

A Temporal Investigation of Within-Person Changes in
Optimism and Stress as Predictors for Changes in Well-Being

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Abstract

A Temporal Investigation of Within-Person Changes in Optimism and Stress as
Predictors for Changes in Well-being

Georgina Faddoul

Meta-analytic studies have established dispositional optimism as a personality trait with clear positive effects on psychological and physical well-being (Rasmussen, Scheier, & Greenhouse, 2009; Solberg Ness & Segerstrom, 2006). Optimism may be most important when experiencing stress, since optimists use more adaptive coping strategies and have more resources available compared to pessimists (Segerstrom, 2007; Solberg Ness & Segerstrom, 2006). Traditionally, studies have assumed optimism to be a stable trait, however recent studies have found optimism to be unstable in certain circumstances (e.g., Segerstrom, 2007). Although instability in optimism has been identified, research examining changes in optimism and well-being have been correlational and unable to identify causal associations. Additionally, these studies have not considered stress as a potential third variable to account for the associations between changes in optimism, and changes in well-being and health. The present study accounted for these limitations by replicating past findings, accounted for stress as a third variable, and also investigated the possibility that changes in optimism and stress may interact to influence changes in well-being and health. This was done by temporally investigating changes in optimism and stress at one point in time to predict changes in well-being and health at a later point in time. Additionally, this study investigated the extent to which the interaction between changes in optimism and stress at one point in time may influence the interaction between changes in optimism and stress on well-being and health at a later point in time. Results were able to show that changes in optimism did predict changes in well-being and health after controlling for stress, but changes in optimism at one point in time did not predict changes in well-being or health at a later point in time after controlling for stress.

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Introduction

A personality trait is an innate quality within an individual that leads to behaviours which remain relatively consistent across time and across situations (Allport, 1961). Consistent behaviours in how people interact with their environment can predict important differences in psychological and physical well-being between people. One such personality trait is dispositional optimism, a trait defined as the extent to which an individual holds generalized expectancies for positive versus negative future outcomes (Carver & Scheier, 2014). Extant findings have shown clear associations between dispositional optimism, from here on referred to simply as “optimism”, and subjective and physical well-being, with results suggesting that optimism is important in maintaining happiness and health (e.g., Aspinwall & Taylor, 1992; Rasmussen, Wrosch, Scheier, & Carver, 2006; Shifren & Hooker, 1995; Tindle et al., 2009; Zeidner & Hammer, 1992). However, some studies have shown instability in optimism in certain circumstances (Antoni et al., 2001; Atienza, Stephens, & Townsend, 2004a; Chopik, Kim, & Smith, 2015; Segerstrom, 2007; Shifren & Hooker, 1995; Symister & Friend, 2003), suggesting that optimism could also change over time. The proposed study aimed to address gaps in the literature and limitations of past studies. It is proposed that examining the predictive power of within-person change in optimism across time may yield more meaningful associations with subjective well-being and physical health than what has been found in the literature to date.

Dispositional Optimism and Subjective Well-Being

When faced with stressful life circumstances, optimists and pessimists differ greatly in the emotions experienced. Optimists expect life to generally yield positive outcomes, which has been associated with positive emotions. Conversely, pessimists, expect life to yield generally negative outcomes, which is associated with negative emotions (Scheier & Carver, 1992). Optimism’s association with emotional experience when under stress is a robust finding that has been examined in a wide range of populations and contexts. Studies have observed this association in undergraduate students (Aspinwall & Taylor,

1992; Brissette, Scheier, & Carver, 2002), survivors of war missile attacks (Zeidner & Hammer, 1992), family caregivers of cancer patients (Given et al., 1993), and spousal caregivers of Alzheimer's patients (Shifren & Hooker, 1995).

A considerable number of studies have also examined dispositional optimism as a predictor for subjective well-being in medical contexts. For example, optimists tend to have better quality of life over the course of illness and following coronary artery bypass surgery compared to pessimists (Fitzgerald, Tennen, Affleck, & Pransky, 1993; Scheier et al., 1989). Optimism protects against clinical depression following a failed attempt at in-vitro fertilization (Litt, Tennen, Affleck, & Klock, 1992). Optimistic long-term survivors of bone marrow transplantation are more likely to be satisfied with life and experience a less negative mood compared to pessimistic survivors. Optimistic breast cancer patients are less distressed pre- and post-surgery compared to pessimistic patients (Carver et al., 1993). Finally, optimistic men responding to the threat of immunodeficiency syndrome (AIDS) tend to be less distressed and have fewer AIDS-related concerns compared to pessimistic men (Taylor et al., 1992).

Dispositional Optimism and Physical Well-Being

Optimists and pessimists also differ in their physical well-being. Much research in the field of health psychology has focused on the impact of optimism on physical health. The theoretical basis for this interest lies in the hypothesis that optimists are less physiologically reactive than pessimists to stressful life events (Carver, Scheier, & Segerstrom, 2010). Since stress causes wear and tear on the body, and optimists experience a lower physiological stress response, optimists may be physically healthier than pessimists (Jobin, Wrosch, & Scheier, 2014; Rasmussen et al., 2009).

Optimism is associated with cardiovascular health. Carotid intima medial thickness (IMT) is a measure of the thickness of artery walls, and is used to predict cardiovascular events, such as heart attacks. Rääkkönen and colleagues (1999) determined that optimists had less progression in mean IMT than pessimists across three years. Optimists are also less likely than pessimists to be hospitalized for a variety of reasons indicative of poor response to elective coronary artery bypass graft surgery (e.g., the need for another bypass surgery; Scheier et al., 1989). In a notable study, Tindle and colleagues (2009)

used data from a project that sampled over 95 000 women across the United States of America over 8 years. Measures of optimism, quality of life, mortality, and morbidity were used to examine the relationship between optimism and physical health. Pessimists were more likely to develop coronary heart disease, and were more likely to die from coronary heart disease related causes than optimists. These studies show a clear relationship between optimism and cardiovascular health.

Optimists tend to have better immunological functioning than pessimists. For example, Ebrecht et al. (2004) sampled men receiving a biopsy, and separated them by slow and fast healing groups. Participants in the slow healing group were more pessimistic compared to participants in the fast healing group, who were more optimistic. In another study, Kohut and colleagues (2002) gave older adults an influenza vaccine. Two weeks later, higher optimism was associated with a higher immune response to the vaccine. Optimistic first year law students have also been found to have a higher number of helper T-cells compared to pessimistic students, another indicator of immunological health (Segerstrom, Taylor, Kemeny, & Fahey, 1998).

Further evidence of the benefits of optimism comes from a study showing that for every standard deviation increase in optimism, antioxidant concentration increases by 3% to 13% (Boehm, Williams, Rimm, Ryff, & Kubzansky, 2013). Antioxidants help to inhibit biological processes that damage cells and contribute to disease pathophysiology. Thus, optimism is tied to better health, and better outcomes when faced with health challenges.

Pathways to Better Psychological and Physical Well-Being

Many pathways through which optimism predicts better psychological and physical well-being have been identified. Optimism may be beneficial in itself, optimists may have more resources than pessimists, and optimists may use more adaptive coping strategies than pessimists. Each of these three pathways is reviewed in the following section.

Optimism is beneficial in itself

As previously mentioned, optimism is associated with psychological well-being. Many studies have shown optimistic beliefs to lead to better well-being compared to

pessimistic beliefs after accounting for affectivity. In a study examining the effect of optimism on postpartum depression, women who were more optimistic about their future were less likely to develop postpartum depression, even after controlling for dysphoria several weeks before childbirth (Carver & Gaines, 1987). Similarly, women diagnosed with breast cancer were interviewed at diagnosis, the day before surgery, a few days after surgery, and 3, 6, and 12 months after surgery. Optimism predicted less distress over time after controlling for earlier distress (Carver et al., 1993). In another study, women were measured on optimism and mood before a breast biopsy, after diagnosis, and after surgery (for those who received a cancer diagnosis). Predictably, cancer patients reported more negative mood than patients with a benign diagnosis, after controlling for initial mood, though the two groups did not differ in mood post-surgery (Stanton & Snider, 1993). In patients who received surgery for ischemic heart disease, optimism post-discharge predicted depressive symptoms one year later, even after controlling for initial depression. (Shnek, Irvine, Stewart, & Abbey, 2001).

Optimists are mentally and physically healthier because they expect positive events to happen in their lives, and will consequently experience more positive emotions and feel physically healthier than pessimists irrespective of affect. Thus, optimism in itself serves as a pathway through which people experience well-being. However, in all the studies mentioned, optimism did not account for all of the variability in psychological well-being, suggesting there are other pathways that lead to better well-being.

Optimism and coping strategies

Optimism may also predict better well-being due to differential uses of coping strategies when experiencing stressful life events. A meta-analytic review identified differences in coping strategies used between optimists and pessimists (Solberg Ness & Segerstrom, 2006). Since optimists expect positive outcomes, they engage with their environment in such a way as to make a positive outcome more likely. When the outcome of a situation is controllable, optimists engage in problem-focused coping strategies, such as persistence and planning. When the outcome of a situation is not controllable, they engage in emotion-focused coping strategies, such as acceptance, and positive re-appraisal. In contrast, pessimists tend to use avoidant strategies, such as behavioural disengagement and denial. These differences in coping strategies mediate associations

between optimism and well-being, such that optimists tend to use adaptive coping strategies which leads to positive well-being, and pessimists tend to use maladaptive coping strategies leading to poorer well-being (Solberg Ness & Segerstrom, 2006). Expectancy-value models of motivation assume that individuals pursue goals that are both important and attainable (Feather, 1982). Although optimists and pessimists may value the same goals, since optimists expect more positive outcomes, optimists are more likely than pessimists to pursue those goals. Thus, optimists and pessimists differ in which goals they choose to pursue, and how they cope with adversity when challenges arise.

Optimism and resources

Since one characteristic of optimism is that optimists tend to persist in goal attainment despite challenges and setbacks (Rasmussen et al., 2006; Wrosch & Scheier, 2003), optimists are more likely than pessimists to accumulate resources over time. For example, optimists seem better than pessimists at attaining status and social resources (Chemers, Hu, & Garcia, 2001). In a study that longitudinally examined former law students across 10 years, status and social resources were examined as potential pathways to better psychological and physical well-being (Segerstrom, 2007). Status was operationalized as income for number of hours worked. Social resources were operationalized as the social network size, number of supportive others, and satisfaction with social support. Participants were also measured on psychological symptoms and physical health. Each mean item increment in optimism at the start of law school was associated with over \$32 000 increment increase in annual income. Mediation analyses indicated that social network size partially mediates the association between optimism and health symptoms, providing evidence for resources as a pathway to better health.

In a separate study, social support accounted for the association between optimism and better adjustment to stressful life events (Brissette, Scheier, & Carver, 2002). First year undergraduate students were longitudinally assessed on dispositional optimism, perceived stress, perceived social support, and depression. Mediation analyses were consistent with findings from the previous study: increases in social support contributed to better adjustment to university experienced by optimists. Thus, optimists appear to be better at generating more supportive social networks than pessimists, leading to better

psychological well-being. Taken together, these studies suggest that optimism seems to be most important when experiencing stressful life events, since optimists and pessimists tend to differ in how they cope with these events, and in the resources they have available.

Stability of Dispositional Optimism

Optimism is a relatively stable trait. Test-retest reliability has ranged between .58 and .79 over periods ranging from four weeks to ten years (Atienza, Stephens, & Townsend, 2004; Lucas, Diener, & Suh, 1996; Matthews, Rääkkönen, Sutton-Tyrrell, & Kuller, 2004; Scheier & Carver, 1985). Stability in optimism has been attributed to genetic contributions and early life experiences. Heritability estimates range from 25% to 30% (Caprara, Steca, Alessandri, Abela, & Mcwhinnie, 2010; Mosing, Zietsch, Shekar, Wright, & Martin, 2009; Plomin et al., 1992). To date, the literature has been unable to find convincing evidence for the genes associated with optimism despite substantial heritability estimates, though this has also been a challenge for other traits (Mens, Scheier, & Carver, 2016). The contradiction between significant heritability estimates and a lack of identified genes has been labeled “the mystery of the missing heritability” (Kaprio, 2012; Zuk, Hechter, Sunyaev, & Lander, 2011). One study suggested that geneticists use faulty assumptions. Namely, they assume that traits involve no genetic interactions, when genetic interactions may explain and are consistent with observed data. Under the assumption that there are no genetic interactions, heritability estimates may be overestimated, leading to a smaller proportion of heritability explained in these models (Zuk et al., 2011). In any case, genetic contributions may play an important role in the expression and stability of optimism.

Early life experiences may contribute to the development of optimism, by fostering negative or positive expectancies. Socioeconomic status (SES) in early childhood seems to be a particularly meaningful predictor of expectancies in adulthood (Ek, Remes, & Sovio, 2004; Heinonen et al., 2006; Heinonen, Rääkkönen, & Keltikangas-Järvinen, 2005), since lower SES is associated with an increase in negative stressors and impairs ability to develop resources to cope with those stressors (Gallo, 2009; Gallo & Matthews, 2003) resulting in poor outcomes. As the number of experiences with negative outcomes

increases, so to does the expectation that negative outcomes will continue to occur. Thus, optimistic expectancies may be shaped as children develop a sense of self mastery and perceptions of control (Mens et al., 2016).

Despite optimism being considered a stable trait, researchers have not always found optimism to be stable in adulthood. Indeed, although overall test-retest reliability of this trait has indicated relative stability (Scheier, Carver, & Bridges, 1994), in some studies stability has been quite low. In fact, some research has begun to examine whether optimism may change as a function of social network growth (Segerstrom, 2007), social support (Symister & Friend, 2003), social role stress (Atienza, Stephens, & Townsend, 2004), and as people age (Chopik et al., 2015). These studies demonstrate instability in optimism across days (Shifren & Hooker, 1995), months (Antoni et al., 2001) and years (Chopik, Kim, & Smith, 2015; Segerstrom, 2007).

Resources have been mentioned as a pathway through which optimism influences well-being. In a study previously mentioned wherein former law students were measured across 10 years on status and social resources, as well as psychological and physical symptoms, stability in optimism was a staggeringly low .35 (Segerstrom, 2007). In this study, increases in optimism appeared to be most closely related to social network growth after the first semester of law school. Thus, this study provides clear evidence that optimism may not always be stable, and also suggests that social network size may shed light on these fluctuations.

