

MARRIAGE AND HEALTH OVER THE MIDDLE YEARS: LINKING ECONOMIC
HARDSHIP TO HEALTH OUTCOMES THROUGH MARITAL PROCESSES

by

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(Under the Direction of Kandauda K.A.S. Wickrama)

ABSTRACT

The current collection of studies investigated the association between marriage and health for middle-aged couples, focusing on how external stress shapes adaptive marital processes, and how this stress proliferation process impacts individuals' mental and physical health. Study 1, using longitudinal couple data, explored how family financial stress and individuals' trait hostility influenced adaptive marital processes, resulting in husbands' and wives' depressive symptoms. The findings affirmed the longitudinal stress proliferation in marriage, whereby family financial stress increased couples' perceptions of spousal hostility leading to increases in depressive symptoms. In addition, while individuals' trait hostility influenced wives' perceptions of spouse's hostile behaviors, this personality did not intensify the effect of financial stress on hostile marital interactions. Beyond depressive symptoms, Study 2 investigated various mechanisms such as behavioral, psychological, and physiological stress-related processes linking couples' consistent hostile marital interactions to physical health outcomes. The research outcomes illustrated that sustained hostile marital interactions negatively impacted later physical health through behavioral, psychological, and physiological mechanisms.

The findings also supported the stress-related dyadic processes in couples especially for psychological process, whereby husbands' and wives' perceived spousal hostility increased both their own and their partners' psychological distress. Furthermore, examining physical health within three different aspects, which were global health, physical illness, and physical impairment, the current study provided additional information regarding how each mechanism influenced physical health differently. Frequent health risk behaviors were strong predictors of a long-term risk of physical illness, and high levels of body mass index were closely related to higher physical impairment. In addition, psychological distress was detrimental in all three features of physical health, reinforcing a salient role of psychological distress in physical health. This comprehensive investigation including biopsychosocial stress-response mechanisms contributes to the growing literature on life stress, marital adaptation, and health consequences, by providing precise information on how marriages change, and how marital distress gets "under the skin" of married individuals.

INDEX WORDS: Marriage, Stress, Middle-aged couples, Hostile marital interactions.
Biopsychosocial processes, Physical health, Cumulative effects

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DEDICATION

To my parents,

Sujin Lee and Sung Duk Yang,

And my husband,

Woo Jang,

Without whom none of my success would be possible.

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CHAPTER 1

GENERAL INTRODUCTION

Introduction

Marriage health benefits have become a central theme in marital research with increasing public attention to healthy marriage and an individual's well-being. Empirical research has shown that married couples are less likely to be depressed and to develop health problems such as dementia, cancer, and heart disease (Kiecolt-Glaser & Newton, 2001). In contrast, unmarried or never married individuals have the highest mortality rates (Kaplan & Kronick, 2006). However, marital research has emphasized that not only marital status per se but also the quality of the marital relationship is associated with health outcomes (Umberson, Williams, Powers, Liu, & Needham, 2006; Wickrama, Lorenz, Conger, Matthews, & Elder, 1997; Williams & Umberson, 2004), suggesting that stress in a marriage can take a serious toll on physical health and raising questions about how marriage might promote or damage health.

Historically, research devoted to the study of marital relationships and health has largely entailed two separate strands. The first area of research, reflecting the psychological traditions (Karney & Bradbury, 1995), has focused on how individual, environmental, and interpersonal factors affect marital relationships and outcomes. An individual's personality, life history, daily stress, and life experiences jointly and multiplicatively alter and shape his/her marital processes, resulting in different marital outcomes (Karney & Bradbury, 1995). Marital research has provided a valuable understanding of changes in marital outcomes. Stressful situations (e.g., economic hardship) increase marital conflicts and reduce marital satisfaction (R. Conger, K.

Conger, & Martin, 2010; White & Rogers, 2000). In broader social contexts including marriage, an individual characteristic, specifically hostility, is related to frequent occurrences of interpersonal conflicts and recurring arguments in general (O'Neil & Emery, 2002; Smith, Uno, Uchino, & Ruiz, 2000). Also, trait hostility is associated with a higher risk of developing depressive symptoms (Moreno, Selby, Fuhriman, & Laver, 1994).

