamma_{34}$	--	--	--	--	-7.21	4.77
Education, $\gamma_{35}$	--	--	--	--	-0.39	0.92

Months since move, $\gamma_{36}$	--	--	--	--	0.47*	0.20
<b>Random effects</b>						
Variance intercept, $\sigma_{u0}^2$	48.83***	7.05	47.39***	6.78	27.78***	5.90
Variance effect of transition, $\sigma_{u1}^2$	21.97**	8.94	22.73**	9.75	20.11*	12.05
Variance adjustment, $\sigma_{u2}^2$	69.15**	26.54	65.22*	35.76	69.44	47.96
Covariance, $\sigma_{u0u1}$	0.42	5.61	0.59	6.11	5.60	6.24
Covariance, $\sigma_{u0u2}$	-26.64**	9.56	-19.76*	10.11	-32.84**	10.90
Covariance, $\sigma_{u1u2}$	-19.21	14.48	-21.91	20.32	-20.68	27.55
Residual, $\sigma_{e1}^2$	30.23***	2.81	25.57***	2.49	27.17***	3.20
-2LL		4146.9		3484.5		2419.7
AIC		4160.9		3498.5		2433.7

*Note.* Model based on up to five occasions of measurement. Model 1 ( $N = 175$ ) = Adding time predictors at Level 1. Model 2 ( $N = 169$ ) = Adding mastery and self-efficacy to the within-person model at Level 1. Model 3 ( $N = 115$ ). = Adding 6 individual difference characteristics to the between-person model at Level 2. AIC = Akaike Information Criterion; -2LL = -2 log likelihood, relative model fit statistics. \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$



*Figure 2.1.* Reported depressive symptoms across the transition. A plot of individual's reported depressive symptoms across the transition to long-term care by wave centered according to the transition, where wave 0 is the wave of the transition.



*Figure 2.2.* Modeled depressive symptoms across the transition. The predicted multilevel model (Model 1) of change in individual’s depressive symptoms across the transition to long-term care by wave centered according to the transition, where wave 0 is the wave of the transition. This figure graphically displays the increasing linear trend of depressive symptoms leading up to and following the transition.

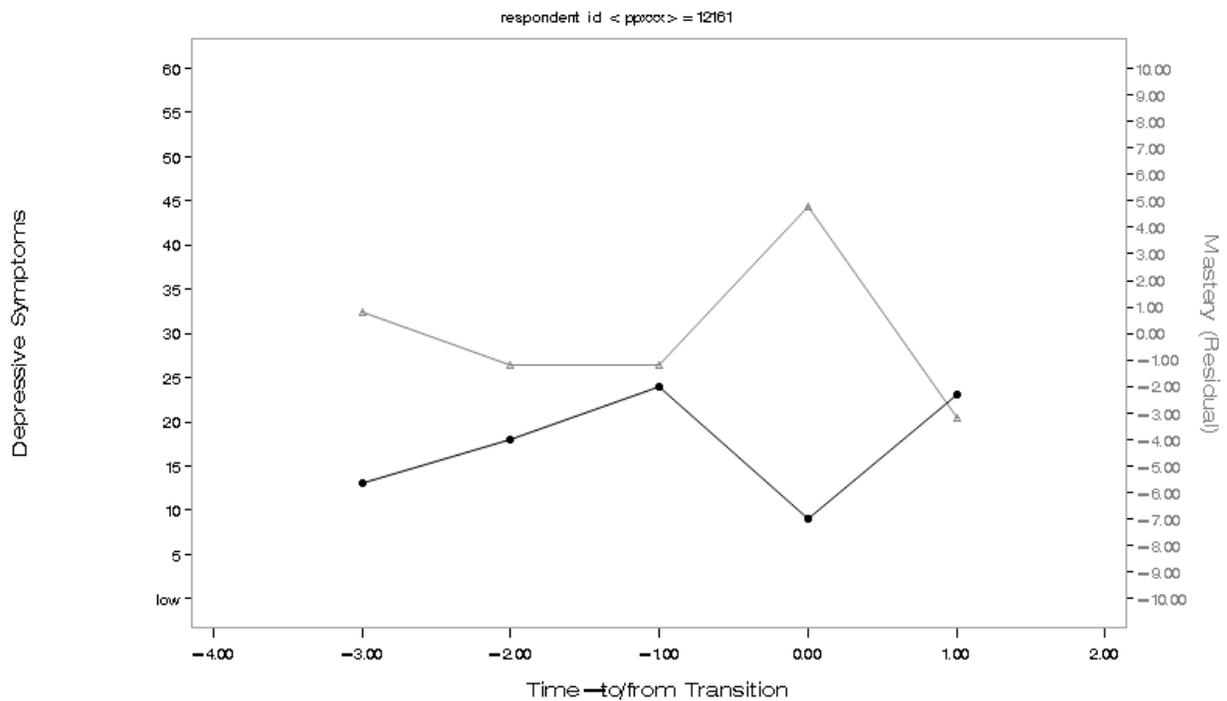
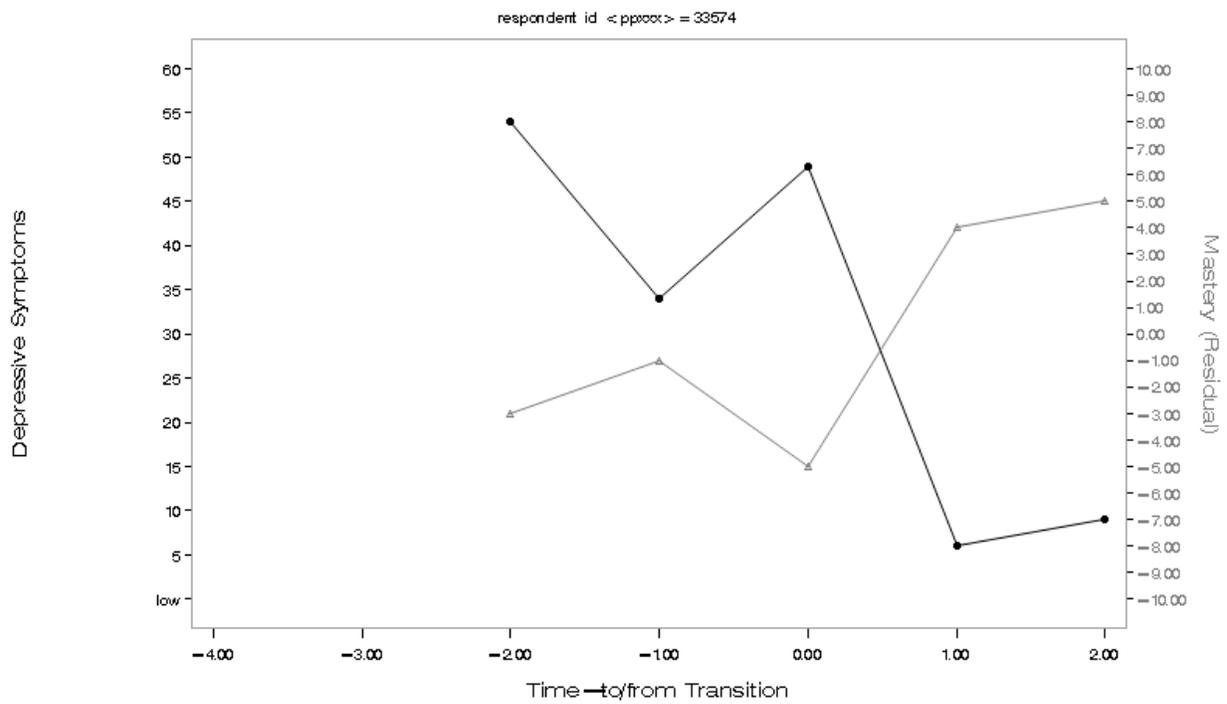


Figure 2.3. Examples of covariation between mastery and depressive symptoms. These figures display two individual-level examples of the covariation between individuals' self-reported person-mean centered mastery across waves pre- and post-transition and individual's reports of depressive symptoms.