In a separate study, optimism and social support were measured in urban end-stage renal disease (ESRD) patients across 3 months. Changes in perceived quality of social support significantly predicted changes in optimism after controlling for negative affect (Symister & Friend, 2003). Middle-aged woman occupying multiple roles such as caregiver to a parent, wife, parent to at least one child living at home, and employee were measured on role stress and optimism at two time points across 12 months. Increases in wife and employee stress were associated with decreases in optimism (Atienza, Stephens, & Townsend, 2004). Thus, changes in perceived quality of social support and social role stress seem to predict changes in optimism among adults.

Age may also predict instability in optimism. Older adults were sampled and measured on optimism, self-rated health, and chronic illness at two time points four years

apart (Chopik, Kim, & Smith, 2015). Age related change in optimism was apparent, such that optimism increased from age 50 to 70, but decreased after age 70. Moreover, increases in optimism were associated with increases in self-reported health and fewer chronic illnesses.

Shifren and Hooker (1995) examined daily fluctuations in optimism among caregivers for spouses with Alzheimer's disease. Participants were assessed every day for 30 days on measures of optimism and affectivity. Between-person analyses indicated that caregivers who were highly optimistic showed more fluctuations in daily optimism than caregivers who were less optimistic. Within-person analyses indicated that a caregiver's change in optimistic outlook predicted changes in affectivity the following day for some caregivers, such that a more optimistic outlook predicted more positive affect.

In a cognitive-behavioural stress management intervention study, women under treatment for early-stage breast cancer were recruited and measured at pre- and post-intervention, 3 months, and 9 months following the intervention on measures of optimism, depressive symptoms, and mood disturbance. Depressive symptoms dropped considerably in the intervention condition compared to the control condition. Optimism increased in the intervention condition for participants that were initially low in optimism, and continued to increase at 9 months post-intervention (Antoni et al., 2001), again suggesting that optimism is not necessarily highly stable and can be altered through intervention.

Conceptualizations of optimism have theorized that optimism is particularly important when faced with stressful life events. Optimists may gain additional benefits of having positive expectancies compared to pessimists when a stressor makes it necessary for individuals to use resources and cope effectively with those stressors (Scheier & Carver, 1985, 1987, 1992). Studies examining the stability of optimism have done so in many contexts, concluding that changes in optimism may occur as a function of social network growth, social role stress, and as people age. This line of work has also found a positive relationship between changes in optimism and changes in psychological and physical well-being.

Limitations of Previous Research

The reviewed literature has offered a considerable amount of evidence suggesting that optimism plays a significant role in predicting subjective well-being and physical health. Some studies have also examined the stability of optimism in adulthood, and have identified situations in which optimism may not be stable. However, limitations have persisted in the optimism literature, particularly in studies examining the stability of optimism.

First, instability in optimism has only been examined in correlational studies, and has thusly been unable to infer directional associations. To date, the literature has perhaps assumed that optimistic attitudes lead to positive well-being. However, it is theoretically conceivable that poor psychological and physical health may cause reductions in individual optimism. As life stressors continuously result in poor outcomes, an individual's expectancies may become increasingly more pessimistic. Conversely, as life stressors continuously result in favourable outcomes, an individual's expectancies may become more optimistic. Thus, although correlational studies are important to determine associations between variables, it is also important to prospectively investigate well-being, such that a change in optimism at one point in time may predict a change in well-being at another point in time.

Second, the identification of a potential third variable linking changes in optimism and changes in well-being has also gone unexamined. Namely, researchers have failed to control for co-occurring stress. It may be possible that increases in an individual's stress may cause decreases in that person's optimism and well-being. For example, evidence suggests changes in optimism may occur as a function of social support, social network growth (Segerstrom, 2007), and reductions in optimism may temporarily occur when preparing to confront a threat (Sweeny, Carroll, & Shepperd, 2006). Increases in stress may also reduce well-being, such that people may become less psychologically healthy, and become more physically ill (DeLongis, DeLongis, & Lazarus, 1988). Thus, changes in stress may be the third variable that drives the association between changes in optimism and changes in well-being.

Third, the literature to date is limited since changes in optimism and stress could interact to predict change in well-being. For example, although being optimistic may

yield positive benefits on its own, optimism may be most important when facing stressful life events. The effect of changes in optimism on well-being may conceivably vary depending on change in stress. Additionally, previous studies have not examined the extent to which events at one point in time may make someone more or less responsive to events at a later point in time. That is to say, the magnitude of the effect of changes in optimism and stress on well-being may be influenced by level of optimism and stress at a previous point in time. Since previous studies have not controlled for stress, this line of inquiry has not been considered.

Lastly, results on the effect of optimism on well-being have very robustly shown the positive influence of dispositional optimism. However, the study of instability and change in optimism as a predictor of changes in well-being have not controlled for between-person differences in target variables. Are within-person increases in optimism still beneficial to well-being after accounting for between-person differences? It is conceivable that changes in optimism may not be a meaningful predictor of changes in well-being if between-person differences in optimism and stress are accounted for.

Present Study

Past research has established a clear association between optimism and well-being. Optimists and pessimists tend to differ in well-being due to differences in resources available and how they cope with problems. However, evidence has suggested instability in optimism in certain circumstances. The present study aimed to better understand how instability in optimism is linked to subjective well-being and physical health. This study accounted for the correlational nature of past studies examining instability in optimism by longitudinally measuring optimism, psychological well-being, and physical well-being and tracking changes in those variables. In addition to this, the third variable problem was addressed by including a measure of stress at each time point. Since changes in optimism have been observed across time, within-person changes in optimism, stress, and well-being were assessed while controlling for average between-person differences in optimism and stress.

Hypotheses:

1. a. Within-person changes in optimism will co-occur with changes in well-being.

- b. Within-person changes in optimism will prospectively predict changes in well-being, such that optimism at one point in time will predict well-being at the next point in time.
2.
 - a. Within-person changes in optimism will predict changes in well-being independently from co-occurring stress.
 - b. Within-person changes in optimism will prospectively predict changes in well-being independently from co-occurring stress, such that optimism at one point in time will predict well-being at the next point in time, after controlling for stress.
3.
 - a. Within-person changes in optimism and co-occurring stress will interact to predict changes in well-being such that increases in optimism will be the more beneficial during times of high, as compared to low, subjective stress.
 - b. Within-person changes in optimism and stress will prospectively interact to predict changes in well-being, such that the influence of optimism and stress on well-being at one point in time will be influenced by level of optimism and stress at the previous point in time.
4. Between-person differences in optimism, stress, and the interaction between optimism and stress will predict differences in subjective well-being and physical health.
 - a. Individuals who are more optimistic will experience more positive subjective well-being and better physical health than individuals who are pessimistic.
 - b. Individuals who are more optimistic will experience more positive subjective well-being and better physical health after accounting for between-person differences in average stress experienced than individuals who are pessimistic.
 - c. The effect of dispositional optimism on subjective well-being and physical health will vary depending on overall magnitude of stress, such that optimism will be more strongly associated with better subjective well-being when experiencing high, as compared to low, subjective stress.

Method

Participants and Procedures

The hypotheses will be tested in a longitudinal study of caregivers to a family member with a mental illness. This sample was selected due to evidence suggesting that providing care to a family member with a mental illness is a source of high stress among family member providing care, since severe mental illness can take a turn for the worse at unpredictable times (Morimoto, Schreiner, & Asano, 2003; Rodrigo, Fernando, Rajapakse, De Silva, & Hanwella, 2013; Wrosch, Amir, & Miller, 2011). As such, a sample of caregivers from this population is an ideal opportunity to measure within-person change in optimism, as variability is likely to occur.

A project was conducted that included such a population of caregivers from Action on Mental Illness (AMI-Quebec). A total sample of 153 caregivers were recruited. Questionnaires were mailed to caregivers at the start of the project in 2008. Subsequent waves of data collection occurred approximately 1.5 years ($M = 1.41$, $SD = 0.12$, $range = 1.16-2.12$, $n = 124$) and 4 years ($M = 3.84$, $SD = 0.11$, $range = 3.54-4.47$, $n = 101$) after baseline. Of the 153 caregivers that participated in the study at baseline, 124 completed the second wave of data collection (81%), and 101 completed the third wave of data collection (66%). Due to misunderstanding of instructions or because the participants' relative with a mental illness had passed away during the course of the study, 6 participants were excluded from the study, reducing the sample to 147 participants. Although not all participants completed all waves, it was required that waves 1 and 2 be completed to be included in the data analyses in order to adequately create cross-sectional and prospective estimates. Based on these criteria, a sample of 106 caregivers were included in the study.

Study attrition indicated significantly different scores on baseline number of caregiving activities performed. Participants included in the study reported a higher number of caregiving activities ($M = 3.43$, $SD = 1.39$) compared to participants not included in the study ($M = 2.64$, $SD = 1.77$; $t = 2.81$, $p < .01$). Attrition was not associated with differences in baseline measures of any other study variables.

Materials

The main variables in the proposed study include measures of dispositional optimism and stress. Stress was operationalized by including measures of caregiver burden, caregiver strain, the effect of caregiving on family, work, and leisure activities, the number of caregiving activities performed by the caregiver, and the number of hours spent caregiving per week. Subjective well-being was assessed in this study by measuring depressive symptoms, positive affect (PA), negative affect (NA), and satisfaction with life. Physical well-being was assessed by measuring number of acute and chronic illnesses. All of these variables were measured at all 3 waves of data collection. In addition, relevant covariates such as age, sex, and socioeconomic status were assessed at baseline.

Optimism. The Life Orientation Test – Revised (LOT-R; Scheier, Carver, & Bridges, 1994) is a validated tool used to measure dispositional optimism. It has good convergent and discriminant validity, and is more accurate at measuring dispositional optimism than other tools (Scheier, Carver, & Bridges, 1994; Smith, Pope, Rhodewalt, Poulton, 1989). This 6-item questionnaire asks participants to rate the extent to which they agree or disagree with items on a 5-point Likert-type scale ranging from 0 = *strongly disagree* to 4 = *strongly agree*. Of the 6 items, three are positively phrased (e.g., “In uncertain times, I usually expect the best”), and three are negatively phrased (e.g., “If something can go wrong for me, it will”), reflecting a continuous dimension from very optimistic to very pessimistic. Negatively phrased items were reverse coded and summed with positively phrased items, so that higher scores represent higher levels of dispositional optimism. Sum scores were computed at each wave of data collection with possible scores ranging from 0 to 24 ($\alpha = .78$ to $.86$; ICC = $.30$).

Caregiver Burden. Caregiver burden was assessed using an adapted version of the Zarit Burden Interview (ZBI; Zarit & Zarit, 1987), to specifically target burden experienced from caregiving. Participants were asked to rate how frequently they agree with each of 21 items. Ratings are on a 5-point Likert-type scale ranging from 0 = *never* to 4 = *nearly always*, where higher scores mark more burden. Sample items include “How often do you feel you will be unable to take care of your relative much longer?” and “How often do you feel that your social life has suffered because you are caring for

your relative?” Sum scores were computed at each wave of data collection with possible scores ranging from 0 to 84 (α s = .94 to .95; ICC = .28).

Caregiver Strain. Caregiver strain was assessed using an a reduced and adapted version of the Caregiver Strain Index (Robinson, 1983). Participants were asked to rate the degree to which they experienced emotional, physical, and financial strain when they provide help to their relative. Ratings were on a 3-point Likert-type scale ranging from 0 = *no strain* to 2 = *a lot of strain*. Sum scores were computed at each wave of data collection with possible scores ranging from 0 to 6 (α s = .60 to .77; ICC = .42).

Influence of Caregiving on Work, Family, and Leisure activities. Participants were asked to rank the extent to which their work, family and leisure activities were affected by the activities they performed for their relative. Ratings were on a 3-point Likert-type scale ranging from 0 = *yes* to 2 = *not at all*. Scores were reverse coded and summed at each wave of data collection with possible scores ranging from 0 to 6 (α s = .90 to 1.0; ICC = .50).

Number of Caregiving Tasks. Participants were asked to list the most frequent activities that they assisted their relative with. The number of activities listed were summed to create a score. In this sample, scores ranged from 0 to 5.

Number of Hours Spent Caregiving per week. Participants were also asked the number of hours per week they spent engaging in the reported activities for their relative. This was ranked on a 4 point Likart-type scale ranging from 0 = *less than 10 hours a week* to 3 = *more than 30 hours a week*.

Depressive Symptoms. Participants’ depressive symptoms was measured using the Center of Epidemiological Studies – Depression (CES-D; Radloff, 1977) 20-item inventory. Participants were asked to rate the frequency with which they experienced 20 symptoms in the past week. Sixteen items were negatively worded (e.g., “I could not get ‘going’”), and 4 items were positively worded (e.g., “I felt that I was just as good as other people”). These items were rated on a 4-point Likert-type scale ranging from 0 = *less than 1 day* to 3 = *5 to 7 days*. Positively worded items were reverse coded and summed with negatively worded items, so that higher scores point to the presence of more depressive symptoms. Scores were computed for depressive symptoms at each wave of data collection, with possible scores ranging from 0 to 60 (α s = .88 to .94; ICC = .40).

Positive and Negative Affect. The Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) is a questionnaire with two subscales that were used to measure positive affect (PA) and negative affect (NA). This questionnaire included 20 items, half of which described PA (e.g., strong, excited) and half of which described NA (e.g., hostile, nervous). Participants were asked to rate the extent to which they experienced these emotions during the past year on a 5-point Likert type scale ranging from 0 = *Very slightly or not at all* to 4 = *Extremely*. Sum scores were computed for PA (α s = .87 to .92; ICC = .27) and NA (α s = .87 to .90; ICC = .53) where possible scores for each subscale ranged from 0 to 40.

Satisfaction With Life. Participants' satisfaction with life was measured using the Satisfaction With Life Scale (SWLS; Diener, Emmons, Sem, & Griffin, 1985). Participants were asked to indicate their level of agreement for 5 items on a 5-point Likert type scale ranging from 0 = *Strongly disagree* to 4 = *Strongly agree*. Sample items include "In most ways my life is close to my ideal," and "If I could live my life over, I would change almost nothing. Sum scores were computed with possible scores ranging from 0 to 20 (α s = .87 to .88; ICC = .31).