The other approach, reflecting biopsychosocial traditions (Engel, 1983; Kiecolt-Glaser & Newton, 2001; Suls & Rothman, 2004), has focused on how marital quality and marital interactions benefit or damage individuals' health and well-being. These approaches have emphasized the interplay between physiological, psychological, and behavioral (social) processes caused by marital discord and their impact on an individual's health. Influenced by these approaches, research has shown that stressful marital experiences are strongly associated with severe depressive symptoms (Whisman, 2001), frequent health risk behaviors (Wickrama et al., 1997), a higher risk of hypertension (Wickrama, Lorenz, Wallace, Peiris, Conger, & Elder, 2001), and substantial sleep problems (Troxel, Robles, Hall, & Buysse, 2007). Hostile marital interactions also evoke stress-related physiological reactivity such as changes in the immune system and metabolism, leading to physical health problems (Robles, Slatcher, Trombello, & McGinn, 2014). Research associated with the biopsychosocial approach has provided valid insights into how marital distress gets "under the skin" of married individuals.

Integrating these related psychological approach and biopsychosocial approach could offer a comprehensive understanding of marital health benefits; however, this integration has not yet been adequately developed. Most research has been fragmented and has examined various associations between marital experiences and health independently, resulting in an incomplete understanding of the mechanisms of marital interactions and marriage health benefits.

Furthermore, the results of marital research have shown how contextual factors lead to changes in marital processes and how the changes in marriage influence mental and physical health (Conger et al., 2010; Kiecolt-Glaser & Newton, 2001). However, there has been persistent inattention to the identification and incorporation of important contextual and individual factors (e.g., various kinds of circumstances surrounding marriage and an individual's strength/vulnerability) in examining marital adaptive processes (Bradbury & Karney, 2004). Thus, as marriage does not exist in a vacuum but is influenced by the dynamics of various contextual and individual factors, there is a need to elucidate the pathways that link the various factors to produce a more complete understanding of the effects of marriage on mental and physical health (Robles et al., 2014).

Building on previous literature, the current study aims to advance our understanding of the associations between marriage and health through two connected studies. The first study addresses how chronic family economic pressure (a contextual stressor) and a husband's and a wife's trait hostility (an individual personality trait) shape hostile marital interactions, which in turn contribute to their depressive symptoms. Extending findings from the first study, the second study addresses how these stressful marital interactions impact physical health outcomes through physiological, psychological, and behavioral mechanisms.

In addition, it is well understood that if stress-related physiological responses are sustained for a long period of time, this may detrimentally impact physical health. For this reason, using a longitudinal sample encompassing an eleven-year period of middle-age, these two connected studies focus on the cumulative effects of chronic financial difficulties on trajectories of stressful marital interactions and their impacts on later mental and physical health outcomes. Also, considering the importance of interdependency in a couple's relationship, the

studies also pay attention to the reciprocal influences between husbands and wives, which include couples' marital distress impacts on not only their own mental and physical health but also on that of their spouses through behavioral, psychological, and physiological mechanisms.

Overview of the Studies

The two proposed studies are longitudinally interconnected through the investigation of the associations among family economic pressure, hostile personality traits, hostile marital interactions, depressive symptoms, and physical health. Figure 1.1 illustrates the overall conceptual framework for the present research and associations among concepts. The framework of the current study can be understood by two connected features: (1) integrating the Vulnerability-Stress- Adaptation (VSA) model (Karney & Bradbury, 1995) and the stress process perspective (Pearlin, Lieberman, Menaghan, & Mullan, 1981), specifically the linkage among personality such as trait hostility (*enduring vulnerability*), the chronic family economic pressure (*stressful life circumstances*), hostile marital interactions (*adaptive process*), and depressive symptoms (mental health); and (2) integrating the biopsychosocial perspective (Engel, 1983), the stress/support-health model (Burman & Margolin, 1992), and the stress-appraisal perspective (Lazarus, 1999), specifically the linkages between perceived hostile marital interactions and physical health through behavioral, psychological, and physiological mechanisms. These studies also incorporate important elements of contemporary theories/models on marriage such as the interpersonal model (Smith & MacKenzie, 2006), the stress proliferation principle (Pearlin & Skaff, 1995), and the family systems theory (O'Brien, 2005).