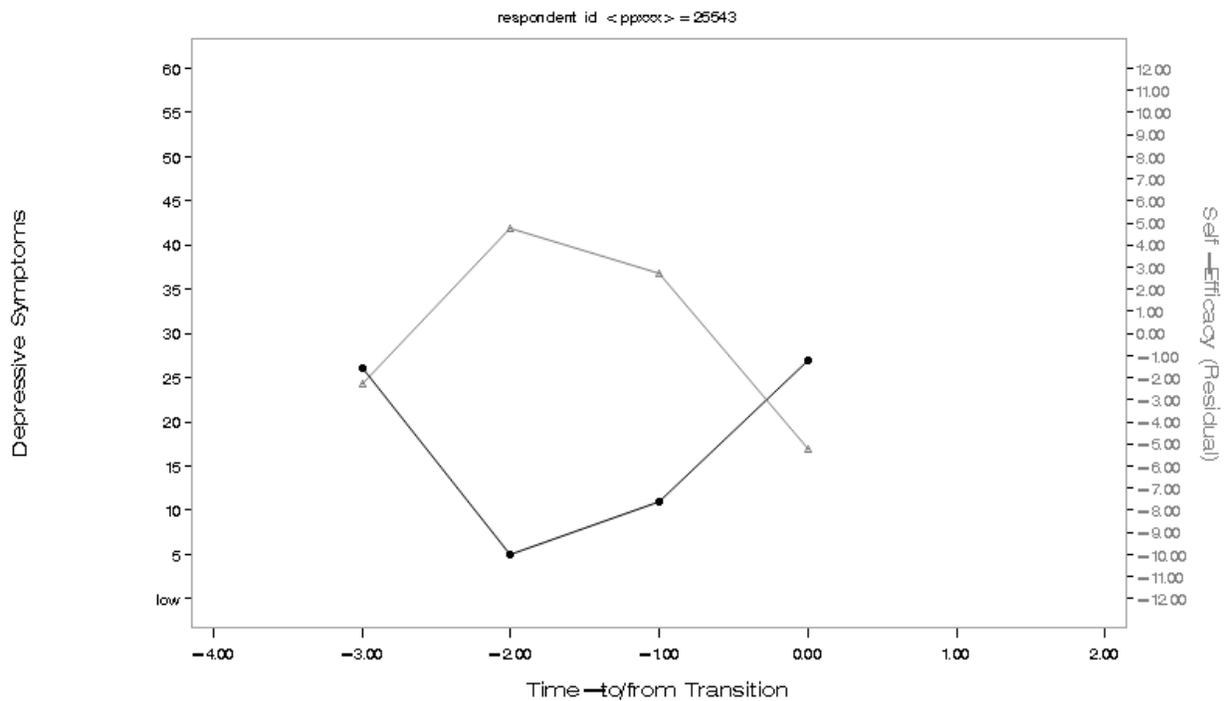
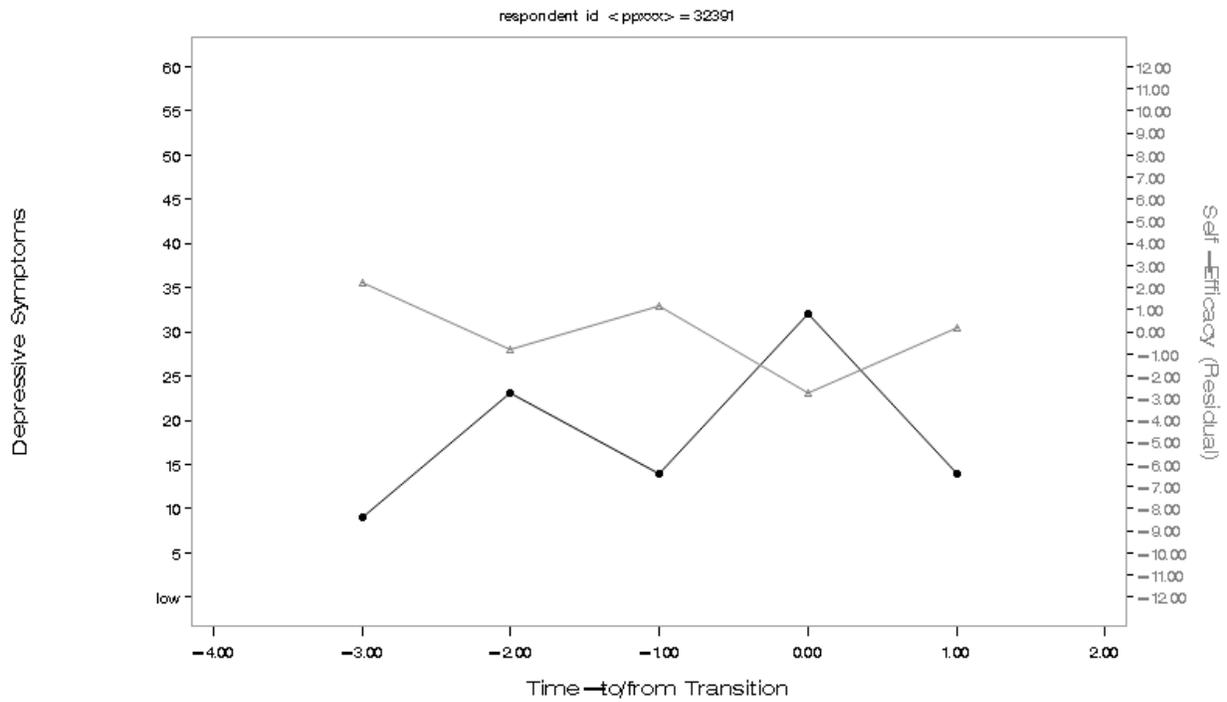


Figure 2.4. Examples of covariation between self-efficacy and depressive symptoms. These figures display two individual-level examples of the covariation between individuals' self-reported person-mean centered self-efficacy across waves pre- and post-transition and individual's reports of depressive symptoms.

## CHAPTER 3. STUDY 2.

### Depressive Symptoms, Anger, and Daily Cortisol of Caregivers on High and Low Stress Days

#### Abstract

The current study examines depressive mood and anger as outcomes of the caregiving stress process and cortisol as a key predictor of daily mood. Depression, a frequently cited and experienced mental health problem, and anger, a common but often overlooked emotion experienced by caregivers, can take a toll on caregiver's health and negatively impact the care which they provide their care receiver. Utilizing a biopsychosocial approach, we examine daily stressful experiences and biological responses associated with depression and anger. This approach may further help to link daily mood with subsequent health changes. The association of depressive mood, anger and two markers of cortisol, area under the curve (AUC) and cortisol awakening response (CAR) was examined for caregivers (N=164) of individuals with dementia (IWD) on low stress days when IWDs attended an Adult Day Service program (ADS) and high stress days when IWDs did not go to ADS. Data were gathered over 8 consecutive days. Caregivers were primarily female (86.7%) with a mean age of 61.99. Multi-level models were first run with CAR and AUC each separately predicting anger and depressed mood, both measured by items drawn from the Non-Specific Psychological Distress Scale. Additional unconditional models tested the association of today's ADS use, last night's sleep quality, and today's care-related stressors with today's depressed mood and anger. Next conditional predictor multi-level models were run to examine the association of anger and depressed mood each with daily cortisol, care-related stressors, sleep quality, and ADS use. In regards to anger, on days where caregivers had AUCs below their individual average they expressed higher anger scores. CAR did not have a significant association with anger. On days where an IWD attended ADS, caregivers had lower anger scores. When care related stressors and sleep problems were entered in the model with ADS use and cortisol, however, anger was associated with more care related stressors and sleep problems, but not ADS use or daily cortisol. Findings indicate that anger is associated with a blunted pattern of cortisol response, a common pattern in chronic stress populations, and with day care use, but daily stressors have the greatest influence on anger. A follow up mediation analyses showed that daily stressors mediated the association between

ADS use and anger, such that ADS's effect on anger is through decreasing care related stressors. In regards to depression, caregiver's who on average had low or blunted CARs were more likely to be depressed. AUC cortisol and ADS use did not have significant unconditional associations with depressed mood. When the conditional predictor model was examined, depressed mood was associated with more care related stressors, sleep problems, and a low average CAR, but not ADS use. Findings indicate that depressed mood is associated with a blunted CAR and care related stressors. These associations are clearly complex and future research should examine how care related stressors specifically impact cortisol and how ADS use may reduce this impact. More normal diurnal cortisol patterns may lead to reduced depressed mood and anger.

**Keywords:** depression, anger, cortisol, adult day services, caregiving, care-related stress, sleep quality

### **3.1 Background and Literature Review**

#### **3.1.1 Anger and Depressive Mood: Outcomes of the Stress Process.**

Family members who are called upon to care for a relative with dementia find themselves living in an emotionally turbulent atmosphere. Researchers have found that caregivers suffer more from emotional difficulties than they do with the financial or physical aspects of their care role (Gallagher, Wrabetz, Lovett, DelMaestro, & Rose, 1989). For example, family caregivers often experience decreased well-being, anger, and depression (Aneshensel, Pearlin, Mullan, Zarit, & Whitlatch, 1995; Hinrichsen & Zweig, 1994; Zarit, 2008). Both anger and depressive mood, are believed to be common emotions among dementia caregivers throughout the course of caregiving and are important constructs of study as they relate to the well-being of the caregiver as well as the care receiver (Coon, Thompson, Steffen, Sorocco, & Gallagher-Thompson, 2003; Cuijpers, 2005; Pinguart & Sorensen, 2006; Steffen & Merritt, 2012). Recent meta-analyses showed that between 22 to 33 percent of caregivers meet criteria for major depressive disorder (MDD), with an even greater number of caregivers reporting non-clinical, but high levels of depressive symptoms (Cuijpers, 2005; Pinguart & Sorensen, 2006). Rates of MDD and minor depression among dementia caregivers are significantly higher than rates found in the general population (Cuijpers, 2005; Pinguart & Sorensen, 2006).

Anger is another common emotion experienced by caregivers, though it has received less attention than depression (Anthony-Bergstone, Zarit, and Gatz, 1988; Coon et al., 2003; Gallagher et al., 1989). Anger/hostility was first examined in a caregiving sample by Anthony-Bergstone, Zarit, and Gatz who found that dementia caregivers had significantly higher hostility scores (a subscale of the Brief Symptom Inventory) in comparison with age matched-norms on the scale. Gallagher and colleagues found that more than two-thirds of their sample expressed

having feelings of anger with moderate frequency. These caregivers cited anger as distressing and a primary reason for seeking help for their caregiving role (Gallagher et al., 1989). Steffen & Berger (2000) found that daughter caregivers were more likely to have higher anger ratings than spousal caregivers. However, twenty percent of caregivers older than 64 had anger scores of 5 or higher on a scale of 1 to 7 with 7 being the highest anger rating.

One difficulty in the study of anger is that anger measures have not been developed with older-adult caregiver samples in mind. In particular, middle-aged and older women who are typical family caregivers for individuals with dementia do not think of themselves as “generally” angry, which is what trait scales measure. However, caregivers have more variable anger experiences in relation to care-related events and the negative emotions they experience may be viewed in the event context and not as a general trait. Studying anger in relation to daily experiences, as done in the current study, may be a more valid form of measurement (Steffen & Berger, 2000).