Acute Illness. Acute illness was measured using a 12-item checklist derived from the PRIME MD patient questionnaire screener (Spitzer et al., 1994). Participants were asked to indicate whether or not they experienced health symptoms in the past month by responding "yes" or "no." Sample items included "Have you been bothered by chest pain?" and "Have you been bothered by fainting spells?" Scores were computed by counting the number of times the participant responded "yes" to experiencing those symptoms, so that higher scores showed the presence of more acute illnesses.

Chronic Illness. Chronic illness was measured using a 17-item checklist. Similar to the questionnaire used to measure acute illness, scores were computed by counting the number of chronic illnesses participants report being diagnosed with. Some of these chronic illnesses include high blood pressure, cardiovascular problems, arthritis, asthma, cancer, and diabetes.

Sociodemographic Variables. Self-report baseline caregiver's age, sex, and socioeconomic status (SES) were included in the study. SES was computed by averaging

the standardized scores of the reported highest level of education and annual family income.

Statistical Analyses

Preliminary analyses were conducted to describe the sample and assess within-person changes in optimism. This was done to ensure that there was significant variability in optimism across waves of data collection to warrant the examination of within-person change as a predictor. The study's main hypotheses were tested using hierarchical linear modeling (HLM 6; Raudenbush, Byrk, & Congdon, 2006).

Principal component analysis with oblimin rotation was conducted on the baseline stress variables to determine loadings on latent stress factors. The stress variables included were caregiver burden, caregiver strain, the influence of caregiving on work, family, and leisure activities, number of caregiving tasks, and number of hours spent caregiving per week. Table 1 summarizes the factor loadings and commonalities. These results clearly suggest two factors: Subjective stress, and frequency of caregiving tasks. The studies main hypotheses were tested twice to compare results between both stress factors. The complete results for both latent stress factors can be found in Tables 1 to 12 in Appendix A. Since the results between factors are similar, only the analyses with subjective stress are reported below.

Outcome variables for this study include depressive symptoms, PA, NA, satisfaction with life, acute illness, and chronic illness. Linear models were created to explain variability in the outcome variables by estimating intercepts and slopes.

In the present study, the intercept indicates the average score on the outcome variable across waves. Predictor variables were separated between Level-1 variables and Level-2 variables. Level-1 predictors represent within-person change, and include optimism, subjective stress, and optimism x subjective stress interaction. Optimism and subjective stress were person-mean centered. These centered predictor variables were then multiplied to create the interaction term. By including these variables as Level-1 predictors, each participant's change in the outcome variable per unit of change in the Level-1 predictor variables is estimated. These estimations were made cross-sectionally and prospectively, as proposed by Wickham and Knee (2013). The cross-sectional analyses predict the outcome variables at each time point, but compare change in Level-1

variables between time points for each participant. Prospective estimates were made by creating lagged Level-1 predictor variables, such that predictor variables at one point in time may predict outcome variables at the next point in time two years later. Level-2 predictor variables explained differences between participants' intercepts and slopes, and include age, sex, SES, average optimism, average subjective stress, and average optimism x subjective stress interaction. The main purpose of the study is to examine the Level-1 effects of cross-sectional and longitudinal within-person change in optimism, subjective stress, and the optimism x subjective stress interaction on the outcome variables, while controlling for Level-2 between person differences in those variables and sociodemographic variables.

A separate analysis was conducted for each outcome variable to test the Level-1 effects of optimism, subjective stress, and optimism x subjective stress for the cross-sectional analyses, and the prospective analyses. All analyses were conducted in three hierarchical steps and follow the same procedure. In a first step, the Level-1 main effect of optimism was tested to test whether this sample is consistent with what has been reported in the literature on change in optimism. In a second step, the Level-1 main effect of subjective stress was added to the model to test the hypothesis that changes in optimism would predict changes in well-being after accounting for stress. The third step was to add the Level-1 optimism x subjective stress interaction term. Level-2 between-person differences in optimism, stress, and optimism x subjective stress interaction were also hierarchically added to the models following the same three steps. In addition, all steps control for the Level-2 covariates of age, sex, SES. Because of limitations with degrees of freedom, the intercepts were estimated as random effects, and all slopes were estimated as fixed effects. Finally, all models were estimated using restricted maximum likelihood estimations with robust standard errors.

Results

Preliminary Analyses

Summarized in Table 2 are the characteristics of the sample based on study variables. The sample was on average approximately 59 years old, with 81.1% of them

being female. All participants had completed at least a high school education, over half of which had completed a bachelors or graduate degree. Approximately half of study participants earned an annual family income of more than \$60,000 a year.

Intrapersonal Change in Optimism

Within person changes in optimism was assessed to demonstrate significant within-person variability in levels of dispositional optimism. The intraclass correlation (ICC) represents the amount of variability in optimism accounted for by within person compared to between person changes. In this study, the ICC indicated that 30% of the variability in optimism was due to within-person variability. This number was high enough to be included in the study, and was fit to be included as a Level-1 variable.

Main Analyses

The analyses conducted for each outcome variable followed the same procedure and controlled for baseline age, sex, SES, as well as average optimism, subjective stress, and optimism x subjective stress interaction. Tables 3 and 4 summarize the results of the study's main hypotheses, with complete results summarised in Appendix A. Before the analyses were conducted, Level-1 optimism and subjective stress were person-mean centered to be able to interpret main effects. These centered predictor variables were then multiplied to create the interaction term. The cross-sectional results are reported first, followed by the prospective results.

Within-Person Cross-Sectional Results

Results for these analyses are summarized in Table 3.

Depressive Symptoms

The first set of analyses included depressive symptoms as the outcome variable, predicted by Level-1 cross-sectional optimism, subjective stress and the optimism x subjective stress interaction term. The model intercept reflected average amounts of depressive symptoms experienced across waves of data collection. The intercept was statistically significant ($t = 12.40, p < .01$), indicating that mean scores on depressive symptoms across time points differed from 0 ($M = 9.63, SE = 0.78$). Level-1 change in optimism predicted change in depressive symptoms ($t = -3.67, p < .01$), indicating that an

increase in participants' level of optimism predicted a decrease in their depressive symptoms. The effect of optimism was maintained when subjective stress was controlled ($t = -4.17, p < .01$). Changes in subjective stress did not predict changes in depressive symptoms ($t = 2.09, p = .04$). The optimism x subjective stress interaction term was not significant ($t = -1.33, p = .18$).

Positive Affect

The second analysis included the same predictor variables and followed the same procedure as the first, but tested PA as the outcome. The model intercept reflected average amounts of PA experienced across waves of data collection. The intercept was statistically significant ($t = 43.90, p < .01$) indicating that mean scores on PA across time points differed from 0 ($M = 26.64, SE = 0.61$).

The Level-1 effect of optimism on PA was significant ($t = 3.62, p < .01$), suggesting that an increase in participants' level of optimism predicted an increase in their PA. This effect was maintained when controlling for co-occurring subjective stress ($t = 3.54, p < .01$). Changes in subjective stress did not predict changes in positive affect ($t = -0.48, p = .68$). The optimism x subjective stress interaction effect was not significant ($t = 0.78, p = .43$).

Negative Affect

The third analysis included NA as the outcome variable. The model intercept was statistically significant ($t = 20.34, p < .01$), indicating that mean scores on NA across time points differed from 0 ($M = 12.53, SE = 0.62$). Level-1 change in optimism served as a significant predictor of change in NA ($t = -3.87, p < .01$), such that as participants' optimism increased, their NA decreased. This effect was maintained when controlling for co-occurring stress ($t = -4.35, p < .01$). Changes in subjective stress predicted changes in negative affect ($t = 4.91, p < .01$), such that when subjective stress increased, negative affect also increased. The Level-1 optimism x caregiver burden interaction effect was not a significant predictor of NA ($t = -1.73, p = .07$).

Satisfaction with Life

The fourth analysis included satisfaction with life as the outcome variable. The model intercept was statistically significant ($t = 33.17, p < .01$), indicating that mean scores on NA across time points differed from 0 ($M = 11.63, SE = 0.352$). Level-1 change

in optimism served as a significant predictor of change in life satisfaction ($t = 4.42, p < .01$), such that as participants' optimism increased, their life satisfaction increased. This effect was maintained when controlling for co-occurring stress ($t = 4.87, p < .01$). Changes in subjective stress predicted changes in satisfaction with life ($t = 3.04, p < .01$), such that when subjective stress increased, satisfaction with life decreased. The Level-1 optimism x caregiver burden interaction effect was not a significant predictor of life satisfaction ($t = 0.05, p = .96$).

Acute Illness

The fifth analysis included number of acute illnesses as the outcome variable. The model intercept was statistically significant ($t = 0.19, p < .01$), indicating that mean scores on acute illnesses across time points differed from 0 ($M = 2.48, SE = 0.17$). Level-1 change in optimism served as a significant predictor of change in number of acute illnesses ($t = -2.77, p < .01$), such that as participants' optimism increased, their number of acute illnesses decreased. This effect was maintained when controlling for co-occurring stress ($t = -2.97, p < .01$). Changes in subjective stress predicted changes in the number of acute illnesses ($t = 2.07, p = .04$), such that as participants' subjective stress increased, they had more acute illnesses. The Level-1 optimism x subjective stress interaction effect was not a significant predictor of NA ($t = -0.83, p = .40$).

Chronic Illness

The sixth analysis included number of chronic illnesses as the outcome variable. The model intercept was statistically significant ($t = 10.69, p < .01$), indicating that mean scores on chronic illness across time points differed from 0 ($M = 1.32, SE = 0.62$). Level-1 change in optimism did not predict change in number of chronic illnesses ($t = -1.76, p = .08$). However, change in optimism did predict change in number of chronic illness when controlling for co-occurring stress ($t = -2.18, p = .03$), such that as optimism increased, number of chronic illnesses decreased. Changes in subjective stress predicted changes in the number of chronic illnesses ($t = 0.01, p = .71$), such that as participants' subjective stress increased, they had more acute illnesses. The Level-1 optimism x caregiver burden interaction effect was not a significant predictor of NA ($t = 0.08, p = .93$).

Within-Person Prospective Results

As summarized in Table 4, change in optimism, changes in optimism while controlling for subjective stress, changes in subjective stress, and optimism x subjective stress interaction at one point in time did not predict any of the well-being outcome variables at the next point in time (for coefficients, see Table 4).

Between-Person Cross-Sectional Results

Results are summarized in Appendix A, Tables 1 to 6.

Depressive Symptoms

As seen in Table 1, participants who tended to experience more depressive symptoms were lower in average optimism ($t = -5.18, p < .01$) and higher in average subjective stress ($t = -5.18, p < .01$) than participants who experienced fewer depressive symptoms. There was no interaction effect between optimism and stress ($t = -1.85, p = .07$), and between-person differences in age, sex, and SES did not predict differences in depressive symptoms ($t = -0.86, p = .35$; $t = -0.46, p = .69$; $t = -1.09, p = .22$, respectively).

Positive Affect

As seen in Table 2, participants who tended to experience more positive affect were higher in optimism ($t = 5.66, p < .01$) as compared to participants lower in optimism. As seen in Figure 1, there was also a significant interaction effect between optimism and stress ($t = -3.02, p < .01$), such that optimism buffered the effect of subjective stress on positive affect, but individuals low in subjective stress benefited from being optimistic more than those high in subjective stress. Between-person differences in subjective stress, age, sex, and SES did not predict differences in positive affect ($t = -1.53, p = .12$; $t = -1.55, p = .23$; $t = -0.42, p = .66$; $t = 0.54, p = .66$, respectively).

Negative Affect

As seen in Table 3, participants who tended to experience more negative affect had low average optimism ($t = -5.09, p < .01$) and experienced more subjective stress on average ($t = 2.66, p = .01$) than participants lower in negative affect. There was no interaction effect between optimism and stress ($t = -1.83, p = .70$), and between-person differences in age, sex, and SES did not predict differences in negative affect ($t = -0.76, p = .43$; $t = -1.28, p = .32$; $t = 0.45, p = .28$, respectively).

Satisfaction with Life

As seen in Table 4, participants who tended to feel more satisfied with life were more optimistic ($t = 5.48, p < .01$), experienced less subjective stress ($t = -5.08, p < .01$), and were of a higher SES ($t = 2.38, p = .05$) than participants who were less satisfied with life. There was no interaction effect between optimism and stress ($t = -1.07, p = .29$), and between-person differences in age and sex did not predict differences in negative affect ($t = -0.43, p = .95$; $t = 0.35, p = .90$, respectively).

Acute Illness

As seen in Table 5, participants who reported more acute illnesses were less optimistic ($t = -3.00, p < .01$) and experienced more subjective stress ($t = 2.01, p = .05$) than participants who reported fewer acute illnesses. There was no interaction effect between optimism and stress ($t = -1.68, p = .20$), and between-person differences in age, sex, and SES did not predict differences in number of acute illnesses ($t = -0.87, p = .27$; $t = -1.46, p = .33$; $t = 0.19, p = .33$, respectively).

Chronic Illness

As seen in Table 6, participants who reported more chronic illnesses tended to be older than participants with fewer chronic illnesses ($t = 5.05, p < .01$). Between-person differences in optimism ($t = -1.06, p = .29$), subjective stress ($t = 1.88, p = .06$), optimism x stress interaction ($t = -1.41, p = .25$), sex ($t = 0.64, p = .39$), and SES ($t = -0.94, p = .55$) did not predict differences in the number of acute illnesses experienced by caregivers.

Additional Findings

Included in the models analyzed were results that were not considered in the hypotheses. First among those are the lagged between-person effects of optimism, subjective stress, optimism x subjective stress, age, sex, and SES on well-being. Between-person variables were computed by averaging scores across time points on those variables. Since predictor variables were lagged, averages were computed using only two time points, compared to three time points in the cross-sectional analyses. Thus, the between-person effects were better estimated using the cross-sectional data.

Second among the results not reported are the cross-level effects of within-person and between-person variables on the outcome variable. These effects were included for completeness of the models but are not reported or relevant to the hypotheses. Both sets

of results discussed in additional findings can be found in Appendix A, Tables 1 to 6.