In this integrated framework, the first study, integrating the VSA model (Karney & Bradbury, 1995) and the principle of *stress proliferation* of the Stress Process model (Pearlin &

Skaff, 1995), will examine the impacts of chronic family financial stress on a marriage. Using a sample of approximately 370 middle-aged husbands and wives followed over four years, the present study explores how family economic pressure (in terms of stability and change) influence the interlocking trajectories of their hostile marital interactions, which lead to increased depressive symptoms. This association has been previously identified in studies (Barton & Bryant, 2016; Conger, Ge, Elder, Lorenz, & Simons, 1994; Gudmunson, Beutler, Israelsen, McCoy, & Hill, 2007; Wickrama, Kwag, Lorenz, Conger, & Surjadi, 2010), however less in relation to considering the cumulative effects of the financial difficulties on trajectories of marital interactions. Furthermore, as previous research has suggested, the current study expects that hostile personality traits may intensify negative marital experiences under stressful circumstances (Lynch, Kaplan, & Shema, 1997), and the specific personality trait may closely relate to depressive symptoms. Thus, the study will also investigate a potential moderating role of hostile personality traits in the association between family economic pressure and hostile marital interactions and also its direct effects on depression.

The second study, integrating the biopsychosocial perspective, the stress/social support model (Burman & Margolin, 1992; Kiecolt-Glaser & Newton, 2001), and the stress-appraisal perspective (Lazarus, 1999), will investigate mediational processes between stressful marital experiences and later physical health outcomes over eleven years. It is well understood that when individuals enter into their middle age, they experience a range of biological and psychological changes, including declining health and various emotional and physical symptoms caused by the aging process. Beyond the increased physical vulnerability associated with the aging process, previous research emphasized that there is substantial heterogeneity in individuals' health in later life depending on individual characteristics and differential exposure

to various stressors over the life course (H. Turner & R. Turner, 2005; Thoits, 2006, Wickrama et al., 2001). Thus, using a sample of approximately 370 couples encompassing an eleven-year period of middle-age, the study investigates the cumulative effects of stressful marital experiences on later physical health. Since a range of physiological dysregulation can be provoked through different processes such as physiological, psychological, and behavioral changes, the second study examines the mediating pathways linking stressful hostile marriage and physical health, revealing details about how chronic stressful marital experiences impact later physical health conditions.