In addition to the toll depression and anger can take on a caregiver’s well-being and health, both emotions can negatively impact the care which caregivers provide their care receiver. Depressed caregivers were found to be more likely to engage in potentially harmful behavior and to be subjected to investigation regarding potential mistreatment of the care receiver (Beach, Schulz, Williamson, Miller, & Weiner, 2005; Bonnie & Wallace, 2003; Williamson & Shaffer, 2001, Williamson et al., 2005). Depression was more highly associated with potentially harmful behaviors at levels of high caregiver anger (MacNeil, Kosber, Durkin, Dooley, DeCoster, & Williamson, 2009). Other research has found that spousal caregivers had less control over their angry feelings than non-caregivers which may lead to more acting out on these intense experienced feelings (Vitaliano, Russo, Bailey, Young, and McCann, 1993).

Given these findings it is important to consider what aspects of the caregiving stress process may lead to poor mental health outcomes such as depression and anger and what interventions may help reduce these negative outcomes for both the caregiver and care receiver. To this end, recent studies have tied biomarkers of the stress process, such as cortisol, to negative mental health outcomes such as depression and anger.

### **3.1.2 The Stress Process, Cortisol, and Mental Health**

In addition to behavioral and contextual caregiving stressors that may lead to poor mental health, an individual's own physiology may also impact one's mental health. A number of studies have pointed to stressors and their associated physiological markers as precipitators of depression and other mental illnesses, and as factors having an impact upon the development, course and severity of disorder (Frank et al., 1990; Gold & Chrousos, 2002; Kendler et al., 1995; Kessler et al., 1994). Consequently the stress system and mental illnesses such as depression may share many common mediators and brain pathways. Cortisol is a biomarker of the hypothalamic-pituitary-adrenal (HPA) axis known as the "stress hormone". It is an anti-inflammatory hormone which mobilizes energy, communicates with the immune system, and adaptively helps the body handle stressful events (Piazza, Almeida, Dmitrieva, & Klein, 2010; Sternberg & Gold, 2002). Biomarkers, such as cortisol, are increasingly being used in research to connect an individual's health with psycho-social factors (Piazza et al., 2010). Cortisol can unobtrusively be measured through saliva and it displays a noticeable diurnal rhythm. Daily, cortisol increases in level when the individual wakes and peaks around 30 minutes after the awakening time and declines thereafter throughout the rest of the day reaching a floor at night (Heaney, Phillips, & Carroll, 2010; Piazza et al., 2010; Pruessner et al., 1997). When stressors are prolonged or chronic, however, the stress response becomes less adaptive and the diurnal

pattern becomes disrupted. Evidence now supports the association between HPA axis impairment, cortisol, and a number of diseases (Sternberg & Gold, 2002). Thus in caregivers, many of whom are experiencing chronic stress and are at risk for mental disorder, cortisol and the stress process may play a critical role.

**Cortisol and Caregiving.** The stressors of the caregiving situation can stimulate the HPA axis and lead to dysregulation of cortisol production which ultimately may be associated with elevated depressive mood and anger (Burke, Davis, Otte, & Mohr, 2005; Hammen, 2005; Holland et al., 2011). Individual differences in combination with stressor variation and reactivity may result in two dysregulated diurnal patterns: either diminished (hypo) or elevated (hyper) cortisol responsiveness (Seltzer et al., 2009). Hypercortisolemia is noted by an elevated cortisol awakening response (CAR) (i.e. the difference in awakening level and level at 30 minutes after awakening) with a flattened slope such that there is little decline across the day in cortisol level, whereas hypocortisolemia is noted by a blunted pattern across the day with no morning peak and consistent low levels (Kurina, Schneider, & Waite, 2004). Both forms of responsiveness may lead to wear-and-tear of the HPA axis and have been found among family caregivers and other individuals experiencing stressful life events (Kiecolt-Glaser et al., 1984; Segerstrom & Miller, 2004). For example, high cortisol levels have been found in dementia caregivers and severely ill and hospitalized depressed patients (Bauer et al., 2000; Da Roza Davis & Cowen, 2001; De Vugt et al., 2005; Gallagher-Thompson et al., 2006; Holland et al., 2011; Maes, Calabrese, & Meltzer, 1994). Elevated cortisol levels have also been associated with specific caregiver tasks such as managing the care receivers' problem behaviors and helping with activities of daily living (Davis et al., 2004).

Low/hypo cortisol levels, on the other hand, have been found among mothers caring for adolescent or adult children with autism spectrum disorder and other serious mental disorders, parents of cancer patients, non-elderly caregivers, and in other populations experiencing chronic stress (Barker, Greenberg, Seltzer, & Almeida, 2012; Miller, Cohen, & Ritchey, 2002; Seltzer et al., 2009; Seltzer et al., 2010; Sonnenschein et al., 2007; Vedhara et al., 2002; for a review see Gunnar & Vazquez, 2001). When the cortisol response is suppressed or attenuated for an extended period, mental and physical health problems may result such as fatigue, attention problems, PTSD, and depression (Holland et al., 2011; Seltzer et al., 2009; Taylor et al., 2006).

Two dynamic measurements of cortisol that assess patterns of hypo and hypercortisolemia are the cortisol awakening response (CAR), and the area under the curve (AUC). The CAR is a difference score assessing the morning rise by subtracting the waking cortisol level from the level thirty minutes post-waking. The AUC measures total cortisol excretion over the course of a day, thereby combining information from several time points into one variable. As described previously, hypercortisolemia is associated with an extreme CAR and a flattened slope of decline across the day, relating to a large total AUC. Hypocortisolemia, on the other hand, is associated with a very small CAR and flat slope across the day, relating to a low total AUC. Though static or single day measures of cortisol levels have most frequently been used in studies examining caregiving populations, evidence for an elevated CAR and elevated total cortisol levels has been found (Da Roza Davis & Cowen, 2001). In contrast, a diminished CAR and low total cortisol levels have been found in some caregiver samples (Barker et al., 2012; Holland et al., 2011; Miller et al., 2002; Vedhara et al., 2002).

**Cortisol and Depression.** Complex mental illnesses such as depression are widely understood to be heterogeneous in origin and course of the illness (Cicchetti, 1993; Cicchetti &

Toth, 1995; Meyer, Chrousos, & Gold, 2001). One common finding is that of abnormal stress system patterns coexisting with negative affect and depression (Bolger, DeLongis, Kessler, & Shilling, 1989; McGonagle & Kessler, 1990). However, it is important to consider the great variety of depressive syndromes and heterogeneous environmental and developmental pathways that may result in common depressive symptom patterns. One possible mediator in the pathway from stress exposure to depressive mood is HPA axis dysfunction and cortisol dysregulation.

When considering cortisol and depression there are two postulates, one that dysregulation of cortisol patterns are a function of mental illness, and second that prolonged activation of the stress system may put individuals at risk of developing depressive illness (Kurina et al., 2004). Gold and Chrousos (2002) suggest that the stress system acts as a go-between, transducing abnormalities in clinical and physiological factors into depressive pathophysiology. Advanced models examining the association between stressors and depression now commonly include biological mediators which help to further elucidate this association (Burke et al., 2005; Hammen, 2005).

As with studies examining the association between caregiving and cortisol levels, major depression has frequently been associated with cortisol hypersecretion (Kurina et al., 2004; Van Santen et al., 2011). The corticosteroid receptor hypothesis of depression, for example, points to hypercortisolism in a mediating role in the etiology of depression. This theory suggests that impairment of the corticosteroid receptor leads to hypercortisolism after stress exposure (Burke et al., 2005; Holsboer 2000, 2001). Likewise studies of individuals with depressed mood have found an association with elevated CAR and heightened levels of overall cortisol (Van Santen et al., 2011; Heaney et al., 2010; Jonsdottir, Halford, & Eek, 2011). A line of research suggests that differing DSM-IV subtype classifications of depression are associated with varying levels of

cortisol secretion. Many studies have noted the correspondence of hypercortisolism with melancholic depression, a form of depression noted for hyperarousal, anxiety about the self, helplessness, memories of failures, and diurnal variation of symptom severity with greatest severity in the morning (Gold & Chrousos, 1999, 2002; Sternberg & Gold, 2002).

Atypical depression, on the other hand, a form of depression noted for symptoms of weariness and emptiness, avoiding others, feelings of disconnectedness, fatigue, increased sleep and weight gain, and symptoms that increase in severity across the day has been associated with hyposecretion of cortisol (Gold & Chrousos, 1999, 2002; Sternberg & Gold, 2002). A blunted cortisol pattern, consisting of no morning rise and low levels of cortisol across the day, for example, has been found among individuals with depression, and older adults in particular (Burke et al., 2005; Bremner et al., 2007; Heaney et al., 2010). It may be that allostatic load, or bodily wear and tear, is associated with hypocortisolism in older adults experiencing chronic stress and depression (Almeida, McGonagle, & King, 2012). Though both hypo- and hypercortisolemic diurnal patterns have been found, given that our sample is older and experiencing chronic stress, it is anticipated that more blunted patterns of daily cortisol will be associated with increased depressive mood.