Discussion

The present study aimed to better understand how change in optimism is linked to subjective well-being and physical health by accounting for the correlational nature of past studies examining changes in optimism. Optimism, psychological well-being and physical health were longitudinally measured. In addition to this, the third variable problem was addressed by including measures of stress at each time point.

The literature on within-person changes in optimism is sparse, with most studies only including a baseline measure of optimism. Although periods of instability in optimism have been identified, the proportion of variability in optimism due to instability has never been investigated. This study examined the amount of variability in optimism explained by within-person change versus between-person differences. Thirty percent of the variability in optimism was due to within-person change, and 70% of the variability was due to between-person differences. This indicates that much of the variability in optimism is due to stable between-person differences, though there is also a considerable proportion of variability due to within-person changes. The present study aimed to investigate changes in optimism to determine the level of meaning those changes hold in predicting well-being.

The first hypothesis predicted that within-person changes in optimism would co-occur with changes in psychological well-being and physical health after controlling for between person differences in average optimism. Supporting the first hypothesis, the results from the cross-sectional analyses were consistent with what has been reported in the literature to date. Changes in optimism did predict change in well-being and health, such that as an individual's level of optimism increased, so too did that individual's psychological and physical well-being improve. This effect was demonstrated in the above reported analyses with respect to individual's depressive symptoms, positive affect, negative affect, satisfaction with life, and number of acute illnesses.

Shifren and Hooker (1995) reported changes in optimism as a predictor for changes in positive and negative affect among spousal caregivers. In addition to this, Chopik, Kim, and Smith (2015) reported similar findings in their study that examined changes in

physical health and optimism among older adults. Congruency between previous studies and the present study on changes in optimism predicting changes in psychological well-being and physical health support the hypothesis that even state level changes in trait optimism may be important in predicting changes in well-being and health.

Since 70% of the sample's variability in optimism was due to between-person differences, it is particularly meaningful that within-person fluctuations in optimism were able to predict changes in well-being after controlling for between-person differences in average optimism. This suggests that within-person changes in optimism predict a unique amount of variance in subjective well-being and health above what could be predicted by between-person differences in optimism.

However, stress was not accounted for in previous studies as a third variable. As well-being and health decrease, mood congruent responses to self-report measures may be a third variable confounding observed associations between changes in optimism, and subjective well-being and health. To this end, the present study was able to add to the literature by supporting the second hypothesis and showing that the effect of within-person changes in optimism on well-being hold when controlling for within-person changes in subjective stress. Thus, all of the observed effects that supported the first hypothesis were maintained in support of the second hypothesis. In addition to the observed results supporting the first hypothesis, the effect was demonstrated in the above reported analyses with respect to chronic illness after controlling for changes in stress. This suggests that subjective stress acts as a suppressor since changes in optimism did not predict chronic illness without controlling for stress. The suppression effect should be interpreted with caution and should be tested and replicated in future studies. Nevertheless, a person's increase in optimism over time was associated with a co-occurring increase in positive affect and satisfaction with life, and a decrease in depressive symptoms, negative affect, acute illness, and chronic illness. Even temporary increases in the expectation that life will yield positive outcomes serves as a protective buffer against the negative consequences of encountering stressful life circumstances, such as caring for a mentally ill family member.

In addition to this, the stress-controlled effects of within-person changes in optimism were maintained after accounting for between-person differences in average

optimism and subjective stress. This suggests that changes in optimism account for fluctuations in well-being above what can be explained by between-person differences in average optimism and stress. This is an important insight into the influence of optimism on well-being, since much of the variability in optimism was accounted for by between-person differences.

The present study also identified within-person changes in stress to independently yield effects on subjective well-being and health. As expected based on previous studies (e.g., Atienza, Stephens, & Townsend, 2004), when participants experienced more stress, they tended to also experience an increase in depressive symptoms, negative affect and acute illness, and a decrease in satisfaction with life. Although no hypotheses were developed with regards to variability in subjective stress, the congruency between the observed associations and findings reported in the literature provide confidence in the obtained sample as a whole.

The third hypothesis predicted that within-person changes in optimism and co-occurring stress would interact to predict changes in subjective well-being and physical health after controlling for between-person differences in average optimism, stress, and the interaction between optimism and stress. The third hypothesis was not supported in that the within-person interaction effects for the cross-sectional analyses were all non-significant. This indicates that the effect of changes in optimism on well-being did not vary depending on changes in the level of stress. This result is surprising since theoretical importance is placed on optimism, such that high optimism is thought to be most important in maintaining subjective well-being and health when individuals experience highly stressful life events (Scheier & Carver, 1992). In the presence of a severe stressor, however, changes in optimism versus pessimism did not predict enhanced variability in well-being in our study.

One possible explanation for the absence of interactions between stress and optimism is that caregivers of a family member with mental illness experience a chronically high magnitude of stress, and may encounter a reduced effectiveness of optimism. In this regard, one study demonstrated a reduction in the associations between optimism and depressive symptoms as older adults advance in age. This finding was explained by the possibility that in the later phases of older age, an increase in

uncontrollable stressors is often unavoidable, and individuals may have a more difficult time overcoming those stressors (Wrosch, Jobin, & Scheier, 2016). Thus, some of the common benefits of optimism, associated with persistence and overcoming stressors, may lose their adaptive value if individuals face uncontrollable stressors. In a similar way, highly stressed caregivers of a family member with a mental illness could have minimal control over the mental health of their relative, which may reduce some of optimism's beneficial influence on well-being and thus could explain the absence of interaction effects.

Additionally, although stress was included to address confounds in associations between optimism, subjective well-being and health, the measures of stress included in the study may have themselves confounded results. As has been mentioned earlier, one of the purposes of this study was to account for stress as a third variable in the examination of associations between changes in optimism. As people become more stressed, they may become generally more pessimistic about their future due to mood congruent memory or reporting biases. Thus, although people may be more likely to report lower subjective well-being and health when they are pessimistic, reports of subjective stress may confound results in a similar way. That is to say that when people experience a high magnitude of stress, they may also report a reduction in optimism, subjective well-being, and health. Controlling for subjective stress may not have been sufficient to overcome this confound, and a more objective measure of stress may be necessary for future studies.

The present study included many measures of stress. A factor analysis of these measures identified two factors: subjective stress and frequency of performing caregiving activities. The results of the analyses were similar between both stress factors. Although subjective stress may be thought of as a psychological measure of stress, the quantity of caregiving tasks does not imply quality, or the experienced level of stress induced by performing those tasks. Thus, this study did not include a truly objective measure of stress. As people experience more stress, they may also report a decrease in optimism, well-being, and health. Confounding issues with the measurement of stress may explain why there were minimal interaction effects between optimism and stress observed in the study, particularly since stress has significant theoretical importance. Kleiman and

colleagues (2017) suggested interviews targeting stressful life events as an objective measure of stress in the investigation of changes in optimism.

Prospective analyses did not yield any statistically significant results, suggesting that changes in optimism at one point in time did not predict changes in subjective well-being or health at the next point in time, independent of whether or not changes in stress were controlled for. That is to say that changes in well-being occurred independently from prior changes in stress and optimism. Additionally, the magnitude of optimism and stress on well-being at one point in time was not influenced by level of optimism and stress at the previous point in time. The hypotheses regarding prospective effects were not supported in this study and point to an inability of changes in optimism and stress to prospectively predict changes in well-being.

Since cross-sectional results did generate important insights into associations between optimism and well-being, considerations must be made as to why prospective associations were not observed in the present study. Optimism has been shown to prospectively predict well-being and health in studies that have not investigated changes in optimism. For example, pessimists are more at risk of developing depressive symptoms and obsessive-compulsive symptoms than optimists following a disaster (van der Velden et al., 2007), have a higher mortality risk (Kim et al., 2017), are more likely to develop depression and anxiety (Kleiman et al., 2017), and are less likely to experience as much career success as their optimistic counterparts (Segerstrom, 2007). Based on the literature demonstrating prospective effects of optimism on subjective well-being and health, it appears that state level changes in trait optimism are perhaps too minimal to predict changes in well-being and health. This may be particularly true since between-person differences in optimism vary a great deal more than within-person changes. The latter argument is supported by this study, where only 30% of the variability in optimism was due to within-person changes.

Although between person differences in optimism may appear to be a better predictor of well-being than within-person changes, it is possible that the duration of the time lag in the prospective analyses, may have been too large. On the one hand, two years may have been too long of a lag to observe the effect of changes in optimism and stress on well-being, particularly since there would have been many life experiences occurring

during the two years between assessment points. To this end, a more appropriate time lag to assess within-person changes may involve daily measures, as was investigated by Shifren and Hooker (1995). And yet, on the other hand, two years may not have been long enough to observe changes in the number of chronic illnesses among family caregivers, since the development of chronic disease could take more time. Future studies may consider measuring optimism, stress, well-being, and health, both, more frequently and across a longer period of time.

Between-person effects of study variables were generally consistent with the literature, supporting the fourth hypotheses. Just as undergraduate students (Aspinwall & Taylor, 1992; Brissette et al., 2002), survivors of war missile attacks (Zeidner & Hammer, 1992), and individuals who have gone through elective artery bypass surgery (Scheier et al., 1989) experienced more positive well-being if they were more optimistic, family caregivers of a family member with mental illness who were more optimistic also experienced fewer depressive symptoms, experienced more positive affect, less negative affect, were more satisfied with life, and reported fewer acute illnesses, as compared to their more pessimistic counterparts. Additionally, individuals who tend to experience a higher, as compared to lower, level of subjective stress tended to experience more depressive symptoms and negative affect, tended to be more satisfied with life, and report more acute illnesses. These results lend confidence to the validity of the measures used in this sample in so far as the between-person effects on well-being are consistent with robust between-person associations reported in the literature.

The study further showed that positive affect could be predicted by an interaction in between-person differences in optimism and subjective stress. Those caregivers who were highly optimistic tended to experience more positive affect than individuals who were less optimistic. Importantly, optimism's influence in predicting positive affect varied depending on level of stress. The effect of optimism on positive affect was stronger for the people who experienced less subjective stress than for those who experienced more subjective stress, such that those who were high in optimism and low in subjective stress experienced the most positive affect. This result shows the moderating effect of stress level in the association between optimism and positive affect. Importantly, the effect of high optimism on well-being was reduced for individuals who experience high subjective

stress. As has been mentioned previously, this effect is surprising since high optimism is theoretically thought to become paramount when individuals perceive high stress. The explanation proposed for this result is the same as before; chronic stress in uncontrollable situations may reduce the importance of optimism for some outcomes of subjective well-being (Wrosch et al., 2016).

Note that some of the between-person variables that were not part of the study's hypotheses predicted changes in well-being variables, such as SES and age. Many studies, including a meta-analytic review have identified associations between SES and satisfaction with life (Pinquart & Sörensen, 2000). Individuals who have a higher income and higher education typically have more access to commercial goods and opportunities to a wider range of leisure activities. As would be expected, people in the present study who had a higher socioeconomic status were more satisfied with life, since they had access to more opportunities that would enhance quality of life.

Additionally, this study showed that older adults had more chronic illnesses than younger adults. This finding is plausible since as people age, they often develop chronic illnesses (Kennedy et al., 2014). Gender differences in well-being were not observed in this study, although other studies have identified gender differences in subjective well-being (Nolen-Hoeksema, 2001) and health (Denton, Prus, & Walters, 2004). The absence of gender differences in well-being may have occurred as a result of the proportion of the sample that self-identified as female compared to male; 81% of the sample was female and 19% was male. This small proportion of male participants likely reduced the chance to observe gender differences in the presented analyses. Nevertheless, gender differences in optimism have not been a general finding in the literature (Carver et al., 2010).

Overall, the additional findings of differences in well-being predicted by SES and age lend confidence to the validity of the study since findings that are not part of the study's main hypotheses are consistent with what would be expected given reports in the literature, and the results of the study as a whole.

The main conclusion of the present study is that between-person differences in overall optimistic disposition may be a better predictor of well-being than within-person changes. The cross-sectional analyses provided new and important information on the relations between optimism and well-being above and beyond the influence of changes in

stress and between-person differences in optimism and stress. However, changes in optimism did not prospectively predict changes in well-being, independent of whether or not changes in stress were controlled for.

Note that nearly all within- and between-person interaction effects between optimism and stress were non-significant in the present study. As the first study to investigate interactional effects between changes in optimism and stress, this overall finding suggests that stress may not moderate, or buffer the effect of optimism on well-being and health. Thus, between-person differences and within-person changes in optimism may be important for maintaining well-being and health, irrespective of the magnitude of stress experienced.

Implications of this study for future research on optimism seems to suggest that it may not be necessary to measure optimism at multiple time points to predict well-being and health outcomes. Although our findings suggest that optimism can be variable, and changes in optimism and well-being are co-occurring, long-term well-being may not change as a function of such changes in optimism.

There are some limitations of the present study. First of all, caregivers in the sample likely experienced long-term chronic stress from caring for their family member. This possibility could have limited the effect of optimism on well-being. As mentioned previously, associations between optimism and well-being may decrease when stressors are uncontrollable (Wrosch et al., 2016). Future studies may want to include a sample of participants who experience relatively novel stressors that are not yet persistent and could be resolved. Examining such samples may enhance the hypothesized effects and could reveal observable interaction effects of optimism and stress in predicting well-being and health.

A final limitation of this study is that the prospective analyses did not convincingly consider the causal direction between associations in optimism, subjective well-being, and health. Instead, this study assumed that changes in optimism would predict changes in well-being and health. It was thus not considered that well-being may also prospectively predict changes in optimism. In the extant literature, pathways between these concepts have been unidirectional, highlighting how optimism leads to better well-being. Since this study was the first to measure within-person changes in optimism,

stress, well-being, and health, hypotheses were centered around observations that have been reported in the extant literature. However, it is theoretically conceivable that poor psychological and physical health may also lead to reductions in the levels of optimism. Said differently, as life stressors repeatedly result in poor outcomes, an individual's expectancies may become increasingly more pessimistic. Similarly, as life stressors may be repeatedly resolved and lead to favourable outcomes, an individual's expectancies may become more optimistic.