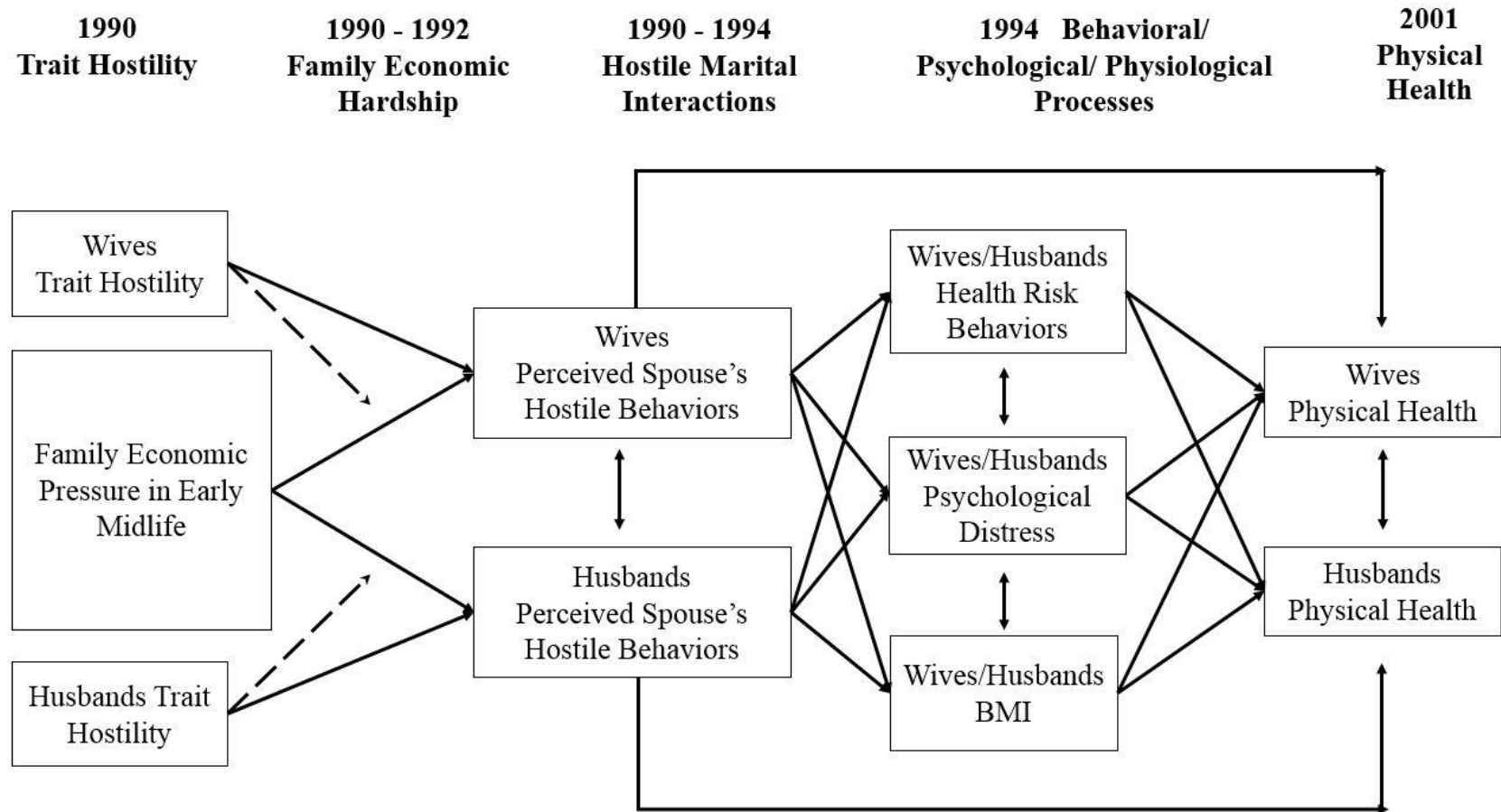


Figure 1.1 Conceptual model of whole study

CHAPTER 2
FAMILY ECONOMIC PRESSURE, TRAIT HOSTILITY, MARITAL PROCESSES, AND
DEPRESSIVE SYMPTOMS

Introduction

Every marriage faces life challenges, and various contextual stressors can powerfully affect marital relationships (Neff & Karney, 2004). Researchers have particularly paid attention to the effects of financial hardship on marital quality as this requires couples to engage in undesired resource management that can increase their emotional and marital stress (R. Conger & K. Conger, 2002). When facing these stressful life experiences, adaptations in marriage are necessary; however, couples can disagree on different aspects of marital life including reducing living expenses, finding a second job, and doing activities as a couple. Previous research found that this adaptation is highly associated with multiple forms of marital interactions including increased couple' conflicts (Gudmunson et al., 2007), distancing behaviors (Guilbert, Vace, & Pasley, 2000), hostile marital interactions (Skinner, Elder, & Conger, 1992), and reduced positive interactions (Guilbert et al., 2000). This strained marital relationship erodes a sense of personal control (Umberson et al., 2006), and long-lasting stressful marital experiences can put husbands and wives at a greater risk for developing depression (Kiecolt-Glaser & Newton, 2001).

Relevant research has suggested that these marital adaptation processes (e.g., marital interactions) can be influenced by individual factors. Stressful circumstances likely increase problematic personality trait (e.g., hostility), and aggressive tendencies may be escalated under

stressful circumstances (Cano & Vivian, 2001). This escalated personality trait may lead to more frequent aggressive arguments occurring in couples (Bodenmann & Cina, 2006), suggesting that interactions between personality and stressful life experiences can influence marriage. Previous research also stated that stressful financial circumstances influence marriage through individual (e.g., exacerbated antisocial behaviors) and interpersonal (e.g., increased negative interactions, hostility, and marital conflicts) processes (Conger et al., 1992; Conger et al., 2010).

In addition, increases in stress have been associated with changes in spouses' appraisals of marriage and interpretation of spouses' behaviors as well as declines in their marital satisfaction (Neff & Karney, 2004). Individual's cognitive attributions can moderate couples' responses and reactions to financial stress (e.g., appraisal of financial problems and marital interactions; Bradbury & Fincham, 1990). Given this literature, it appears some personality can moderate the effect of external stress (e.g., economic pressure) on marital stress and eventually mental health.