**Anger.** In comparison with depression, few studies have examined the association between anger and cortisol, and an examination of the association from a chronic stress, caregiving context is needed. In existing studies, elevated levels of cortisol are most commonly associated with feelings of anger and hostility. Anger, which has been associated with confrontational and aggressive behaviors, may be exacerbated from elevated cortisol levels or the “metabolic fuel” stemming from the HPA axis (Kemeny & Shestyuk, 2008). For example, university students who scored high on cynical hostility were found to have elevated cortisol

levels during the day (Pope & Smith, 1991). When examining anger and cortisol from a stress perspective, a positive association was found between anger and cortisol such that the higher the anger score following the Trier Social Stress Test, the higher the cortisol level of the individual following the task (Moons, Eisenberger, & Taylor, 2010). Additionally, teachers who reported high job strain and high anger scores on the Spielberger State-Trait Anger Expression Inventory had significantly elevated cortisol in the morning in comparison with teachers who reported low job strain and high anger (Stephoe et al., 2000). In a population based sample of older adults, feelings of anger were associated with a same-day flattened, elevated cortisol slope. Cortisol levels remained elevated in the evening rather than declining throughout the day resulting in a flatter slope (Adam, Hawkley, Kudielka, & Cacioppo, 2006). Among patients with atherosclerosis, individuals with high cynical hostility showed less steep decline in cortisol across the day in comparison with individuals who scored low on cynical hostility (Ranjit et al., 2009). Based on prior research it is expected that hyper-cortisol levels will be associated with daily anger, although given the age and experienced chronic stress of the sample, it is possible that more blunted patterns will be seen.

### **3.1.3 Care Related Stressors and Interventions in Association with Daily Mood**

It is important to consider diurnal cortisol of caregivers, however, in the context of experienced daily stress. For example, the frequency of daily stressors faced by dementia caregivers, such as behavioral and emotional problems (e.g., screaming, hallucinations, wandering, and aggression) has been found to be associated with caregivers' mental health and well-being (Aneshensel et al., 1995; Pearlin, Mullan, Semple & Skaff, 1990; Schulz, O'Brien, Bookwala, & Fleissner, 1995). A theory that highlights this association is Pearlin and colleagues' Stress Process Theory, which considers both primary care stressors such as

behavioral and emotional problems, and the caregiver's feelings and perceptions regarding the care demands as contributing factors to a caregiver's well-being, or lack thereof, over time.

One of the most frequent stressors experienced by dementia caregivers, behavioral and emotional problems exhibited by the IWD, are consistently associated with depression in caregivers with a greater frequency of behavior problems being associated with more depressive symptoms (Schulz et al., 1995 offers a review). Furthermore, caregivers with high trait anger scores have reported lower self-efficacy in handling behavior problems associated with the dementia of the care recipient (Steffen, McKibbin, Zeiss, Gallagher-Thompson, & Bandura 2002). In Alspaugh, Stephens, Townsend, Zarit, and Greene's (1999) one year longitudinal study, they found that caregivers whose relative had lower levels of behavior problems were significantly more likely to remain asymptomatic across the year and caregivers whose relative had higher levels of behavior problems were significantly more likely to remain consistently depressed or develop depression at some point over the year. Another important factor that influences mood is sleep quality. For example, sleep quality is not just a symptom but a core contributing risk factor to the development and expression of depression and anger (Pilcher, Ginter, & Sadowsky, 1997; Riemann, Berger, & Voderholzer, 2001; Tsuno, Besset, & Ritchie, 2005). Care-related stressors and sleep quality will be included as covariates in the current study.

Understanding the correspondence between depressive mood, anger, and the stress process is critical because interventions such as Adult Day Services (ADS), also known as Adult Day Care (ADC), may reduce caregiver stress and assuage negative emotions. ADS provides individuals with dementia (IWDs) and other illnesses outside of the home social/therapeutic activities and medical care and their caregivers with respite from care responsibilities. In

comparison with non-day care service using caregivers, caregivers whose relative attended ADS reported fewer behavioral and emotional problems and less time spent managing these problems in the evenings following ADS attendance and over time (Gaugler et al., 2003; Zarit et al., 2011). Furthermore, in a comparative intervention study examining negative affect in caregivers utilizing day care services, at 3 months the caregivers whose relative attended ADS had significantly lower anger and depression scores in comparison with caregivers whose relatives were not using day care services (Zarit, Stephens, Townsend, & Greene, 1998). Additionally, anger is believed to coincide with daily care demands and may subside when relief is provided (Aneshensel et al., 1995). Thus ADS may provide caregivers' reprieve from managing behavior problems and care responsibilities and thereby help to reduce caregivers' negative emotions and improve the care they are providing their care receiver. ADS may provide the relief caregivers need to focus on personal tasks and may lead to improved health behaviors, self-care, and physical health, ultimately improving overall mental and physical well-being (Lavretsky, 2005; Schulz & Martire, 2004). As the caregiving situation is dynamic, strategies to handle care problems may become ineffective over time leading to frustration, depressive mood, and anger, and thus respite provided by programs such as ADS may become even more important throughout the care process (Steffen, 2000).

#### **3.1.4 Significance**

The complex associations between depression, anger, caregiving, cortisol, daily stressors, and ADS usage need further examination. The Daily Stress and Health Study (DASH) provides a unique opportunity to look at these constructs from a daily diary, within-person approach. Though individual associations between caregiving, anger, and depression with cortisol have

been found, we don't know to what extent depressive mood and anger have the same association with cortisol, particularly in a sample of caregivers experiencing both chronic and daily stress.

The current study examines depressive mood and anger as outcomes of the caregiving stress process and cortisol as a key predictor of daily mood. Extending upon prior work, the current study utilizes an 8-day, daily diary and saliva collection approach in family caregivers of individuals with dementia, a group experiencing daily and chronic stress. The current study examines both CAR and AUC cortisol as predictors of daily mood. Furthermore, all caregivers are experiencing days where their relative is not at ADS and they are involved in active daily care tasks, and days where their relative is attending ADS. Actions taken to decrease responsivity to stress, such as receiving respite due to one's relative attending ADS, could positively affect the mental health of caregivers and their immune system as well given the interactions of stress and hormonal responses (Sternberg & Gold, 2002).

### **3.2 Research Questions**

Two main research questions are proposed. First, *how are two dynamic measures of cortisol, CAR and AUC, associated with depressive mood and anger in a sample of caregivers for individuals with dementia?* Using a two level, multilevel model with depression and anger as outcomes in separate analyses, between-person and within-person measures of CAR and AUC cortisol are examined as predictors. It is hypothesized that hypo or blunted levels of CAR and AUC will be associated with depressive mood. In contrast, it is hypothesized that CAR and AUC will have a positive association with anger such that elevated levels of cortisol are associated with greater feelings of anger.

Second, *in conjunction with daily cortisol, how are daily stressors, namely care related stressors and sleep problems, and ADS use, as a possible intervention, associated with*

*depressive mood and anger in a sample of dementia caregivers?* After testing individual associations between depressive mood and anger with each of the covariates, a conditional two-level multilevel model will be tested examining between and within-person measures of CAR and AUC cortisol, ADS usage, and between and within-person measures of care related stressors and sleep quality as predictors of depressive mood and anger. It is hypothesized that more care-related stressors and poorer sleep quality will be associated with more anger and depressive mood. Additionally, it is hypothesized that on days where the care receiver attends ADS, caregivers will have fewer stressors, which will lead to lower depressive mood and anger. Finally it is hypothesized that cortisol, as a biomarker of the stress process, will remain a significant predictor in the model. This study will lead to a better understanding of the association between diurnal cortisol and daily mood in a stressful context where caregivers are experiencing both the chronic stress of caring for an individual with dementia and the daily stress that coincides with this care.

### **3.3 Methods**

#### **3.3.1 Sample**

Participants in this study were drawn from the Daily Stress and Health Study (DASH) which examines the stresses and daily experiences of primary, family caregivers of a relative with diagnosed dementia who attends ADS at least twice a week. Participants were recruited from ADS programs in Colorado, New Jersey, Pennsylvania, and Virginia. A screener interview was given to all participants to determine eligibility. Participants were eligible for the study if they were an informal caregiver with primary responsibility for the individual with dementia (IWD), lived with the IWD, did not have an endocrine disorder or other problem that could affect saliva production, the IWD had received a dementia diagnosis not including mild cognitive

impairment, and the IWD had attended ADS for at least one month and attended at least two days a week. The overall sample consists of 184 caregivers, however, the analytical sample excludes all caregivers who had no variability in their relative's day care attendance (i.e. relative attended day care for all 8 study days or did not attend day care during any of the 8 study days), did not complete any daily interviews after baseline, did not complete any saliva collection, or whose relative was in the hospital during the daily data collection. The resulting analytic sample includes 165 caregivers. See Table 1 for caregiver and care receiver demographic information.

### **3.3.2 Procedure**

Caregivers were recruited through ADS programs identified from their state and regional associations including five areas: Denver, Colorado, the greater Philadelphia area and greater Pittsburgh area in Pennsylvania, Northern and Central New Jersey, and Northern Virginia. Representatives from the ADS programs were invited to meetings where the study was explained and they were provided with recruitment flyers. Across the three years of recruiting, 57 programs provided referrals to the study. Some participants contacted study personnel after seeing the study advertised in ADS flyers and others were contacted by study personnel after a referral from an ADS. After going through an eligibility screening process, participants were given a baseline interview in their home or another place of their choosing (i.e. the ADS or public restaurant). The interviewer obtained informed consent, gave a number of baseline measures, and provided a short training on saliva collection.

After the baseline interview, caregivers filled out daily diaries on 8 consecutive days, some of which the IWD was attending day care and some of which the caregiver was actively caring for the IWD, and relayed their responses to a telephone interviewer from the Penn State Survey Research Center each evening. Saliva was also collected each day, 5 times a day: before

getting out of bed, half an hour after getting out of bed, before lunch, late afternoon, and before bed. Participants had a home saliva collection worksheet to help them keep track of their collections and tubes were numbered and color coded based on the day and time of collection. Participants were instructed to take samples before eating, drinking, or brushing teeth or to have tobacco or caffeinated products within 30 minutes of taking a sample. Participants chewed on a cotton swab for two minutes until saturated, placed the swab in the tube and kept it in the refrigerator until all salivettes had been collected at the end of 8 days. Salivettes were then picked up by an express mail service and delivered overnight to the lab at the Pennsylvania State University where they were assayed.