No study has examined change in well-being and health as prospective predictors for changes in optimism. However, other personality traits have been investigated in this context. For example, the big-5 personality traits have been noted to change as a function of changes in well-being. These studies have concluded that increases in conscientiousness and extraversion are associated with improvements in mental and physical health and increases in neuroticism are associated with decreases in mental and physical health (e.g., Letzring, Edmonds, & Hampson, 2014; Magee, Heaven, & Miller, 2013; Magee, Miller, & Heaven, 2013). In light of these findings, it seems possible that changes in optimism may also be predicted by changes in well-being and health. Future studies may further investigate this line of inquiry.

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Tables

Table 1. Factor loadings and communalities based on a principal components analysis with oblimin rotation for baseline measurements of five stress variables.

| | Subjective Stress | Frequency of Caregiving | Communality |
|--|-------------------|-------------------------|-------------|
| Caregiver burden | .89 | .30 | .79 |
| Caregiver Strain | .83 | .15 | .57 |
| Caregiving affecting work, family, and leisure activities | .77 | .35 | .69 |
| Number of caregiving activities | .19 | .83 | .71 |
| Number of hours spent caregiving | .31 | .75 | .61 |

Table 2. Descriptive statistics for study variables.

| Variable | Mean (SD) or Percentage | Range |
|---------------------------------------|-------------------------|---------|
| Age (T1) | 59.69 (10.99) | 33 – 87 |
| Female (%) (T1) | 81.1 | |
| Education (%) (T1) | | |
| High School | 13.2 | |
| College / Trade | 25.5 | |
| Bachelor | 36.7 | |
| Master / PhD | 24.5 | |
| Annual Income (%) (T1) | | |
| Less than \$17 000 | 0.9 | |
| \$17 000 - \$34 000 | 16.0 | |
| \$34 001 - \$51 000 | 14.2 | |
| \$51 001 - \$68 000 | 16.3 | |
| \$68 001 - \$85 000 | 14.8 | |
| > \$85 000 | 37.7 | |
| Optimism (T1) | 17.08 (3.68) | 4 – 24 |
| Optimism (T2) | 17.13 (3.78) | 8 – 24 |
| Optimism (T3) | 16.84 (4.32) | 6 – 24 |
| Caregiver Burden (T1) | 32.56 (14.90) | 0 – 65 |
| Caregiver Burden (T2) | 30.08 (13.75) | 3 – 81 |
| Caregiver Burden (T3) | 29.78 (15.97) | 1 – 78 |
| Caregiver Strain (T1) | 1.99 (1.49) | 0 – 6 |
| Caregiver Strain (T2) | 1.72 (1.40) | 0 – 6 |
| Caregiver Strain (T3) | 1.96 (1.59) | 0 – 6 |
| Affect work, family leisure (T1) | 3.88 (1.81) | 0 – 6 |
| Affect work, family leisure (T2) | 4.16 (1.80) | 0 – 6 |
| Affect work, family leisure (T3) | 4.27 (1.78) | 0 – 6 |
| Number of caregiving activities (T1) | 3.43 (1.40) | 0 – 5 |
| Number of caregiving activities (T2) | 3.00 (1.71) | 0 – 5 |
| Number of caregiving activities (T3) | 3.22 (1.56) | 0 – 5 |
| Number of hours spent caregiving (T1) | | |
| Less than 10 hours per week | 70.9 | |
| 10-20 hours per week | 23.3 | |
| 20-30 hours per week | 2.9 | |
| More than 30 hours per week | 2.9 | |
| Number of hours spent caregiving (T2) | | |
| Less than 10 hours per week | 72.3 | |
| 10-20 hours per week | 18.1 | |
| 20-30 hours per week | 4.3 | |
| More than 30 hours per week | 5.3 | |

| | | |
|---------------------------------------|--------------|-----------|
| Number of hours spent caregiving (T3) | | |
| Less than 10 hours per week | 76.3 | |
| 10-20 hours per week | 15.0 | |
| 20-30 hours per week | 6.3 | |
| More than 30 hours per week | 2.5 | |
| Depressive Symptoms (T1) | 8.95 (8.39) | 0 – 42 |
| Depressive Symptoms (T2) | 10.18 (9.02) | 0 – 42 |
| Depressive Symptoms (T3) | 9.64 (10.64) | 0 – 48 |
| PA (T1) | 26.98 (6.50) | 7 – 40 |
| PA (T2) | 26.34 (6.55) | 8 – 40 |
| PA (T3) | 26.81 (7.79) | 2 – 40 |
| NA (T1) | 12.20 (8.27) | 0 – 33 |
| NA (T2) | 11.37 (7.36) | 0 – 34.44 |
| NA (T3) | 11.64 (7.63) | 0 – 33 |
| Satisfaction With Life (T1) | 11.64 (4.13) | 2 – 20 |
| Satisfaction With Life (T2) | 11.38 (3.89) | 0 – 20 |
| Satisfaction With Life (T3) | 12.02 (4.13) | 2.5 – 20 |
| Acute Illness (T1) | 2.49 (2.07) | 0 – 10 |
| Acute Illness (T2) | 2.57 (2.39) | 0 – 9 |
| Acute Illness (T3) | 2.25 (2.15) | 0 – 11 |
| Chronic Illness (T1) | 1.21 (1.29) | 0 – 5 |
| Chronic Illness (T2) | 1.36 (1.41) | 0 – 6 |
| Chronic Illness (T3) | 1.39 (1.47) | 0 – 5 |

Table 3. Table summarizing results for cross-sectional hypotheses.

| | Intercept | Optimism | Optimism ^a | Subjective Stress | Optimism x Subjective Stress |
|------------------------|-----------------|------------------|-----------------------|-------------------|---------------------------------|
| Depressive Symptoms | 9.633 (0.777)** | -0.934 (0.254)** | -0.886 (0.211)** | 0.097 (0.045)* | -0.046 (0.034) |
| Positive Affect | 26.637(0.607)** | 0.562 (0.155)** | 0.498 (0.140)** | -0.013 (0.027) | 0.024 (0.031) |
| Negative Affect | 12.531(0.616)** | -0.849 (0.219)** | -0.869 (0.200)** | 0.216 (0.044)** | -0.079 (0.046) |
| Satisfaction with Life | 11.629(0.351)** | 0.401 (0.090)** | 0.396 (0.081)** | -0.052 (0.017)** | 0.000 (0.017) |
| Acute Illness | 2.483 (0.172)** | -0.127 (0.045)** | -0.129 (0.043)** | 0.024 (0.012)* | -0.013 (0.015) |
| Chronic Illness | 1.320 (1.320)** | -0.043 (0.024) | -0.048 (0.022)* | -0.002 (0.007) | 0.001 (0.008) |

^aThe effect of optimism while controlling for Level-1 subjective stress

*Significant at $p = .05$ ** Significant at $p = .01$

Table 4. Table summarizing results for prospective hypotheses.

| | Intercept | Optimism | Optimism ^a | Subjective Stress | Optimism x Subjective Stress |
|------------------------|------------------|---------------|-----------------------|-------------------|---------------------------------|
| Depressive Symptoms | 9.633 (0.777)** | 0.131 (0.335) | 0.131 (0.335) | 0.059 (0.350) | 0.058 (0.069) |
| Positive Affect | 26.637 (0.607)** | 0.233 (0.237) | 0.225 (0.245) | 0.065 (0.049) | 0.000 (0.046) |
| Negative Affect | 12.531 (0.616)** | 0.022 (0.316) | -0.119 (0.255) | 0.084 (0.067) | -0.123 (0.060) |
| Satisfaction with Life | 11.629 (0.351)** | 0.125 (0.132) | 0.186 (0.134) | 0.014 (0.033) | -0.015 (0.029) |
| Acute Illness | 2.483 (0.172)** | 0.145 (0.089) | 0.097 (0.078) | 0.003 (0.026) | 0.000 (0.020) |
| Chronic Illness | 1.320 (1.320)** | 0.010 (0.039) | 0.021 (0.038) | -0.008 (0.010) | 0.005 (0.009) |

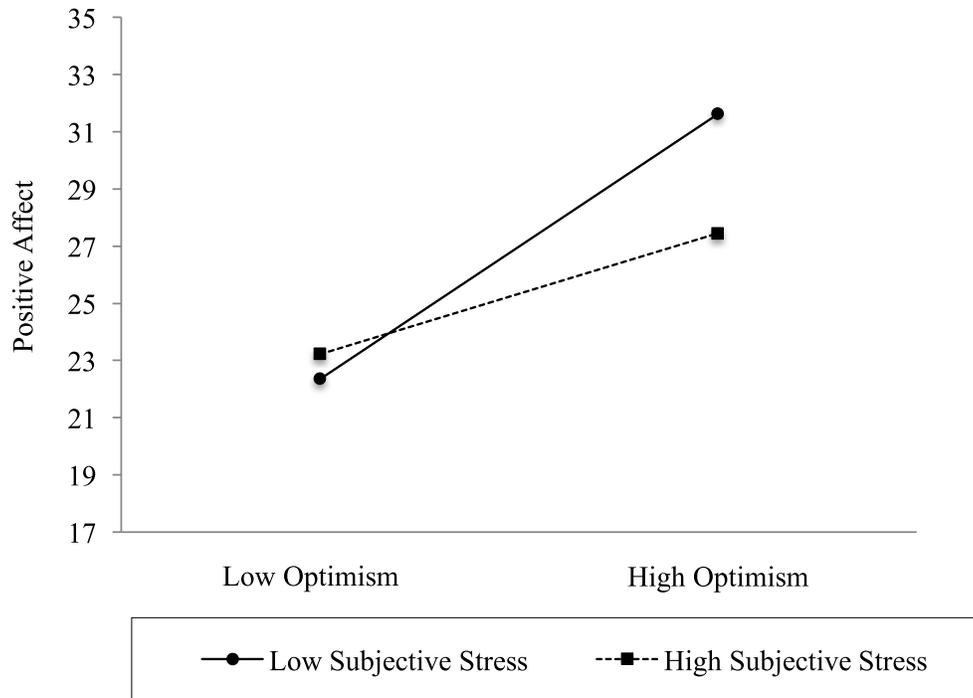
^a The effect of optimism while controlling for Level-1 subjective stress

* Significant at $\alpha = .05$

** Significant at $\alpha = .01$

Figures

Figure 1. Interaction of the between-person effect of optimism and subjective stress on positive affect.



Appendix A

Table A-1. Summary of results from all models including depressive symptoms as the outcome variable and subjective stress as the latent stress factor. Predictor variables that are not indented represent Level-1 variables, and indented predictor variables represent Level-2 variables. Bolded are the results from the study's main hypotheses.

| Predictors | Depressive Symptoms | | | | |
|---|-----------------------|-----------------|-----------------------|-----------------|--|
| | Cross-Sectional | | Lagged | | |
| | Coefficient (SE) | T-Ratio | Coefficient (SE) | T-Ratio | |
| Intercept | 9.633 (0.777) | 12.396** | 9.633 (0.777) | 12.396** | |
| Age | -0.484 (0.564) | -0.858 | -0.288 (0.701) | -0.412 | |
| Sex | -0.227 (0.491) | -0.462 | -0.402 (0.669) | -0.600 | |
| Socioeconomic Status | -1.038 (0.949) | -1.094 | -1.376 (1.153) | -1.193 | |
| Optimism | -4.216 (0.813) | -5.183** | -3.883 (0.872) | -4.453** | |
| Subjective Stress | 2.480 (0.624) | 3.951** | 2.735 (0.787) | 3.476** | |
| Optimism x Subjective Stress | -0.993 (0.536) | -1.853 | 3.731 (3.814) | -0.978 | |
| Optimism | -0.934 (0.254) | -3.672** | 0.131 (0.335) | 0.391 | |
| Age | 0.402 (0.310) | 1.296 | -0.607 (0.472) | -1.285 | |
| Sex | 0.045 (0.204) | 0.220 | -0.157 (0.284) | -0.553 | |
| Socioeconomic Status | 0.805 (0.230) | 3.497** | 0.219 (0.452) | 0.485 | |
| Optimism | -0.404 (0.248) | -1.625 | -0.468 (0.302) | -1.552 | |
| Optimism (Controlling Subjective Stress) | -0.886 (0.211) | -4.186** | 0.059 (0.350) | 0.170 | |
| Age | 0.569 (0.276) | 2.059* | -0.804 (0.440) | -1.827 | |
| Sex | -0.060 (0.238) | -0.250 | -0.068 (0.331) | -0.205 | |
| Socioeconomic Status | 0.642 (0.205) | 3.126** | 0.264 (0.431) | 0.612 | |
| Optimism | -0.288 (0.192) | -1.503 | -0.506 (0.319) | 1.587 | |
| Subjective Stress | -0.350 (0.190) | -1.845 | 0.510 (0.264) | 1.934 | |
| Subjective Stress | 0.097 (0.045) | 2.090* | 0.058 (0.069) | -0.837 | |
| Age | -0.134 (0.042) | -3.177** | 0.034 (0.055) | 0.611 | |
| Sex | -0.006 (0.042) | -0.064 | -0.024 (0.097) | -0.246 | |
| Socioeconomic Status | -0.085 (0.098) | -1.312 | 0.011 (0.110) | 0.097 | |
| Optimism | -0.061 (0.047) | -2.159* | 0.191 (0.061) | 3.112** | |
| Subjective Stress | 0.023 (0.028) | 0.501 | 0.120 (0.066) | 1.806 | |
| Optimism x Subjective Stress | -0.046 (0.034) | -1.334 | -0.101 (0.081) | -1.253 | |
| Age | 0.111 (0.038) | 2.895** | -0.034 (0.062) | -0.545 | |
| Sex | -0.212 (0.056) | -3.764** | -0.001 (0.122) | -0.010 | |
| Socioeconomic Status | 0.187 (0.046) | 4.022** | 0.047 (0.096) | 0.492 | |
| Optimism | 0.137 (0.123) | 1.108 | -0.289 (0.163) | -1.776 | |
| Subjective Stress | 0.295 (0.192) | 1.533 | -0.380 (0.227) | -1.675 | |
| Optimism x Subjective Stress | -0.315 (0.205) | -1.534 | 0.406 (0.244) | 1.666 | |