However, other research has shown inconsistent results, indicating that personality had no specific role in marital adaptation to life stressors. Neff and Karney (2004) found that the specific personality trait of neuroticism was not related to the association between external stress and marital relationship quality. With these mixed findings, marital scholars have emphasized the need to explore further the role of chronic circumstances (contextual factors) and spouses' individual characteristics (vulnerabilities or strengths) as antecedents of hostile/supportive marital interactions (Bradbury & Karney, 2004). Nevertheless, few studies have comprehensively considered the role of the interplay between contextual and individual factors in shaping adaptive processes in marriage and the subsequent consequences for individuals' mental health. Thus, this present study aims to explore the dynamic processes in which chronic

economic pressure changes marital interactions, and an individual's trait hostility intensifies the association between contextual factors and the marital adaptive processes. Consequently, all the stress (economic and marital) is hypothesized to influence husbands' and wives' depressive symptoms.

In addition to the interplay between individual and contextual factors influencing marriage and depression, other factors that influence marital adaptive processes include changes in marriage over time, the duration of the marriage, or aging process. As a subsystem in a family, a married couple represents a complex, integrated, and evolving system continually changing over time (White, 2008). Understanding individuals' lives as lifelong developmental processes, which explains development or change as consistently occurring in individuals over time (Elder & Shanahan, 2006), this study pays attention to the effects of time, considering cumulative effects of stressful life events on marital interactions and enduring changes in marriage over time. Some researchers found that stress outside of marriage had cumulative effects on marital quality and mental health over time, and that these negative effects on marriage were not different for all ages (Umberson, Williams, Powers, Liu, & Needham, 2005).

However, a majority of studies have used cross-sectional data that included individuals from multiple birth cohorts. This commonly restrained variability of different age groups, limits the ability to further explore age or life-course effects (Robles et al., 2014) and long-term effects. There is one study that investigated the effects of financial stress on trajectories of marital interactions and marital outcomes. Barton and Bryant (2016) examined the longitudinal associations among financial stress, trajectories of marital processes, and marital stability for newly married couples over three years. The researchers found that a higher level of financial stress was associated with declines in positive marital interactions, and that this resulted in

increases in marital instability. This study examined the negative impacts of long-term financial strain on changes in marriage, however, it did not fully consider the rate of change of financial stress over time (i.e., parallel association).

In another previous study, researchers examined the associations between the dynamics of family economic hardship and the progression of health problems for middle-aged couples (Wickrama et al., 2010). This study focused on couples' later mental and physical health, however, not marital adaptive process as mediating pathway. As a result, little is known about how chronic contextual stressors and individual factors can shape trajectories of marital interactions over time as enduring changes and it ultimately influence individuals' mental health.

Taken together, the present study will investigate the complicated processes of marital changes influenced by consistent family economic pressure, focusing specifically on marital couples who have remained married over an eleven-year period. Specific attention is given to elucidating three aspects: first, how the trajectories of family financial hardships (a contextual factor) shape trajectories of hostile marital interactions over four years; and second, how traits hostility (an individual factor) may influence this process; third, how husbands' and wives' hostile marital interactions influence depressive symptoms.

Theoretical Background

The Vulnerability-Stress-Adaptation (VSA) Model

The VSA model (Karney & Bradbury, 1995) provides a concise framework for a mechanism of marital change. The VSA model emphasizes the interplay between personal characteristics and stressful life circumstances affecting marital outcomes. Specifically, the ways couples adapt or respond to stressful life events (*adaptive process*) are facilitated or constrained by spouses' capabilities and resources (e.g., family background, personality traits,

and cognitive style), which is referred to as enduring *vulnerability*. The vulnerability that each spouse brings to the marriage influences and shapes the adaptive processes (e.g., resolving problems, marital interactions, or perception of a spouse's problem-solving behaviors).

Ultimately, it affects marital quality and stability. Poor adaptation may result in perpetuating or worsening stressful experiences, and adequate adaptation may help to mitigate negative experiences (Karney & Bradbury, 1995). In addition, an individual's personality and family experiences can influence multiple aspects of marriage. Individuals with problematic personality traits, such as neuroticism, a tendency to anger, and aggressiveness, report steeper declines in marital satisfaction over time (Lavner & Bradbury, 2010). Marriages in which at least one partner has parents who divorced or had a distressed marital relationship likely experience more difficulty in resolving marital problems, leading to declines in marital satisfaction (Story, Karney, Lawrence, & Bradbury, 2004). Thus, this study draws from the VSA model (Karney & Bradbury, 1995) to investigate marital adaptive processes: how family economic pressure affects marital interactions, and how traits of hostility influence the association between family economic hardship and marital interactions.