Participants recorded the times of their saliva collections, any medications they took over the past 48 hours (this includes steroids which may impact salivary steroid hormone assessment; Granger, Hibel, Fortunato, & Kapelewski, 2009), their tobacco smoking status (confirmed by salivary cotinine testing for all participants), and menstrual cycle information for females. These procedures are consistent with prior studies (Almeida et al., 2009; Almeida, Piazza, & Stawski, 2009; Granger & Kivlighan, 2003). Only ten participants were current smokers and thus this information was not considered in analyses. Flags, or indications that a saliva sample may not be valid, were then created for samples that had extreme values or that had times which didn't allow the normal diurnal curve to take place (for example if the caregiver was awake less than 12 hours or more than 20 hours or if more than 60 minutes elapsed between the first and second morning samples). Different flags apply to different cortisol measures given which part of the curve is being examined. For example, all flags apply to the AUC as it takes all five samples into account. In analyses including CAR as a predictor, the observation  $N$ , or number of days included in the analysis, was 1,142 which excluded 76 missing, problematic or empty samples

and 91 flagged samples. In analyses including AUC as a predictor, the observation  $N$  was 1,005 which excluded 261 missing, problematic, or empty samples and 89 flagged samples.

The daily diary and saliva collection portion of the DASH study was designed in order to assess within-person, daily variability in stressors, affective states, and stress reactivity. For example, there may be between person differences in caregivers' sleep quality, but an individual caregiver's sleep quality may also differ from day to day. Caregivers face varying stressors each day in response to care tasks or respite provided by ADS, and caregivers' cortisol levels and affective states, such as depressed mood and anger/hostility, may likewise vary across days. In order to assess stress reactivity, measures of stressors, cortisol levels, and affective states across days are necessary.

### **3.3.3 Measures**

#### **Outcomes.**

***Depressive Mood.*** Depression items were drawn from an adapted inventory of emotions from the Non-Specific Psychological Distress Scale developed for the original MIDUS survey (Kessler et al., 2002; Mroczek & Kolarz, 1998). The scale included seven items ( $\alpha = 0.78$ ) and was modified to ask participants to report over a 24-hour period rather than the past week. Participants were asked how frequently they felt each emotion on a 5-point scale from 1 (none of the day) to 5 (all day) with higher scores indicating greater depressive mood. Sample items include feeling worthless, hopeless, and so sad that nothing could cheer you up.

***Anger/Hostility.*** Anger/hostility items were also drawn from the Non-Specific Psychological Distress Scale (Kessler et al., 2002; Mroczek & Kolarz, 1998) with the same modifications and 5-point scaling as the depressive items such that a higher score indicates greater anger. The scale consisted of three items: angry, frustrated, and irritable ( $\alpha = 0.78$ ).

### **Covariates: Within-Person (Day Specific)**

Person mean centered scores of AUC and CAR cortisol, ADS use, care-related stressors, and sleep quality are included as within-person predictors.

**Cortisol: Cortisol Awakening Response (CAR) and Area Under the Curve (AUC).** The cortisol awakening response (CAR) is defined as the interval between the awakening cortisol level and the value 30 minutes after awakening and is calculated by subtracting the nmol/L waking score from the 30 minute after waking nmol/L value. A larger interval is indicative of a normal pattern, which consists of a large morning rise followed by a steep decline throughout the day. A smaller interval would be indicative of a blunted pattern of either consistently low or elevated cortisol levels which is hypothesized to be associated with caregiver depressive mood and anger (Burke et al., 2005; Gallagher-Thompson et al., 2006).

The area under the curve (AUC) is defined as the total output of cortisol across the day. It is assessed by summing the mean of adjacent samples across the day weighted by the amount of time between the samples (Pruessner, Kirschbaum, Meinlschmid, & Hellhammer, 2003). A normal AUC reflects the typical diurnal pattern of a steep CAR and decline slope across the day resulting in moderate cortisol output. A very small AUC would reflect a blunted slope across the day and too large of an AUC would reflect an elevated pattern with little decline across the day. These extreme patterns are expected to be associated with depression and anger.

**Day Care.** Day care attendance is a dichotomous variable of whether the relative with dementia attended ADS that day (ADS = 1) which was confirmed during the daily telephone interviews.

**Care-Related Stressors.** Behavioral and psychological symptoms of dementia (BPSD) have been found to be particularly upsetting to caregivers and are associated with daily mood

(Schulz et al., 1995; Teri, 1997). BPSD were measured using the Daily Record of Behavior (DRB) for use in daily interviews and caregivers reported on the behaviors of the IWD for the previous 24 hours from the time of the interview call. (Fauth, Zarit, Femia, Hofer, & Stephens, 2006; Femia, Zarit, Stephens, & Greene, 2007). In this study the scale includes 19 items from six categories: depressive behaviors, disruptive behaviors, memory-related behaviors, reality problems, restless behaviors, and resistance to help with activities of daily living (ADL). Participants could also indicate up to three care-related behavioral events which they experienced in addition to the 19 listed items. Caregivers reported the occurrence of behavior problems for four periods of the day: waking to 9:00a.m., 9:00 a.m. to 4:00 p.m., 4:00 p.m. to bedtime, and overnight. Participants reported which periods of the day a behavior problem occurred. A frequency count was computed by summing the total number of behaviors reported from each time frame for a highest possible count of 88 ( $\alpha = 0.92$ ). Given that the purpose of this paper was to look at daily mood, sum scores were constructed as listed above with frequencies counting last night's overnight behavior problems through today's bedtime problems, in other words counting the four periods that would influence today's mood.

***Sleep Quality.*** During the daily phone interviews, caregivers rated their sleep quality the previous night on a 5-point scale from 1 (poor) to 5 (excellent).

**Covariates: Between-Person (Person Specific)**

Person mean scores (grand-mean centered) of AUC and CAR cortisol, care-related stressors, and sleep quality are included as person specific predictors.

***Controls.*** Caregiver age, caregiver gender, the duration of care in months, the total number of day care days used, and the ADL impairment of the IWD were all considered as

controls, however, none of them were significantly associated with daily depressive mood or anger and were thus dropped from the analytic models.

### 3.3.4 Analysis

Multilevel linear modeling (Raudenbush & Bryke, 2002) was used to examine variability in depressive mood and anger among caregivers experiencing the chronic stress of caring for a relative with dementia. We utilized two-level multilevel models (SAS PROC MIXED) to examine the daily data which was nested within individuals thus consisting of two levels: *day level* and *person level* (Littell, Miliken, Stroup, & Wolfinger, 1996). By partitioning the variability into two levels, the association between depressive mood/anger and daily cortisol can be estimated at each level such that the variation across days and between individuals is estimated. Separate multilevel models were run with depressive mood and anger/hostility as outcomes. To examine the first research question regarding the unconditional effect of daily cortisol on depressed mood and anger, we modeled depressive mood and anger for the  $d$ th day in the  $i$ th person as:

$$\text{Depressive Mood}_{di} = \beta_{0i} + \beta_{1i}(\text{CAR}_{di}) + e_{di}$$

At Level 1 (within-person), daily depressive mood is a function of an intercept ( $\beta_{0i}$ , representing the mean level of depressive mood for each individual averaged across days), CAR ( $\beta_{1i}$ , the first slope parameter representing the coefficient of the within-person variability of the CAR), and the person-specific deviations from the intercept ( $e_{di}$ ). CAR is a person-mean centered score to show daily fluctuations around one's mean or within-person effects (Hoffman & Stawski, 2009). At Level 2 (between-person), a person-mean CAR is included as a predictor. This model was also run with anger as an outcome and AUC as a predictor of both anger and depressive mood. Unconditional models were also run with ADS use, care-related stressors, and

sleep quality as separate predictors. The same models were run with anger replacing depressive mood as the outcome variable.

The second research question examined the effects of diurnal cortisol in addition to ADS use, care-related stressors, and sleep quality on anger and depressive mood. The equation for the two-level, multilevel model estimating day-level (Level 1) and person-level (Level 2) associations between daily cortisol levels and depressive mood and anger follows:

Level 1 (within-person):

$$\text{Depressive Mood}_{di} = \beta_{0i} + \beta_{1i} (\text{CAR}_{di}) + \beta_{2i} (\text{ADS}_{di}) + \beta_{3i} (\text{Sleep Quality}_{di}) + \beta_{4i} (\text{Care-Related Stressors}_{di}) + e_{di}$$

Level 2 (between-person):

$$\beta_{0i} = \gamma_{00} + \gamma_{01} (\text{CAR}_i) + \gamma_{02} (\text{Sleep Quality}_i) + \gamma_{03} (\text{Care-Related Stressors}_i) + u_{0i}$$

$$\beta_{1i} = \gamma_{10}$$

$$\beta_{2i} = \gamma_{20}$$

$$\beta_{3i} = \gamma_{30}$$

$$\beta_{4i} = \gamma_{40}$$

where depressive mood<sub>di</sub> and anger<sub>di</sub> is the score for day *d* and person *i*. The intercept ( $\beta_{0i}$ ) represents the mean level of depressive mood/anger for each individual (averaged across days). The first slope ( $\beta_{1i}$ ) represents the coefficient of the within-person variability of the CAR or AUC on the caregiver's depressive mood or anger. The second slope parameter ( $\beta_{2i}$ ) represents the effect of whether the IWD attended day care today. The third slope ( $\beta_{3i}$ ) represents the effect of whether last night's sleep quality affects today's depressive mood and anger. Finally the fourth slope ( $\beta_{4i}$ ) represents the effect of today's care-related stressors on today's mood. These predictors reflect within-person daily fluctuations by centering around the person-mean.