** Significant at $\alpha = .01$

Table A-2. Summary of results from all models including positive affect as the outcome variable and subjective stress as the latent stress factor. Predictor variables that are not indented represent Level-1 variables, and indented predictor variables represent Level-2 variables. Bolded are the results from the study's main hypotheses.

| Predictors | Positive Affect | | | |
|---|-----------------------|-----------------|-----------------------|-----------------|
| | Cross-Sectional | | Lagged | |
| | Coefficient (SE) | T-Ratio | Coefficient (SE) | T-Ratio |
| Intercept | 26.637 (0.607) | 43.901** | 26.637 (0.607) | 43.901** |
| Age | -0.867 (0.559) | -1.551 | -0.726 (0.555) | -1.307 |
| Sex | -0.202 (0.481) | -0.420 | 0.274 (0.478) | 0.574 |
| Socioeconomic Status | 0.273 (0.510) | 0.536 | 0.122 (0.696) | 0.176 |
| Optimism | 3.310 (0.582) | 5.661** | 3.349 (0.630) | 5.315** |
| Subjective Stress | -0.862 (0.562) | -1.534 | -1.199 (0.601) | -1.995* |
| Optimism x Subjective Stress | -1.263 (0.418) | -3.019** | -6.220 (2.313) | -2.690** |
| Optimism | 0.562 (0.155) | 3.612** | 0.233 (0.237) | 0.984 |
| Age | -0.169 (0.204) | -0.827 | -0.181 (0.260) | -0.697 |
| Sex | -0.506 (0.161) | -3.149** | 0.699 (0.323) | 2.168* |
| Socioeconomic Status | -0.305 (0.134) | -2.271* | -0.202 (0.280) | -0.721 |
| Optimism | 0.513 (0.139) | 3.685** | 0.017 (0.213) | 0.081 |
| Optimism (Controlling Subjective Stress) | 0.498 (0.140) | 3.546** | 0.225 (0.245) | 0.918 |
| Age | -0.207 (0.185) | -1.120 | -0.135 (0.340) | -0.397 |
| Sex | -0.458 (0.141) | -3.240** | 0.681 (0.278) | 2.453** |
| Socioeconomic Status | -0.283 (0.136) | -2.064* | 0.264 (0.249) | -1.058 |
| Optimism | 0.521 (0.135) | 3.858** | -0.009 (0.188) | -0.048 |
| Subjective Stress | 0.283 (0.094) | 3.015** | -0.101 (0.185) | -0.546 |
| Subjective Stress | -0.013 (0.027) | -0.477 | 0.065 (0.049) | 1.328 |
| Age | 0.035 (0.019) | 1.861 | -0.036 (0.024) | -1.461 |
| Sex | 0.001 (0.040) | 0.014 | 0.130 (0.070) | 1.856 |
| Socioeconomic Status | 0.069 (0.033) | 2.102* | 0.014 (0.067) | 0.212 |
| Optimism | -0.007 (0.021) | -0.322 | 0.005 (0.049) | 0.109 |
| Subjective Stress | 0.004 (0.019) | 0.243 | -0.019 (0.040) | -0.484 |
| Optimism x Subjective Stress | 0.024 (0.031) | 0.785 | 0.000 (0.046) | 0.007 |
| Age | -0.045 (0.028) | -1.535 | 0.071 (0.034) | 2.100* |
| Sex | 0.177 (0.041) | 4.327** | -0.255 (0.075) | -3.411** |
| Socioeconomic Status | 0.181 (0.040) | 4.465** | 0.040 (0.052) | 0.772 |
| Optimism | -0.017 (0.094) | -0.181 | 0.141 (0.114) | 1.236 |
| Subjective Stress | -0.013 (0.132) | -0.097 | 0.166 (0.163) | 1.020 |
| Optimism x Subjective Stress | 0.050 (0.148) | 0.336 | -0.174 (0.176) | -0.991 |

* Significant at $\alpha = .05$

** Significant at $\alpha = .01$

Table A-3. Summary of results from all models including negative affect as the outcome variable and subjective stress as the latent stress factor. Predictor variables that are not indented represent Level-1 variables, and indented predictor variables represent Level-2 variables. Bolded are the results from the study's main hypotheses.

| Predictors | Negative Affect | | | |
|---|-----------------------|-----------------|-----------------------|---------------|
| | Cross-Sectional | | Lagged | |
| | Coefficient (SE) | T-Ratio | Coefficient (SE) | T-Ratio |
| Intercept | 12.531 (0.616) | 20.340** | 12.531 (0.616) | 20.340** |
| Age | -0.409 (0.539) | -0.759 | -0.213 (0.645) | -0.330 |
| Sex | -0.635 (0.496) | -1.279 | -0.701 (0.537) | -1.305 |
| Socioeconomic Status | 0.250 (0.559) | 0.447 | 0.391 (0.800) | 0.489 |
| Optimism | -3.204 (0.628) | -5.095** | -2.387 (0.749) | -3.187** |
| Subjective Stress | 1.371 (0.514) | 2.663** | 1.622 (0.538) | 3.013** |
| Optimism x Subjective Stress | -0.757 (0.414) | -1.829 | -4.226 (2.884) | -1.466 |
| Optimism | -0.849 (0.219) | -3.875** | 0.022 (0.316) | 0.069 |
| Age | -0.022 (0.282) | -0.077 | -0.174 (0.343) | -0.506 |
| Sex | -0.028 (0.224) | -0.124 | -0.135 (0.415) | -0.326 |
| Socioeconomic Status | 0.161 (0.252) | 0.640 | -0.172 (0.376) | -0.458 |
| Optimism | -0.535 (0.219) | -2.439* | 0.276 (0.290) | 0.949 |
| Optimism (Controlling Subjective Stress) | -0.869 (0.200) | -4.349** | -0.119 (0.255) | -0.467 |
| Age | 0.221 (0.227) | 0.972 | -0.160 (0.336) | -0.476 |
| Sex | -0.064 (0.180) | -0.354 | -0.006 (0.239) | -0.024 |
| Socioeconomic Status | 0.073 (0.224) | 0.324 | -0.113 (0.286) | -0.395 |
| Optimism | -0.282 (0.179) | -1.572 | 0.386 (0.242) | 1.594 |
| Subjective Stress | 0.257 (0.220) | 1.170 | 0.575 (0.256) | 2.247* |
| Subjective Stress | 0.216 (0.044) | 4.913** | 0.084 (0.067) | 1.232 |
| Age | -0.086 (0.029) | -2.957** | -0.039 (0.041) | -0.949 |
| Sex | 0.039 (0.057) | 0.685 | 0.136 (0.110) | 1.238 |
| Socioeconomic Status | -0.005 (0.047) | 0.047 | 0.007 (0.092) | 0.079 |
| Optimism | -0.103 (0.034) | -3.062** | 0.014 (0.068) | 0.211 |
| Subjective Stress | -0.057 (0.042) | -1.347 | 0.052 (0.072) | 0.716 |
| Optimism x Subjective Stress | -0.079 (0.046) | -1.733 | -0.123 (0.060) | -2.029 |
| Age | -0.064 (0.036) | -1.781 | 0.010 (0.046) | -0.223 |
| Sex | -0.119 (0.056) | -2.117* | 0.010 (0.102) | 0.102 |
| Socioeconomic Status | 0.064 (0.033) | 1.930 | -0.039 (0.069) | -0.560 |
| Optimism | 0.078 (0.136) | -0.572 | -0.376 (0.174) | -2.156* |
| Subjective Stress | -0.133 (0.188) | -0.709 | 0.581 (0.262) | -2.212* |
| Optimism x Subjective Stress | 0.103 (0.214) | 0.480 | 0.643 (0.273) | 2.359* |

* Significant at $\alpha = .05$

** Significant at $\alpha = .01$

Table A-4. Summary of results from all models including satisfaction with life as the outcome variable and subjective stress as the latent stress factor. Summary of results from all models including satisfaction with life as the outcome variable and subjective stress as the latent stress factor. Predictor variables that are not indented represent Level-1 variables, and indented predictor variables represent Level-2 variables. Bolded are the results from the study's main hypotheses.

| Predictors | Satisfaction With Life | | | |
|---|------------------------|-----------------|-----------------------|---------------|
| | Cross-Sectional | | Lagged | |
| | Coefficient (SE) | T-Ratio | Coefficient (SE) | T-Ratio |
| Intercept | 11.629 (0.351) | 33.168** | 11.629 (0.351) | 33.168** |
| Age | -0.127 (0.294) | -0.434 | 0.096 (0.253) | -0.380 |
| Sex | 0.098 (0.286) | 0.345 | -0.008 (0.316) | -0.026 |
| Socioeconomic Status | 0.704 (0.296) | 2.379* | 0.888 (0.375) | 2.365* |
| Optimism | 1.792 (0.327) | 5.480** | 1.575 (0.368) | 4.278** |
| Subjective Stress | -1.437 (0.283) | -5.075** | -1.604 (0.297) | -5.407** |
| Optimism x Subjective Stress | -0.302 (0.283) | -1.066 | -0.850 (1.632) | -0.521 |
| Optimism | 0.401 (0.090) | 4.418** | 0.125 (0.132) | 0.943 |
| Age | 0.184 (0.121) | 1.518 | -0.032 (0.156) | -0.205 |
| Sex | -0.141 (0.083) | -1.696 | 0.112 (0.138) | 0.814 |
| Socioeconomic Status | -0.113 (0.090) | -1.262 | -0.173 (0.143) | -1.209 |
| Optimism | 0.155 (0.096) | 1.610 | 0.090 (0.108) | 0.836 |
| Optimism (Controlling Subjective Stress) | 0.396 (0.081) | 4.872** | 0.186 (0.134) | 1.396 |
| Age | 0.123 (0.109) | 1.130 | -0.060 (0.149) | -0.405 |
| Sex | -0.127 (0.085) | -1.494 | 0.088 (0.152) | 0.579 |
| Socioeconomic Status | -0.107 (0.088) | -1.211 | -0.220 (0.140) | -1.574 |
| Optimism | 0.109 (0.082) | 1.323 | 0.080 (0.111) | 0.718 |
| Subjective Stress | -0.001 (0.080) | -0.012 | -0.128 (0.123) | -1.042 |
| Subjective Stress | -0.052 (0.017) | -3.042** | 0.014 (0.033) | 0.430 |
| Age | 0.023 (0.011) | 2.169* | -0.003 (0.021) | -0.164 |
| Sex | 0.016 (0.027) | 0.612 | 0.010 (0.053) | 0.189 |
| Socioeconomic Status | 0.020 (0.023) | 0.876 | -0.018 (0.038) | -0.485 |
| Optimism | 0.015 (0.011) | 1.403 | -0.002 (0.031) | -0.061 |
| Subjective Stress | 0.003 (0.017) | 0.198 | 0.001 (0.028) | 0.050 |
| Optimism x Subjective Stress | 0.000 (0.017) | 0.054 | -0.015 (0.029) | -0.511 |
| Age | -0.019 (0.013) | -1.442 | 0.020 (0.022) | 0.903 |
| Sex | 0.082 (0.030) | 2.690** | -0.072 (0.045) | -1.622 |
| Socioeconomic Status | -0.044 (0.015) | -2.783** | 0.008 (0.034) | 0.240 |
| Optimism | -0.075 (0.057) | -1.302 | 0.109 (0.107) | 1.017 |
| Subjective Stress | -0.099 (0.080) | -1.245 | 0.150 (0.158) | 0.953 |
| Optimism x Subjective Stress | 0.121 (0.088) | 1.371 | 0.165 (0.169) | -0.977 |

* Significant at $\alpha = .05$

** Significant at $\alpha = .01$

Table A-5. Summary of results from all models including acute illness as the outcome variable and subjective stress as the latent stress factor. Predictor variables that are not indented represent Level-1 variables, and indented predictor variables represent Level-2 variables. Bolded are the results from the study's main hypotheses.

| Predictors | <u>Acute Illness</u> | | | |
|---|------------------------|-----------------|----------------------|--------------|
| | <u>Cross-Sectional</u> | | <u>Lagged</u> | |
| | Coefficient (SE) | T-Ratio | Coefficient (SE) | T-Ratio |
| Intercept | 2.483 (0.172) | 0.186** | 2.483 (0.172) | 0.186** |
| Age | -0.170 (0.195) | -0.871 | -0.151 (0.207) | -0.732 |
| Sex | -0.208 (0.142) | -1.464 | -0.265 (0.187) | -1.415 |
| Socioeconomic Status | -0.217 (0.244) | 0.189 | -0.140 (0.248) | -0.564 |
| Optimism | -0.487 (0.162) | -3.003** | -0.505 (0.194) | -2.595* |
| Subjective Stress | 0.366 (0.182) | 2.011* | 0.352 (0.211) | 1.673 |
| Optimism x Subjective Stress | -0.253 (0.150) | -1.681 | -1.685 (0.856) | -1.969 |
| Optimism | -0.127 (0.045) | -2.777** | 0.145 (0.089) | 1.562 |
| Age | 0.062 (0.057) | 1.102 | -0.016 (0.100) | -0.208 |
| Sex | -0.048 (0.067) | -0.717 | -0.089 (0.117) | -0.855 |
| Socioeconomic Status | 0.102 (0.052) | 1.963* | 0.085 (0.107) | -0.841 |
| Optimism | -0.094 (0.058) | -1.607 | 0.141 (0.082) | 1.552 |
| Optimism (Controlling Subjective Stress) | -0.129 (0.043) | -2.967** | 0.097 (0.078) | 1.240 |
| Age | 0.081 (0.055) | 1.486 | -0.018 (0.071) | -0.257 |
| Sex | -0.064 (0.068) | -0.944 | -0.029 (0.103) | -0.278 |
| Socioeconomic Status | 0.096 (0.050) | 1.913 | -0.074 (0.104) | -0.716 |
| Optimism | -0.080 (0.052) | -1.559 | 0.181 (0.092) | 1.967* |
| Subjective Stress | -0.017 (0.043) | -0.391 | 0.154 (0.080) | 1.925 |
| Subjective Stress | 0.024 (0.012) | 2.065* | 0.003 (0.026) | 0.112 |
| Age | -0.009 (0.009) | -0.978 | 0.009 (0.012) | 0.739 |
| Sex | 0.002 (0.016) | 0.165 | -0.028 (0.044) | -0.641 |
| Socioeconomic Status | 0.014 (0.020) | 0.714 | -0.007 (0.028) | -0.270 |
| Optimism | 0.001 (0.013) | -0.077 | -0.011 (0.024) | -0.464 |
| Subjective Stress | 0.008 (0.016) | 0.490 | -0.028 (0.019) | -1.504 |
| Optimism x Subjective Stress | -0.013 (0.015) | -0.834 | 0.000 (0.020) | 0.007 |
| Age | 0.010 (0.008) | 1.269 | -0.025 (0.013) | -1.833 |
| Sex | -0.017 (0.026) | -0.678 | 0.053 (0.036) | 1.496 |
| Socioeconomic Status | -0.022 (0.013) | -1.623 | -0.021 (0.019) | -1.089 |
| Optimism | -0.013 (0.036) | -0.371 | -0.006 (0.054) | -0.104 |
| Subjective Stress | -0.042 (0.053) | -0.805 | -0.000 (0.084) | -0.002 |
| Optimism x Subjective Stress | 0.041 (0.055) | 0.733 | 0.008 (0.093) | 0.082 |