Stress Proliferation

Couples generally encounter life stressors at times. These stressors can be environmental, physical, or psychosocial and commonly require some degree of changes or adaptive responses. Pearlin (1999) divided stressors into two different types: event stressors and chronic stressors. Event stressors refer to either expected or sudden events that result in stress outcomes, which include life event stresses and generally single stress-inducing events with limited-duration effects. Chronic stressors describe long-term problems or kinds of stress-inducing conditions (e.g., financial strains, status strains, and role strains). For example, a

financial crisis seems to be a single stressful event; in reality, a financial crisis can initiate a series of related stressors, which become chronic stressors affecting an individual's life (Pearlin, 1999; Pearlin, Schieman, Fazio, & Meersman, 2005). This expansion of an initial stressor into additional stressors is referred to *stress proliferation*, which is the principle of the Stress Process Model (Pearlin, 1999; Pearlin et al., 2005). Specifically, a stressor crosses the boundaries of multiple life domains (e.g., financial crisis/economic pressure to marriage or marriage to mental health) or carries its effects from one life stage to another. Also, the stress proliferation process and its consequences are not always immediately evident but commonly unfold over time especially for all aspects of health. Thus, consistent with the principle of stress proliferation of the Stress Process Model, this study will explore how the influence of chronic financial hardship is carried from one life domain to another such as marriage, and how this influence continues beyond the initial moment of a stressful life event such as a financial crisis.

In light of prevailing research findings and the models, the integrated theoretical framework of the study is presented in Figure 2. 1. Figure 2.1 offers a summary of pathways through a) how trajectories of family economic pressure shape trajectories of marital interactions over time; b) how an individual's hostility traits intensify the associations between family economic pressure and hostile marital interactions; and c) how long-term hostile marital interactions influence couples' depressive symptoms.

Literature Review

Family Economic Pressure and Hostile Marital Interactions

Adult life is full of stressors in different life domains such as family, work, and finance. Financial difficulty as a source of stress in family deserves further attention. Consistent with the notion of stress proliferation, as financial hardship brings secondary stressors at home, family

economic distress can be a strong direct predictor of marital discord. As outlined in the VSA model, when negative financial events happen in a family (e.g., low income, job loss), couples are forced to make unexpected adjustments such as borrowing money to help pay bills, selling property to raise money, or moving to more affordable residences. Under the economic pressure, tension may increase between spouses, making a range of changes and adjustments between them difficult, which leads to marital discord. Previous research indicated that financial concerns were the most common topic of marital disagreement (Papp, Cummings, & Goeke-Morey, 2009). Furthermore, the financial disagreement may develop into marital conflicts if couples are under financially stressful circumstances. Having conflicts over limited financial resources can increase emotional distress and hostile behaviors between spouses (Conger et al., 1994). Family stress researchers found that financial strain increases negative forms of marital interactions (e.g., hostile behaviors, disagreements, and fights) and decreases positive forms of the interactions (e.g., quality time, social support; see Gudmunson et al., 2007). In addition, hostile behaviors were more frequently observed when financially stressed couples discussed their financial issues (Conger et al., 1994).

In addition, continuity of economic hardship has more strongly deleterious effects on individuals' well-being than episodic financial problems (Kahn & Pearlin, 2006). Some couples may manage their financial needs successfully with alternative sources of income or family support and thus avoid the chronic economic pressure (Lorenz, Elder, Bao, Wickrama, & Conger, 2000). However, other couples with consistently low income and no support, or facing significant economic downfall (e.g., the farm crisis in the 1980s or the recession of 2008) are likely to feel trapped and unable to escape from the chronic state of their economic difficulties. Previous research has shown that individuals who had experienced continuous financial

difficulties reported more psychological and physiological problems at the moment and also later years compared to those who periodically experienced multiple financial problems (Kahn & Pearlin, 2006). Recent research also highlighted a cumulative negative impact of sustained economic hardship on individuals' psychosocial functioning. Specifically, individuals who have experienced economic pressure and financial insecurity over a longer period face a greater risk of being depressed and having a cynically hostile outlook (Lynch et al., 1997). Furthermore, there was the strong association between marital distress and a greater risk of depression (Fincham & Beach, 1999). Therefore, the current study pays specific attention to the cumulative effect of long-term exposure to family financial hardships (economic pressure) on hostile marital interactions (perceived spousal hostile behaviors) and depressive symptoms.