At Level 2, person mean levels of AUC or CAR cortisol, sleep quality, and care-related stressors are entered as between-person predictors. A random effect is estimated for the intercept.

### **3.4 Results**

Demographic characteristics of caregivers and IWDs may be found in Table 1. On average across days caregivers reported IWDs displaying 5.40 ( $SD=7.23$ ; reported range 0 - 60) behavioral and psychological problems (care-related stressors). On average caregivers reported a sleep quality score of 2.99 ( $SD = 1.07$ ; reported range 1 - 5) indicating “good” quality of sleep. Expression of anger and depressive mood symptoms was low but with moderate variation, with an average reported anger score at 2.09 ( $SD = 2.11$ ; reported range 0 – 10) and depressive mood at 2.51 ( $SD = 3.39$ ; reported range 0 – 24). Intraclass correlations were calculated for the two outcome variables depressive mood ( $ICC = 0.63$ ) and anger (0.51) reflecting that for depression 63 percent of the variance is between person and 37 percent is within person, and for anger 51 percent of the variance is between person and 49 percent is within person.

#### **3.4.1 Unconditional Models**

In examining the first research question regarding the zero-order effect of cortisol on daily mood, multi-level models indicated that the between-person, mean level of CAR was significantly associated with depressive mood ( $\beta = -0.171, p < .01$ ) such that a reduced or blunted CAR on average was associated with more depressive mood. Furthermore, the person-mean centered, within-person AUC was significantly associated with anger ( $\beta = -0.003, p < .05$ ) such that anger was higher on a day with a smaller AUC. Depressive mood was not significantly associated with the within-person fluctuations in CAR or between or within-person levels of AUC. Anger was not significantly associated with between-person levels of AUC or between or within-person levels of CAR.

Additional multi-level models indicated that depressive mood was unconditionally associated with within-person effects for care related stressors ( $\beta = 0.148, p < .001$ ) and sleep quality ( $\beta = -0.341, p < .001$ ), but not ADS, and between-person effects for care related stressors ( $\beta = 0.154, p < .001$ ) and sleep quality ( $\beta = -0.850, p < .01$ ). Anger was unconditionally associated with within-person effects for care related stressors ( $\beta = 0.108, p < .001$ ), sleep quality ( $\beta = -0.181, p < .001$ ), and ADS ( $\beta = -0.172, p < .05$ ), and between-person effects for care related stressors ( $\beta = 0.113, p < .001$ ) and sleep quality ( $\beta = -0.637, p < .001$ ). Thus care related stressors were independently associated with both depressive mood and anger such that a higher mean level of stressors was associated with more negative mood and a day with higher than an individual's average in care related stressors was associated with more negative mood. Similarly poorer sleep quality was associated with both depressive mood and anger such that a lower mean level of sleep quality was associated with more negative mood and a day with poorer than average sleep quality was associated with more negative mood. A day where the IWD was attending ADS was associated with reduced anger, but this effect was not seen for depression.

### **3.4.2 Conditional Models**

To address the second research question, two conditional (including all covariates: ADS, sleep quality, and care-related stressors), two-level multilevel models were run for depressive mood as an outcome- one model with CAR as a predictor and one model with AUC as a predictor. The same structure was used in running models with anger as the outcome. As shown in Table 2, the between-person, person-mean score CAR was negatively associated with depressive mood, reflecting an association between a blunted cortisol pattern and depression. The CAR was not significantly associated with anger. Both between and within-person levels of care related stressors were associated with depression and anger. Within-person sleep quality

scores were associated with both depressive mood and anger, but between-person sleep quality scores were only associated with anger. ADS use did not have a significant association with depressive mood or anger. As shown in Table 3, the effect of AUC cortisol on anger did not hold in the conditional model as neither between or within-person AUC scores were associated with daily mood. The associations of care-related stressors, sleep quality, and ADS use with depressive mood and anger were the same as the previously described models.

Finally, given the unconditional association of ADS use with anger, we considered a mediation model to test whether care-related stressors on a given day mediate the association between ADS use and anger. As previously shown, ADS use ( $\beta = -0.172, p < .05$ ) had a significant unconditional effect on anger. Additionally, ADS use is significantly associated with care related stressors ( $\beta = -2.202, p < .001$ ) such that a day care day is associated with less stressors. However, when entered in the model together, the effect of ADS use on anger becomes insignificant ( $\beta = -0.069, p = .423$ ) while within-person fluctuations in care-related stressors remain significant ( $\beta = 0.107, p < .001$ ). Thus, mediation is found as the effect of ADS use on anger is in reducing daily care-related stressors.

### **3.5 Discussion**

#### **3.5.1 The Association of Blunted Cortisol with Depressive Mood and Anger**

Our findings suggest that blunted cortisol patterns are associated with negative mood under conditions of chronic stress. We found that the between-person level, person mean CAR was associated with depressed mood such that individuals with smaller, blunted CARs were more depressed. This association was found in the unconditional model and in the conditional model including stressors and ADS use. Anger was significantly associated with the within-person daily fluctuations in AUC in the unconditional model such that a day with a lower AUC

output of cortisol was associated with greater anger. This association did not hold in the conditional model. Though prior research has found both hypo- and hyper- cortisol to be associated with depression and anger, our findings lend further support to studies finding blunted cortisol patterns in populations experiencing chronic stress. For example, the hypo-cortisol pattern has been found in mothers caring for adolescent or adult children with autism spectrum disorder or other serious mental disorders, women caregivers for individuals with dementia, non-elderly caregivers, parents of cancer patients, employees experiencing burnout, combat veterans, Holocaust survivors, victims of domestic violence, and in several review articles examining individuals experiencing chronic stress (Barker et al., 2012; Fries, Hesse, Hellhammer, & Hellhammer, 2005; Gunnar & Vazquez, 2001; Heim, Ehlert, & Hellhammer, 2000; Holland et al., 2011; Miller et al., 2002; Seedat, Stein, Kennedy, & Hauger, 2003; Seltzer et al., 2009; Seltzer et al., 2010; Sonnenschein et al., 2007; Vedhara et al., 2002; Yehuda et al., 1995; Yehuda, Boisonuae, Lowy, & Giller, 1995). Furthermore, consistent with our finding of the blunted CAR pattern's association with depression, a recent meta-analysis found that a blunted awakening response, in particular, is common in groups experiencing chronic stress (Miller, Chen, & Zhou, 2007).

Likewise a blunted cortisol pattern has been found in prior work examining individuals with depression, and in particular among older adult samples (Bremmer et al., 2007; Burke et al., 2005; Heaney et al., 2010). Our sample of family caregivers, who on average are older (given that many are spousal caregivers) and are experiencing the chronic stress associated with caring for a loved one with dementia, may face a heightened, accumulated allostatic load, or bodily wear and tear, that is associated with hypocortisolism (Almeida et al., 2012). Though anger's association with cortisol has been examined less frequently than depression, a hyper-cortisol

pattern is commonly found (Adam et al., 2006; Kemeny & Shestyuk, 2008; Moons et al., 2010; Pope & Smith, 1991; Ranjit et al., 2009; Steptoe et al., 2000). Our findings, though consistent with patterns of chronic stress, fall in contrast to these prior studies. It may be that a blunted cortisol pattern leaves caregivers with fewer cognitive and emotional resources for controlling angry outbursts.

### **3.5.2 The Association of ADS use, Care-related Stressors, and Sleep Quality with Depressive Mood and Anger**

Consistent with prior studies (Alspaugh et al., 1999; Schulz et al., 1995; Teri, 1997), we found that care-related stressors were significantly associated with both depressive mood and anger. This association was at the within-person and between-person level such that on average individuals handling more stressors are more depressed and angry, and days where individuals had to face more stressors than their personal average were associated with more depression and anger. ADS use had a significant association with anger such that days where the IWD attended ADS were associated with less anger. This association did not stand, however, in the conditional model. After further investigation by running a mediational analysis, it was found that ADS's association with anger is through a reduction in stressors. In a separate analysis, Zarit, Kim, Femia, Almeida, & Klein (2013) found a buffering effect of the number of ADS days on care-related stressors in association with depressive symptoms such that caregivers who used more ADS had less of an increase in depressive mood when stressors were high than caregivers who used fewer days of ADS overall. Thus it appears that ADS, both on the daily level and cumulatively, impacts the mood of caregivers through its impact on reducing care-related stressors.

Sleep quality was also found to be significantly associated with depressed mood and anger. Sleep quality is considered a contributing risk factor to the development and expression of depression and anger (Pilcher et al., 1997; Riemann et al., 2001; Tsuno et al., 2005). We were able to include it as a covariate because sleep items were not included in our measure of depression or anger. Days where individuals had poorer than usual sleep quality were associated with greater depression and anger. A between-person association, however, was only found with anger such that individuals with poorer average sleep quality were angrier. These associations highlight the impact of sleep on daily mood, particularly in regard to an individual's daily variation in sleep quality. We did look at the relation of ADS use to sleep quality and found no association. It may be that the ADS effect on daily mood is limited, because it does not address disruptions of sleep that are very common in caregivers and individuals who are depressed or angry. The importance of sleep quality for daily mood suggests that ADS programs might consider offering sleep hygiene programs for caregivers, such as developed by Susan McCurry and colleagues, which have been found to improve sleep of both people with dementia and their caregivers (McCurry, Gibbons, Logsdon, Vitiello, & Teri, 2003; McCurry, Logsdon, Vitiello, & Teri, 1998).