* Significant at $\alpha = .05$

** Significant at $\alpha = .01$

Table A-6. Summary of results from all models including chronic illness as the outcome variable and subjective stress as the latent stress factor. Predictor variables that are not indented represent Level-1 variables, and indented predictor variables represent Level-2 variables. Bolded are the results from the study's main hypotheses.

| Predictors | Chronic Illness | | | |
|---|-----------------------|----------------|----------------------|---------------|
| | Cross-Sectional | | Lagged | |
| | Coefficient (SE) | T-Ratio | Coefficient (SE) | T-Ratio |
| Intercept | 1.320 (1.320) | 10.694** | 1.320 (1.320) | 10.694** |
| Age | 0.597 (0.118) | 5.047** | 0.645 (0.131) | 4.922** |
| Sex | 0.068 (0.107) | 0.635 | 0.114 (0.140) | 0.818 |
| Socioeconomic Status | -0.100 (0.106) | -0.937 | -0.244 (0.151) | -1.615 |
| Optimism | -0.111 (0.104) | -1.064 | -0.043 (0.116) | -0.366 |
| Subjective Stress | 0.234 (0.124) | 1.882 | 0.228 (0.145) | 1.575 |
| Optimism x Subjective Stress | -0.135 (0.096) | -1.408 | -0.046 (0.462) | -0.099 |
| Optimism | -0.043 (0.024) | -1.758 | 0.010 (0.039) | -0.245 |
| Age | -0.004 (0.017) | -0.260 | 0.032 (0.038) | 0.839 |
| Sex | 0.013 (0.032) | 0.424 | -0.033 (0.059) | -0.564 |
| Socioeconomic Status | 0.012 (0.037) | 0.319 | -0.027 (0.039) | -0.686 |
| Optimism | 0.007 (0.021) | 0.349 | 0.028 (0.028) | 0.979 |
| Optimism (Controlling Subjective Stress) | -0.048 (0.022) | -2.182* | 0.021 (0.038) | -0.537 |
| Age | -0.009 (0.016) | -0.553 | 0.032 (0.033) | 0.963 |
| Sex | 0.013 (0.029) | 0.438 | -0.021 (0.060) | -0.351 |
| Socioeconomic Status | 0.022 (0.033) | 0.661 | -0.040 (0.038) | -1.049 |
| Optimism | -0.001 (0.020) | -0.026 | 0.023 (0.029) | 0.779 |
| Subjective Stress | 0.003 (0.016) | 0.203 | 0.004 (0.038) | 0.099 |
| Subjective Stress | -0.002 (0.007) | 0.007 | -0.008 (0.010) | -0.722 |
| Age | 0.006 (0.005) | 1.416 | -0.013 (0.007) | -1.755 |
| Sex | -0.016 (0.012) | -1.358 | -0.016 (0.015) | -1.045 |
| Socioeconomic Status | 0.022 (0.007) | 3.091** | -0.009 (0.017) | -0.513 |
| Optimism | -0.003 (0.006) | -0.524 | 0.014 (0.014) | 1.002 |
| Subjective Stress | 0.003 (0.006) | 0.483 | -0.005 (0.010) | -0.470 |
| Optimism x Subjective Stress | 0.001 (0.008) | 0.076 | 0.005 (0.009) | 0.556 |
| Age | -0.006 (0.004) | -1.508 | 0.004 (0.006) | 0.672 |
| Sex | 0.004 (0.011) | 0.378 | -0.041 (0.017) | -2.384* |
| Socioeconomic Status | -0.005 (0.007) | -0.649 | 0.016 (0.008) | 1.891 |
| Optimism | 0.009 (0.021) | 0.441 | 0.108 (0.022) | 4.918** |
| Subjective Stress | 0.002 (0.032) | 0.076 | 0.163 (0.034) | 4.764** |
| Optimism x Subjective Stress | -0.005 (0.035) | -0.137 | -0.191 (0.036) | -5.347** |

* Significant at $\alpha = .05$

** Significant at $\alpha = .01$

Table A-7. Summary of results from all models including depressive symptoms as the outcome variable and frequency of stress as the latent stress factor. Predictor variables that are not indented represent Level-1 variables, and indented predictor variables represent Level-2 variables. Bolded are the results from the study's main hypotheses.

| Predictors | Depressive Symptoms | | | |
|---|-----------------------|-----------------|----------------------|--------------|
| | Cross-Sectional | | Lagged | |
| | Coefficient (SE) | T-Ratio | Coefficient (SE) | T-Ratio |
| Intercept | 9.633 (0.777) | 12.396 | 9.633 (0.777) | 12.396 |
| Age | -0.534 (0.611) | -0.875 | -0.044 (0.729) | -0.061 |
| Sex | -0.401 (0.574) | -0.700 | -0.841 (0.709) | -1.186 |
| Socioeconomic Status | -1.231 (0.740) | -1.663 | -1.143 (1.062) | -1.076 |
| Optimism | -4.213 (0.837) | -5.029** | -3.883 (0.872) | -4.453** |
| Subjective Stress | 2.019 (0.637) | 3.171** | 2.282 (0.810) | 2.817** |
| Optimism x Frequency of Caregiving | 0.246 (0.701) | 0.351 | 2.939 (4.399) | 0.668 |
| Optimism | -0.929 (0.253) | -3.666** | 0.131 (0.335) | 0.391 |
| Age | 0.402 (0.310) | 1.296 | -0.607 (0.472) | -1.285 |
| Sex | 0.045(0.204) | 0.220 | -0.157 (0.284) | -0.553 |
| Socioeconomic Status | 0.805(0.230) | 3.497** | 0.219 (0.452) | 0.485 |
| Optimism | -0.404 (0.248) | -1.625 | -0.468 (0.302) | -1.552 |
| Optimism (Controlling Frequency of Caregiving) | -0.888 (0.214) | -4.153** | 0.120 (0.321) | 0.375 |
| Age | 0.359 (0.253) | 1.418 | -0.598 (0.408) | -1.464 |
| Sex | -0.098 (0.231) | -0.426 | -0.048 (0.357) | -0.135 |
| Socioeconomic Status | 0.706 (0.257) | 2.745** | 0.500 (0.434) | 1.150 |
| Optimism | -0.395 (0.249) | -1.586 | -0.469 (0.300) | -1.564 |
| Frequency of Caregiving | -0.467 (0.297) | -1.574 | 0.545 (0.323) | 1.688 |
| Frequency of Caregiving | 0.666 (0.482) | -1.382 | -0.247 (0.739) | -0.334 |
| Age | 0.867 (0.583) | 1.486 | 0.220 (1.039) | 0.212 |
| Sex | -0.105 (0.582) | -0.180 | 0.060 (0.626) | 0.095 |
| Socioeconomic Status | 0.409 (0.637) | 0.643 | 1.317 (1.026) | 1.284 |
| Optimism | 0.290 (0.323) | 0.896 | 0.508 (0.877) | 0.579 |
| Frequency of Caregiving | 0.563 (0.391) | -1.441 | 0.080 (0.668) | 0.121 |
| Optimism x Frequency of Caregiving | 0.141 (0.315) | 0.444 | 0.407 (0.579) | 0.703 |
| Age | 0.069 (0.463) | 0.150 | 0.998 (0.928) | 1.075 |
| Sex | 0.060 (0.343) | 0.150 | 0.323 (0.852) | 0.379 |
| Socioeconomic Status | -0.456 (0.400) | -1.331 | -1.358 (0.787) | -1.725 |
| Optimism | 0.143 (0.223) | 0.643 | -1.810 (2.410) | -0.751 |
| Subjective Stress | 0.084 (0.287) | 0.293 | -4.919 (4.950) | -0.994 |
| Optimism x Frequency of Caregiving | 0.753 (0.466) | 1.616 | 3.449 (5.326) | 0.648 |

* Significant at $\alpha = .05$

** Significant at $\alpha = .01$

Table A-8. Summary of results from all models including positive affect as the outcome variable and frequency of stress as the latent stress factor. Predictor variables that are not indented represent Level-1 variables, and indented predictor variables represent Level-2 variables. Bolded are the results from the study's main hypotheses.

| Predictors | Positive Affect | | | |
|---|-----------------------|----------------|----------------------|--------------|
| | Cross-Sectional | | Lagged | |
| | Coefficient (SE) | T-Ratio | Coefficient (SE) | T-Ratio |
| Intercept | 26.637 (0.607) | 43.901** | 26.637 (0.607) | 43.901** |
| Age | -0.963 (0.530) | -1.815 | -0.972 (0.556) | -1.750 |
| Sex | -0.074 (0.482) | -0.155 | 0.383 (0.541) | 0.708 |
| Socioeconomic Status | 0.186 (0.502) | 0.371 | -0.145 (0.696) | -0.208 |
| Optimism | 3.310 (0.582) | 5.682** | 3.349 (0.630) | 5.315** |
| Subjective Stress | -0.203 (0.534) | -0.381 | -0.222 (0.573) | -0.388 |
| Optimism x Frequency of Caregiving | -0.625 (0.513) | -1.219 | -6.176 (2.831) | -2.182* |
| Optimism | 0.561 (0.155) | 3.616** | 0.233 (0.237) | 0.984 |
| Age | -0.169 (0.204) | -0.827 | -0.181 (0.260) | -0.697 |
| Sex | -0.506 (0.161) | -3.149** | 0.699 (0.323) | 2.168* |
| Socioeconomic Status | -0.305 (0.134) | -2.271* | -0.202 (0.280) | -0.721 |
| Optimism | 0.513 (0.139) | 3.685** | 0.017 (0.213) | 0.081 |
| Optimism (Controlling Frequency of Caregiving) | 0.527 (0.149) | 3.527** | 0.223 (0.230) | 0.969 |
| Age | -0.149 (0.172) | -0.866 | -0.177 (0.350) | -0.506 |
| Sex | -0.424 (0.152) | -2.792** | 0.665 (0.269) | 2.469** |
| Socioeconomic Status | -0.245 (0.144) | -1.699 | -0.288 (0.289) | -0.994 |
| Optimism | 0.510 (0.136) | 3.752** | -0.009 (0.182) | -0.050 |
| Frequency of Caregiving | 0.225 (0.152) | 1.480 | -0.331 (0.262) | -1.262 |
| Frequency of Caregiving | -0.246 (0.280) | -0.883 | 0.145 (0.497) | 0.292 |
| Age | 0.048 (0.369) | 0.131 | 0.112 (0.728) | 0.154 |
| Sex | -0.037 (0.262) | -0.139 | 0.249 (0.402) | 0.620 |
| Socioeconomic Status | 0.180 (0.325) | 0.554 | -0.368 (0.599) | -0.615 |
| Optimism | 0.074 (0.271) | 0.272 | 0.067 (0.520) | 0.128 |
| Frequency of Caregiving | 0.185 (0.250) | 0.739 | -0.182 (0.425) | -0.429 |
| Optimism x Frequency of Caregiving | -0.521 (0.229) | -2.270* | 0.001 (0.369) | 0.003 |
| Caregiving | | | | |
| Age | 0.166 (0.303) | 0.546 | -0.560 (0.575) | -0.974 |
| Sex | 0.109 (0.289) | 0.375 | -0.968 (0.545) | -1.777 |
| Socioeconomic Status | 0.070 (0.304) | 0.231 | 1.495 (0.521) | 2.867** |
| Optimism | -0.130 (0.168) | -0.772 | -2.640 (1.445) | -1.827 |
| Subjective Stress | -0.124 (0.187) | -0.666 | -4.139 (2.890) | -1.432 |
| Optimism x Frequency of Caregiving | -0.803 (0.281) | -2.854** | 6.096 (3.300) | 1.847 |

* Significant at $\alpha = .05$

** Significant at $\alpha = .01$

Table A-9. Summary of results from all models including negative affect as the outcome variable and frequency of stress as the latent stress factor. Predictor variables that are not indented represent Level-1 variables, and indented predictor variables represent Level-2 variables. Bolded are the results from the study's main hypotheses.