The present study seeks to investigate: a) trajectories of family economic pressure over time; b) the associations between the trajectories of family economic pressure and the trajectories of hostile marital interactions over time; c) the effects of hostile marital interactions on depressive symptoms.

Trait Hostility, Hostile Marital Interactions, and Depressive Symptoms

As a personality trait, *hostility* can be defined as a negative and cynical attitude toward others with a propensity for anger, denigration, and aggression (Smith, 1994). Literature has shown that trait hostility is consistently associated with increased exposure to interpersonal conflicts, relational stress, and low level of social support in both general (O'Neil, & Emery, 2002) and the context of a close relationship such as marriage (Smith et al., 2000). This reflects the transactional cycle (Kiesler, 1996), which stipulates that personality can give rise to recurring interpersonal reactions. Specifically, an individual's personality brings a specific social style (i.e., hostility encourages hostility; hostile persons evoke coldness or conflicts) in social

circumstance. The interpersonal perspective suggests that an individual's early childhood experiences can shape interpersonal behaviors, representations of self and others, and perspectives of social relationships (Gallo & Smith, 1999). Adverse childhood experiences typically led to negative internal representation of self and others, which might influence the development of attachment-related anxiety and avoidance in a romantic relationship during adulthood (Gallo & Smith, 1999). This correlation can influence personality development and social behaviors (e.g., cold, mistrusting and antagonistic behavioral style). Negative perceptions of self and others are likely to increase conflicts or provoke for negative responses, in turn decreasing social interactions and hence social support (Smith, 1994; Smith, Glazer, Ruiz, & Gallo, 2004). Through a recurring series of similar situations (transactional cycle), these negative interpersonal behaviors would foster unhealthy social interactions and contexts (e.g., isolation or conflicts) over time. Through reciprocal interactions between individuals and their social networks, this social context would promote additional unhealthy transactional cycles, thus unhealthy interpersonal trajectories are continued (Kiesler, 1996; Smith & Spiro, 2002). Some studies have shown that trait hostility can be related to not only heighten physical reactivity to stressors, but also frequent and prolonged exposure to relational stressors (Smith et al., 2004). Furthermore, previous research found that both individuals' self-reported trait hostility and their perceived spousal hostility were positively related to their own depressive symptoms (Brummett et al., 2000).

Therefore, this present study investigates how an individual's trait hostility influences adaptive marital process, depressive symptoms as well as moderates the association between family economic pressure and couples' perceived hostile marital interactions and depressive symptoms.

The Present Study

Figure 2.1 illustrates the conceptual framework for the present research showing associations among key concepts. As outlined in the VSA model, chronic financial stress influences changes in marital interactions as a couple's adaptive processes. Trait hostility can also affect the couple's adaptive processes directly and by moderating the association. In addition, the effects of hostile marital interactions can carry over from one stage of life to another producing hostile behavior trajectories (Pearlin et al., 2005), which in turn to increase depressive symptoms. In summary, this study hypothesizes: 1) initial levels and rates of change in family economic pressure will be associated with perceived spouse's hostile behavioral trajectories of husbands and wives; 2) an individual's personality hostility with moderate this effect, such that the association between chronic family economic pressure and perceived marital hostility will be intensified by an individual's trait hostility.

Method

Sample

The sample for the study comes from the Iowa Midlife Transition Project, specifically couples who originally participated in the Iowa Youth and Family Project (IYFP) between 1989 and 1994 and continued to participate in the project in 2001. The main purpose of the IYFP is to explore the impact of economic hardships on the changes in family life including developmental outcomes of a child, changes in parent-child relationships, and the psychological well-being of each family member (Conger & Elder, 1994). The participants were identified and recruited through public schools. The document of the project description was sent to families by mail, the families were asked to participate in the study by phone, and then the consent of the families was obtained. At the time of the initial wave in 1989, 34% of the families lived on a farm, 54%

of the families lived in rural communities (approximately 5,000 people), and 12% of the families resided in rural areas but not on a farm. Trained field interviewers visited families at their homes at two different times in a year; during the visits, each family member was independently asked about family economic circumstances, the relationship with children (parents), individual well-being, and marital relationships. Subsequent visits were conducted annually.