### **3.5.3 Limitations**

There are several limitations to the current study. First, given the daily diary approach of our study, we do not have information on past history of mental health problems in our caregivers. However, this study design gave us a unique opportunity to look at day-to-day fluctuations in response to diurnal cortisol, care stressors, and ADS use. Additionally, while our within-person approach allows us to compare caregivers to themselves by examining day-to-day fluctuations in mood, cortisol, and stressors, we were not able to compare the association of

diurnal cortisol with daily mood in our sample with caregivers not using ADS. Furthermore, our depressive mood and anger scales, taken from the Non-Specific Psychological Distress Scale developed for the original MIDUS survey (Kessler et al., 2002; Mroczek & Kolarz, 1998) indicate only expression of symptoms, not a diagnosable depression or anger/hostility disorder. In regards to our sample, the caregivers self-selected into our study by volunteering and thus there may be an element of selection bias. However, the sample characteristics of our caregivers compare similarly to other studies of dementia caregivers.

#### **3.5.4 Implications and Future Directions**

This study provides strong support for an association of blunted, diurnal cortisol with negative mood in a sample of dementia caregivers experiencing chronic stress. Our findings also reflect a strong association between care-related stressors and sleep quality with depressive mood and anger. Ultimately ADS may impact caregiver's mood by reducing exposure to stressors and providing other programs to support family caregiver's quality of life. Future work should not ignore the importance of cortisol, as a biomarker of the stress process, in association with daily mood. Determining how ADS and other interventions may prevent a blunted diurnal pattern may help caregivers more adaptively respond to stress, provide better care for the IWD, and reduce their risk for a number of mental and physical health concerns.

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Table 3.1

*Sample Characteristics of Caregivers and Individuals with Dementia*

	<i>M</i>	<i>SD</i>	Range
<b>CG's characteristics</b>			
Female (yes = 1)	0.87	0.34	0 - 1
Age	61.99	10.70	39 - 89
White (yes = 1)	0.72	0.45	0 - 1
Married (yes = 1)	0.69	0.46	0 - 1
Education <sup>a</sup>	4.46	1.21	1 - 6
Employed (yes = 1)	0.41	0.49	0 - 1
Relation to IWD			
Spouse (yes = 1)	0.39	0.49	0 - 1
Child (yes = 1)	0.57	0.50	0 - 1
Others (yes = 1)	0.04	0.20	0 - 1
Number of ADS days	4.15	1.45	1 - 6
Length of care (in months)	61.53	46.02	3 - 264
<b>IWD's characteristics</b>			
Age	81.87	8.47	57 - 100
Female (yes = 1)	0.59	0.49	0 - 1
ADL impairment <sup>b</sup>	3.05	0.49	2 - 4

Notes. ADS = adult day services. CG = caregiver. IWD = individual with dementia.

Participant *N* = 165.

<sup>a</sup> A 6-point scale ranging from 1 (*less than high school*) to 6 (*post college degree*)

<sup>b</sup> Mean scores of 13 items rated on a 4-point scale ranging from 1 (*does not need help*) to 4 (*cannot do without help*)

Table 3.2

*The effects of CAR Cortisol, ADS use, and Daily Stressors on the Depressive Mood and Anger of Family Caregivers*

	<b>Depressive Mood</b>	<b>Anger</b>
	<i>B(SE)</i>	<i>B(SE)</i>
<b><i>Fixed effects</i></b>		
Intercept	2.56(0.21)***	2.11(0.11)***
<b><i>Within-Person Predictors</i></b>		
CAR <sup>a</sup>	-0.00(0.01)	-0.00(0.01)
ADS use (yes = 1)	-0.12(0.13)	-0.08(0.09)
Care-related stressors <sup>a</sup>	0.13(0.02)***	0.10(0.01)***
Sleep quality <sup>a</sup>	-0.32(0.08)***	-0.16(0.06)**
<b><i>Between-Person Predictors</i></b>		
CAR <sup>b</sup>	-0.15(0.06)**	-0.03(0.03)
Care-related stressors <sup>b</sup>	0.14(0.03)***	0.10(0.02)***
Sleep quality <sup>b</sup>	-0.47(0.29)	-0.41(0.15)**
<b><i>Random effects</i></b>		
Intercept VAR.	6.69(0.82)***	1.68(0.23)***
Residual VAR.	3.81(0.17)***	2.15(0.10)***
-2 Log Likelihood	5178.8	4418.5
AIC	5182.8	4422.5

*Notes.* \* $p < .05$ . \*\* $p < .01$ . \*\*\*  $p < .001$ .

ADS = adult day services.

Participant  $N = 165$ ; Observation  $N = 1,142$ .

<sup>a</sup> Person-mean-centered scores (i.e., time-varying).

<sup>b</sup> Person-mean scores across days (i.e., time-invariant).

Table 3.3

*The effects of AUC Cortisol, ADS use, and Daily Stressors on the Depressive Mood and Anger of Family Caregivers*

	<b>Depressive Mood</b>	<b>Anger</b>
	<i>B(SE)</i>	<i>B(SE)</i>
<b><i>Fixed effects</i></b>		
Intercept	2.56(0.22)***	2.09(0.11)***
<b><u>Within-Person Predictors</u></b>		
AUC <sup>a</sup>	-0.00(0.00)	-0.00(0.01)
ADS use (yes = 1)	-0.13(0.14)	-0.06(0.10)
Care-related stressors <sup>a</sup>	0.12(0.02)***	0.10(0.01)***
Sleep quality <sup>a</sup>	-0.33(0.09)***	-0.17(0.06)**
<b><u>Between-Person Predictors</u></b>		
AUC <sup>b</sup>	-0.00(0.01)	-0.00(0.00)
Care-related stressors <sup>b</sup>	0.13(0.04)***	0.09(0.02)***
Sleep quality <sup>b</sup>	-0.55(0.31)	-0.41(0.16)**
<b><i>Random effects</i></b>		
Intercept VAR.	7.38(0.92)***	1.71(0.24)***
Residual VAR.	3.92(0.19)***	2.16(0.11)***
-2 Log Likelihood	4635.2	3925.8
AIC	4639.2	3929.8

*Notes.* \* $p < .05$ . \*\* $p < .01$ . \*\*\*  $p < .001$ .

ADS = adult day services.

Participant  $N = 165$ ; Observation  $N = 1,105$ .

<sup>a</sup> Person-mean-centered scores (i.e., time-varying).

<sup>b</sup> Person-mean scores across days (i.e., time-invariant).

## CHAPTER 4. CONCLUSIONS AND IMPLICATIONS.

Depression, though appearing less frequently among older adults than among younger age groups, is still the most prevalent mental illness of late-life and is associated with a great amount of suffering, disability, social difficulties, complicated outcomes for medical problems, poorer quality of life, and even mortality (Alexopoulos, 2005; Beekman, Deeg, Braam, Smit, & van Tilburg, 1997; Blazer, 2003; Blazer & Hybels, 2005; Haynie, Berg, Johansson, Gatz, & Zarit, 2001; Meeks, Vahia, Lavretsky, Kulkarni, & Jeste, 2011). Depression is characterized by a number of symptoms both emotional and physical which may consist of a common underlying neurochemical pathway across individuals. These symptoms, however, may be brought on or triggered by a range of different life experiences or stressors. A number of hypotheses have been offered to explain why depression is less common among older adults than younger age groups. The most “vulnerable” adults, such as those with severe depression, selectively attrite out of the population due to associations with earlier mortality (Vink, Aartsen, & Schoevers, 2008). It follows that a scientific belief in “survival of the fittest” may be well founded with a healthier population surviving to late adulthood (Haynie et al., 2001; George, 2011; Zarit & Zarit, 2007). Additionally, older adults are believed to develop strengths in appraisals, attentional strategies, and behaviors that can be employed to help individuals regulate these negative experiences over time. Psychosocial processes such as emotion regulation and coping resources may allow individuals’ well-being to stay stable and even increase over time ultimately decreasing risk for mental illnesses such as depression (Charles, 2010; Femia, Zarit, and Johansson, 1997). Yet, there are a number of distinct, stressful, social contexts which carry particular risk of depression for middle aged to older adults and may ultimately overwhelm these coping capabilities. Two of these distinct social contexts: family caregiving for older adults with dementia and the transition

to a long-term care facility have been previously found to have high rates of depression and were examined in this dissertation (Dura, Stukenberg, & Kiecolt-Glaser, 1991; Gallagher, Rose, Rivera, Lovett, & Thompson, 1989; Parmelee, Katz, & Lawton, 1992; Schulz, O'Brien, Bookwala, & Fleissner, 1995; Watson, Garrett, Sloane, Gruber-Baldini, & Zimmerman, 2003).

#### **4.1 A Social Contextual Approach**

Taking a social, contextual approach to the study of depression in late-life acknowledges that mental health is embedded in social systems which may impact the expression of mental disorder (Angel & Williams, 2000). In particular, the transition to long-term care residency may be considered a stressful life event with the impact being felt before and after the relocation. This stressor may become chronic if the environment is not congruent with an individual's abilities and wishes regarding care (Lawton & Simon, 1968; Lawton, 1986). In this dissertation it was found that depressive symptoms increased across the transition to long-term care with a mean CES-D score at the transition of 13.46 suggesting moderately high levels of depressive symptoms on average.