| Predictors | Negative Affect | | | |
|---|-----------------------|-----------------|-----------------------|-----------------|
| | Cross-Sectional | | Lagged | |
| | Coefficient (SE) | T-Ratio | Coefficient (SE) | T-Ratio |
| Intercept | 12.531 (0.616) | 20.340** | 12.531 (0.616) | 20.340** |
| Age | -0.365 (0.537) | -0.680 | 0.210 (0.586) | 0.358 |
| Sex | -0.730 (0.570) | -1.281 | -1.066 (0.553) | -1.926 |
| Socioeconomic Status | 0.343 (0.558) | 0.615 | 0.209 (0.769) | 0.272 |
| Optimism | -3.210 (0.630) | -5.094** | -2.387 (0.749) | -3.187** |
| Subjective Stress | 1.456 (0.485) | 2.886** | 1.396 (0.551) | 2.533* |
| Optimism x Frequency of Caregiving | 0.439 (0.542) | 0.810 | 6.986 (4.066) | 1.718 |
| Optimism | -0.847 (0.218) | -3.889** | 0.022 (0.316) | 0.069 |
| Age | -0.022 (0.282) | -0.077 | -0.174 (0.343) | -0.506 |
| Sex | -0.028 (0.224) | -0.124 | -0.135 (0.415) | -0.326 |
| Socioeconomic Status | 0.161 (0.252) | 0.640 | -0.172 (0.376) | -0.458 |
| Optimism | -0.535 (0.219) | -2.439* | 0.276 (0.290) | 0.949 |
| Optimism (Controlling Frequency of Caregiving) | -0.795 (0.219) | -3.626** | -0.054 (0.246) | -0.220 |
| Age | -0.047 (0.265) | -0.179 | -0.193 (0.306) | -0.631 |
| Sex | -0.097 (0.243) | -0.399 | -0.041 (0.256) | -0.161 |
| Socioeconomic Status | 0.130 (0.258) | 0.505 | 0.098 (0.304) | 0.324 |
| Optimism | -0.519 (0.220) | -2.366* | 0.249 (0.232) | 1.076 |
| Frequency of Caregiving | -0.213 (0.265) | -0.804 | 0.433 (0.285) | 1.520 |
| Frequency of Caregiving | 0.449 (0.594) | 0.756 | -0.504 (0.633) | -0.797 |
| Age | 0.393 (0.750) | -0.524 | 0.425 (0.820) | 0.518 |
| Sex | -0.190 (0.384) | -0.495 | 0.436 (0.621) | 0.702 |
| Socioeconomic Status | 0.530 (0.667) | 0.795 | 0.834 (0.910) | 0.916 |
| Optimism | 0.100 (0.731) | 0.136 | 1.020 (0.820) | 1.244 |
| Frequency of Caregiving | -0.170 (0.641) | -0.266 | -0.180 (0.600) | -0.299 |
| Optimism x Frequency of Caregiving | 0.109 (0.297) | 0.367 | 0.006 (0.376) | 0.016 |
| Age | -0.790 (0.507) | -1.556 | 0.483 (0.623) | 0.775 |
| Sex | -0.637 (0.428) | -1.485 | -1.195 (0.599) | -1.996* |
| Socioeconomic Status | -0.747 (0.463) | -1.611 | 0.182 (0.592) | 0.307 |
| Optimism | -2.255 (1.632) | -1.382 | -0.013 (2.179) | -0.006 |
| Subjective Stress | -3.791 (3.321) | -1.142 | -0.738 (4.621) | -0.160 |
| Optimism x Frequency of Caregiving | 4.020 (3.391) | 1.185 | 0.194 (4.850) | 0.040 |

* Significant at $\alpha = .05$

** Significant at $\alpha = .01$

Table A-10. Summary of results from all models including satisfaction with life as the outcome variable and frequency of stress as the latent stress factor. Predictor variables that are not indented represent Level-1 variables, and indented predictor variables represent Level-2 variables. Bolded are the results from the study’s main hypotheses.

| Predictors | Satisfaction With Life | | | | |
|---|------------------------|-----------------|----------------------|--------------|--|
| | Cross-Sectional | | | Lagged | |
| | Coefficient (SE) | T-Ratio | Coefficient (SE) | T-Ratio | |
| Intercept | 11.629 (0.351) | 33.168** | 11.629 (0.351) | 33.168** | |
| Age | -0.099 (0.297) | -0.334 | -0.176 (0.285) | -0.619 | |
| Sex | 0.059 (0.313) | 0.190 | 0.048 (0.356) | 0.135 | |
| Socioeconomic Status | 0.613 (0.307) | 1.991* | 0.920 (0.406) | 2.269* | |
| Optimism | 1.801 (0.328) | 5.499** | 1.575 (0.368) | 4.278** | |
| Subjective Stress | -0.818 (0.301) | -2.716** | -0.802 (0.318) | -2.526* | |
| Optimism x Frequency of Caregiving | -0.027 (0.298) | -0.093 | -0.424 (1.625) | -0.261 | |
| Optimism | 0.402 (0.091) | 4.426** | 0.125 (0.132) | 0.943 | |
| Age | 0.184 (0.121) | 1.518 | -0.032 (0.156) | -0.205 | |
| Sex | -0.141 (0.083) | -1.696 | 0.112 (0.138) | 0.814 | |
| Socioeconomic Status | -0.113 (0.090) | -1.262 | -0.173 (0.143) | -1.209 | |
| Optimism | 0.155 (0.096) | 1.610 | 0.090 (0.108) | 0.836 | |
| Optimism (Controlling Frequency of Caregiving) | 0.389 (0.083) | 4.736** | 0.135 (0.132) | 1.019 | |
| Age | 0.195 (0.104) | 1.881 | -0.072 (0.146) | -0.495 | |
| Sex | -0.093 (0.077) | -1.194 | 0.107 (0.168) | 0.637 | |
| Socioeconomic Status | -0.084 (0.097) | -0.865 | 0.237 (0.136) | -1.742 | |
| Optimism | 0.147 (0.101) | 1.459 | 0.099 (0.110) | 0.897 | |
| Frequency of Caregiving | 0.105 (0.101) | 1.042 | -0.120 (0.124) | -0.968 | |
| Frequency of Caregiving | 0.109 (0.204) | 0.538 | -0.032 (0.288) | -0.111 | |
| Age | 0.204 (0.262) | 0.777 | 0.173 (0.331) | 0.522 | |
| Sex | 0.002 (0.175) | 0.012 | 0.085 (0.234) | 0.366 | |
| Socioeconomic Status | 0.255 (0.226) | 1.130 | -0.779 (0.426) | -1.829 | |
| Optimism | 0.171 (0.182) | 0.941 | -0.386 (0.380) | -1.015 | |
| Frequency of Caregiving | 0.339 (0.192) | 1.761 | -0.357 (0.279) | -1.277 | |
| Optimism x Frequency of Caregiving | -0.028 (0.165) | -0.171 | 0.083 (0.217) | 0.382 | |
| Age | 0.404 (0.151) | 2.673** | -0.100 (0.327) | -0.307 | |
| Sex | -0.235 (0.246) | -0.956 | -0.673 (0.332) | -2.026* | |
| Socioeconomic Status | -0.212 (0.170) | -1.244 | 0.480 (0.313) | 1.534 | |
| Optimism | 1.446 (0.456) | 3.173** | 1.006 (0.785) | -1.281 | |
| Subjective Stress | 1.951 (1.006) | 1.940 | -2.280 (1.485) | -1.535 | |
| Optimism x Frequency of Caregiving | 2.483 (1.014) | -2.448* | 2.616 (1.753) | 1.493 | |

* Significant at $\alpha = .05$

** Significant at $\alpha = .01$

Table A-11. Summary of results from all models including acute illness as the outcome variable and frequency of stress as the latent stress factor. Predictor variables that are not indented represent Level-1 variables, and indented predictor variables represent Level-2 variables. Bolded are the results from the study's main hypotheses.

| Predictors | Acute Illness | | | |
|---|-----------------------|-----------------|-----------------------|---------------|
| | Cross-Sectional | | Lagged | |
| | Coefficient (SE) | T-Ratio | Coefficient (SE) | T-Ratio |
| Intercept | 2.483 (0.172) | 0.186** | 2.483 (0.172) | 0.186** |
| Age | -0.232 (0.183) | -1.265 | -0.251 (0.206) | -1.217 |
| Sex | -0.126 (0.193) | -0.652 | -0.201 (0.192) | -1.049 |
| Socioeconomic Status | -0.201 (0.190) | -1.058 | -0.195 (0.247) | -0.790 |
| Optimism | -0.493 (0.163) | -3.027** | -0.505 (0.194) | -2.595* |
| Subjective Stress | 0.254 (0.180) | 1.411 | 0.098 (0.188) | 0.520 |
| Optimism x Frequency of Caregiving | -0.340 (0.184) | -1.848 | -2.240 (1.036) | -2.164* |
| Optimism | -0.128 (0.046) | -2.806** | 0.145 (0.089) | 1.562 |
| Age | 0.062 (0.057) | 1.102 | -0.016 (0.100) | -0.208 |
| Sex | -0.048 (0.067) | -0.717 | -0.089 (0.117) | -0.855 |
| Socioeconomic Status | 0.102 (0.052) | 1.963* | 0.085 (0.107) | -0.841 |
| Optimism | -0.094 (0.058) | -1.607 | 0.141 (0.082) | 1.552 |
| Optimism (Controlling Frequency of Caregiving) | -0.125 (0.042) | -2.942** | 0.112 (0.085) | 1.322 |
| Age | 0.061 (0.054) | 1.128 | -0.064 (0.070) | -0.907 |
| Sex | -0.056 (0.061) | -0.920 | -0.070 (0.107) | -0.654 |
| Socioeconomic Status | 0.102 (0.058) | 1.757 | 0.029 (0.107) | 0.271 |
| Optimism | -0.107 (0.059) | -1.802 | 0.133 (0.084) | 1.588 |
| Frequency of Caregiving | -0.028 (0.057) | -0.483 | 0.151 (0.100) | 1.538 |
| Frequency of Caregiving | 0.111 (0.128) | 0.867 | 0.088 (0.167) | 0.528 |
| Age | -0.196 (0.129) | -1.522 | 0.201 (0.196) | 1.025 |
| Sex | 0.139 (0.130) | 1.067 | 0.279 (0.175) | 1.590 |
| Socioeconomic Status | -0.221 (0.179) | -1.236 | -0.647 (0.264) | -2.451* |
| Optimism | 0.193 (0.157) | 1.234 | 0.311 (0.242) | 1.285 |
| Frequency of Caregiving | 0.100 (0.154) | 0.649 | -0.382 (0.168) | -2.270* |
| Optimism x Frequency of Caregiving | -0.134 (0.120) | -1.122 | -0.015 (0.125) | -0.119 |
| Age | -0.094 (0.101) | -0.931 | -0.119 (0.166) | -0.718 |
| Sex | 0.059 (0.134) | 0.439 | 0.099 (0.183) | 0.543 |
| Socioeconomic Status | -0.065 (0.169) | -0.383 | -0.400 (0.171) | -2.338* |
| Optimism | -0.783 (0.446) | -1.758 | 0.548 (0.557) | 0.983 |
| Subjective Stress | -1.617 (0.974) | -1.661 | 1.405 (1.136) | 1.237 |
| Optimism x Frequency of Caregiving | 0.343 (0.160) | 2.136* | -1.765 (1.197) | -1.475 |

* Significant at $\alpha = .05$

** Significant at $\alpha = .01$

Table A-12. Summary of results from all models including chronic illness as the outcome variable and frequency of stress as the latent stress factor. Predictor variables that are not indented represent Level-1 variables, and indented predictor variables represent Level-2 variables. Bolded are the results from the study's main hypotheses.

| Predictors | Chronic Illness | | | |
|---|-----------------------|---------------|-----------------------|---------------|
| | Cross-Sectional | | Lagged | |
| | Coefficient (SE) | T-Ratio | Coefficient (SE) | T-Ratio |
| Intercept | 1.320 (1.320) | 10.694** | 1.320 (1.320) | 10.694** |
| Age | 0.565 (0.123) | 4.599** | 0.571 (0.124) | 4.591** |
| Sex | 0.113 (0.117) | 0.969 | 0.048 (0.125) | 0.386 |
| Socioeconomic Status | -0.097 (0.104) | -0.930 | -0.191 (0.146) | -1.311 |
| Optimism | -0.110 (0.104) | -1.058 | -0.043 (0.116) | -0.366 |
| Subjective Stress | 0.230 (0.117) | 1.954 | 0.206 (0.126) | 1.641 |
| Optimism x Frequency of Caregiving | -0.181 (0.096) | -1.894 | -1.123 (0.598) | -1.877 |
| Optimism | -0.044 (0.025) | -1.761 | 0.010 (0.039) | -0.245 |
| Age | -0.004 (0.017) | -0.260 | 0.032 (0.038) | 0.839 |
| Sex | 0.013 (0.032) | 0.424 | -0.033 (0.059) | -0.564 |
| Socioeconomic Status | 0.012 (0.037) | 0.319 | -0.027 (0.039) | -0.686 |
| Optimism | 0.007 (0.021) | 0.349 | 0.028 (0.028) | 0.979 |
| Optimism (Controlling Frequency of Caregiving) | -0.039 (0.023) | -1.648 | -0.010 (0.040) | -0.251 |
| Age | -0.008 (0.017) | -0.466 | 0.031 (0.057) | 0.669 |
| Sex | 0.008 (0.031) | 0.264 | -0.030 (0.061) | -0.496 |
| Socioeconomic Status | 0.012 (0.037) | 0.324 | -0.005 (0.044) | -0.106 |
| Optimism | 0.005 (0.022) | 0.228 | 0.015 (0.031) | 0.506 |
| Frequency of Caregiving | -0.021 (0.021) | -1.010 | 0.040 (0.043) | 0.934 |
| Frequency of Caregiving | 0.050 (0.051) | 0.983 | 0.089 (0.093) | 0.957 |
| Age | -0.156 (0.089) | -1.747 | 0.180 (0.125) | 1.440 |
| Sex | 0.006 (0.069) | 0.089 | 0.044 (0.084) | 0.526 |
| Socioeconomic Status | 0.028 (0.080) | 0.352 | -0.150 (0.157) | -0.955 |
| Optimism | 0.066 (0.071) | 0.937 | -0.031 (0.123) | -0.253 |
| Frequency of Caregiving | 0.025 (0.072) | 0.343 | 0.111 (0.095) | 1.169 |
| Optimism x Frequency of Caregiving | -0.119 (0.073) | -1.635 | 0.147 (0.062) | 2.366* |
| Age | 0.064 (0.061) | 1.056 | -0.108 (0.078) | -1.379 |
| Sex | -0.103 (0.132) | -0.779 | 0.317 (0.088) | 3.609** |
| Socioeconomic Status | 0.008 (0.067) | 0.115 | -0.084 (0.110) | -0.763 |
| Optimism | 0.144 (0.200) | 0.723 | -0.297 (0.334) | -0.889 |
| Subjective Stress | 0.249 (0.394) | 0.632 | -0.488 (0.634) | -0.769 |
| Optimism x Frequency of Caregiving | -0.316 (0.425) | -0.745 | 0.562 (0.667) | 0.843 |

* Significant at $\alpha = .05$

** Significant at $\alpha = .01$