Caregiving for a relative with dementia, on the other hand, is a chronic stressor for the caregiver in that individuals are often in the care role for many years. Care responsibilities consist of daily stressors which can impact an individual's daily mood and lead to accumulated negative outcomes over time. In Study 2 it was found that though daily reports of depressive symptoms among caregivers were relatively low ( $M = 2.51$ ;  $SD = 3.39$ ; reported range 0 – 24), our participants had been using Adult Day Services (ADS) as a care intervention which may have reduced their reports of negative mood. Additionally, there was a strong amount of within-person variability suggesting that individuals' mood was very reactive to the amount of care-related stressors they faced in their day.

The social precursor models of mental illness presents six stages: demographic variables, early events and achievements, later events and achievements, social integration, vulnerability and protective factors, and provoking agents and coping efforts, with each stage presenting risk factors successively more imminent to the development of mental illness (Blazer, 2002; George, 2004). In this model the social contexts of caregiving and the transition to long-term care fall at the most proximate precursor stages of the model. Family caregiving, as a chronic stressor, falls at the vulnerability factor stage (Stage 5) and the transition to long-term care as a life event falls at the provoking agent stage (Stage 6) which functions as a distinct and immediate precursor to mental illness. Studying older populations experiencing social stressors at these stages is valuable because situational or contextual risk factors can be examined in conjunction with personal vulnerabilities. In this way appropriate interventions may be designed targeting the appropriate risk and protective factors at both the individual and contextual level. Given the upward trajectory of depressive symptoms among individuals making a transition to long-term care found in Study 1, it may be that interventions targeting personal risk factors, such as perceptions of control, would be beneficial before the transition takes place, while interventions targeting the institutional context, such as opportunities for residents to exert their personal control, may be critical after the transition. In Study 2 on family caregivers, depressive symptoms were moderately low across all observation days, which may reflect their use of ADS as an intervention. A number of other factors, however, were associated with caregiver's daily mood such as their cortisol levels and the care-related stressors faced each day. For this reason, taking a biopsychosocial approach to the study of risk and protective factors in varying stressful contexts is merited to fully understand the multiple dimensions playing into older adults' mental health.

## **4.2 A Biopsychosocial Approach to the Study of Risk and Protective Factors**

Foundational theorist and researcher Paul Baltes (1987) suggested the value of studying human development and aging from multiple perspectives, dimensions, and disciplines. A biopsychosocial approach to the study of development and depression which takes a multidisciplinary view has been widely endorsed (Areán & Reynolds, 2005; Blazer & Hybels, 2005; Kuo, Chong, & Joseph, 2008). This dissertation showed the value of studying risk and protective factors for mental health from multiple dimensions: biological, psychological, and social. Cortisol, for example, was examined as a biomarker of the stress process and as a covariate in the risk pathway for daily depressive mood and anger in Study 2. We found that a blunted or hypo-cortisol pattern reflecting chronic stress was associated with both daily depressive mood and anger in family caregivers for individuals with dementia. Thus, in addition to other biological pathways associated with depression, such as serotonin levels, cortisol as a biomarker of the stress process appears to be a key covariate and provides a link between daily stressors and affective symptoms. We found that anger and depressive mood were greater on days with greater frequency of care-related stressors and poorer sleep quality the night prior. Though the amount of daily stressors varies from day to day, daily mood is highly associated with these fluctuations. Here both biological and social dimensions were at play in predicting daily mood.

This dissertation also considered psychological protective factors through an examination in Study 1 of mastery and self-efficacy as covariates of depressive symptoms across the transition to long-term care. Though mastery and self-efficacy may be impacted by an individual's environment, it appears that strong feelings of control are protective regardless of the setting. Individual's depressive symptoms were reactive to variations around their average

feelings of control. When individuals experienced reduced perceptions of mastery and self-efficacy, they were more likely to be depressed. Future research might consider biological and social factors such as health status or social support in conjunction with perceptions of control across the transition to long-term care. Additionally the changing nature of control across time may be investigated. It may be questioned whether other psychological processes such as selective optimization with compensation may impact feelings of control with age or whether perceptions of control regarding psychological processes or physical processes are more critical to mental health with aging (Baltes & Baltes, 1990).

#### **4.3 Depressive Symptoms across Varying Time Continua**

This dissertation also provided an opportunity to examine depressive mood across two different time continua: eight consecutive days in one study and five waves each separated by three years in another study. When examining the intraclass correlation statistic, 37% of the variation in depressive mood across the eight days for family caregivers was within person, whereas 52% of the variation in depressive symptoms was within-person across years for individuals transitioning to long-term care. Thus it appears that depressive mood is more stable when examined on a weekly basis and has more within person variation when examined across years. DSM-IV criteria for a diagnosis of major depressive disorder requires that symptoms are consistently present during a two week period (American Psychiatric Association, 2000). Therefore, when depressive mood is examined across one week, it follows that there would be more variability between individuals than within-individuals. When it is examined over many years, depressive episodes may be more variable or sporadic, and could be tied to specific events or circumstances in individual's lives. These episodes and symptoms generally are less likely to be picked up by a single measurement.

Further, we utilized a type of statistical methodology, multi-level modeling (and growth curve modeling) that allowed us to examine similar associations across different time continua. This methodology allows for variability between individuals, but also within individuals over days and years (Raudenbush & Bryk, 2002; Singer & Willett, 2003). In both studies we examined between-person and within-person levels of the various risk and protective factors postulated to be associated with depressive mood. For example, both within-person and between-person levels of mastery were associated with depressive symptoms. On a wave where mastery was below an individual's average level, they had higher depression scores. Additionally, individuals with low levels of mastery prior to the transition were more likely to be depressed at the transition and had a steeper change in depressive symptoms at the adjustment period. On the other hand self-efficacy was only associated with depressive symptoms at the within-person level. Though mastery and self-efficacy are different constructs, they both represent perceptions of personal control and thus it is unclear why this difference is seen. As self-efficacy relates to achieving desired goals, it may be that in the face of decline and a long-term care transition, goals are modified. Mastery, however, which relates to the extent to which an individual feels control over circumstances may have a greater association with depression at the transition where one's circumstances have dramatically changed. Future research may further examine these associations in individual's receiving long-term care and other settings.

Additional differences were seen in examining between and within-person level predictors of depressive mood among family caregivers over a period of eight days. Sleep quality, for example, was only predictive of next day depressive mood at the within-person level. This suggests that daily mood is reactive to variations in sleep quality, but not absolute level of sleep quality. We also found the frequency of care-related stressors to be associated with

depressive mood at both the within and between-person levels suggesting that depressive mood is associated with individual variations and mean level of stressors. Future longitudinal studies should further examine the associations between cortisol and daily mood at both the between and within-person level. In the current study low mean levels of CAR cortisol were associated with depressed mood, while within-person fluctuations in AUC cortisol were associated with anger, though this association was not significant in the conditional predictor model. Though both patterns reflected a blunted pattern commonly associated with chronic stress, it may be important to untangle further how day to day fluctuations in cortisol levels can impact daily mood and ultimately what interventions may impact daily cortisol levels leading to reduced stress and mental health problems. Then as mean level of CAR cortisol was associated with depressive mood, it might be questioned when an intervention should be forged in the stress process that would prevent cortisol from developing such a blunted pattern. Given the differences found in between and within-person associations in both studies, these results highlight the importance of utilizing multilevel modeling techniques to examine covariates of depressive symptoms across both short and extended periods of time. Variations away from an individual's "homeostasis" in certain areas may be equally critical to having a relatively high or low average level of certain risk and protective factors.

#### **4.4 Future Directions and Implications**

Building upon the results of the current studies, a number of future directions may be proposed. Given the strong covariation between mastery and self-efficacy with depressive symptoms, future research may examine predictors of control and how control changes in response to the anticipation of and actual transition to long-term care. Additionally, while our study focused on changes in depressive symptoms over many years, a similar study may benefit

from more intensive longitudinal methods as proposed by Bolger and Laurenceau (2013) potentially in the year prior to and following a care transition or other major life event. This would further help to illuminate distinct changes processes as they occur and how risk factors are affecting change at specific moments in time in response to the life event. This would be a challenge, however, as care transitions and other major life events often aren't anticipated long in advance. Future research may also consider how ADS and other interventions can impact cortisol levels and consequently improve the mental health of family caregivers. Klein and colleagues (in preparation) have found that days where caregivers use ADS are associated with more normal cortisol patterns. For example, individuals with blunted cortisol patterns show higher cortisol levels on ADS days. It may be important to examine these associations over time to see if ADS use normalizes cortisol patterns not just on ADS days, but at the mean level as well.

In conclusion, it is important to study the depressed mood of older adults in context while considering an array of factors- biological, psychological, and social that may impact the development and expression of this mental disorder. Certain stressful contexts may overwhelm the coping capabilities of older adults, and it is in these settings that we often see high prevalence rates of mental illness. In this dissertation, caregivers displayed biological patterns of chronic stress which were associated with depressive mood. Interventions may be needed early on in the care process before stress reaches a chronic level to fully protect from the development of depressed mood. Individuals transitioning to long-term care had increasing depressive symptoms across this continuum, yet both mastery and self-efficacy served as protective factors for these individuals. Continuing to look at this transition longitudinally and from a transition

specific time frame may further illuminate the associations between control, depression, and other factors.

Though depressive symptoms are less prevalent among older adults than younger age groups, social contexts carrying high prevalence rates of depression do exist and are important to explore. Determining factors that overwhelm or protect and support coping capabilities among older adults can aid us in the ultimate goal to prevent the development of mental disorder or reverse the course of mental health problems that take away from a fulfilling and healthy late adulthood. As the aging population is rapidly increasing around the world, family caregivers and long-term care institutions will be highly valued commodities for the social and medical care of older adults in the coming years. Finding ways to support the mental health of caregivers and protect the mental health of long-term care residents will be of utmost importance.

## 4.5 References

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