In 1989, when the families began to participate in the study, the median ages for the husbands, the wives, and adolescent children were 39, 37, and 12 years, respectively. The median year of education for both husbands and wives was 13 years, and couples had been married for at least 14 years in 1989. A family was selected for the study if the family included a target child in the seventh grade. Additionally, if the target child had a sibling, that sibling had to have been within four years of age of the target child, and the entire family had to live all together. From the larger sample of 450 couples, the present study selects only 368 couples who had remained married (since 1989) and continued to participate in the Iowa Midlife Transition Project in 2001. Some participants were excluded because they had possibly relocated to different places, had terminated their marital relationships, or had indicated that they were no longer able to participate in the study. Although the data of the study mainly reflects the experiences of families who live in rural areas during specific economic hard-times, the families share similar experiences of significant financial hardship caused by various life challenges. Thus, this study will provide valuable insights into the understanding of how families are affected when undergoing stressful times, and how they adapt to the situations.

Measures

Trait hostility. In 1990, trait hostility was assessed using items from the NEO scale (Costa & McCrae, 1985) asking participants to report their degree of agreement on a 5-point

scale, ranging from 1 (*strongly agree*) to 5 (*strongly disagree*), to statements about themselves such as “I am an even-tempered person,” “I often get angry at the way people treat me,” “I am not considered a touch or temperamental person.” Responses were appropriately coded and averaged, with higher scores representing a higher level of hostile personality. (Cronbach’s $\alpha = .73$ for both husbands and wives).

Family economic pressure. The questionnaire asked about family economic pressure (Conger, 1988). In 1990, 1991, and 1992, husbands and wives were asked to respond “yes” or “no” to each of the 22 items on economic problems based on the questions, “During the past 12 months, has your family made any of the following adjustments because of financial need?” The measure was constructed by summing up the husbands’ and wives’ “yes” responses to each of the items (1 = *yes*, 0 = *no*). The list of the economic problems included items such as “used savings to meet daily living expenses,” “changed food shopping or eating habits to save money,” “received government assistance,” “borrowed money to help pay bills,” “forfeited a contract for land or other property,” and “sold property to raise money.” This reflects family economic pressure in early middle years; higher scores indicate higher levels of severe economic pressure in a family (Cronbach’s $\alpha = .85$ to $.86$ for husbands and wives across years).

Perceived hostile marital behaviors. Fifteen items from the behavioral/affect questionnaire (Conger, 1988) were used to ask each spouse about his/her partner’s hostile behaviors during the past month. In 1990, 1992, and 1994, respondents were asked to indicate on a 7-point scale, ranging from 1 (*always*) to 7 (*never*), to each of 15 hostile behaviors based on the question, “during the past month when you and your spouse have spent time talking or doing things together, how often did your spouse do toward you?” The list of 15 hostile behaviors included items such as “get angry at you,” “shout or yell at you,” and “make you feel guilty.”

The measure was constructed by summing up the husbands' and wives' responses to each of the items with higher scores representing a higher level of hostility (Cronbach's $\alpha = .89$ to $.91$ for husbands and wives across years).

Depressive symptoms. Thirteen items from the Symptoms Check-List-90-Revised (SCL-90-R) depression scale (Derogatis, 1983) were used to ask each spouse about their levels of distress during the previous week. In 1994, respondents were asked to report their distress levels based on a 5-point scale ranging from 1(*not at all*) to 5(*extremely*), including "feeling down," "crying easily," and "feeling no interest in things". Husbands' and wives' responses were averaged with higher scores representing a higher level of depressive symptoms (Cronbach's $\alpha = .88$ both for husbands and wives).

Analysis

Latent growth curve models (LGCM) were used to estimate trajectories of family economic pressure from 1990 to 1992 and trajectories of husbands' and wives' changes in perceived spousal hostile marital behaviors from 1990 to 1994. This analytical approach is unique and advantageous for a couple of reasons. The LGCM captures the inter-individual variation of the individuals by estimating random effects (i.e., continuous latent variables), which usually produces average initial status, the average rate of change, the variability of the initial status, and variability of the rate of change for all individuals in the sample (Wickrama, Lee, O'Neal, & Lorenz, 2016). That is, the LGCM produces both a distinct pattern of changes in individuals over time, at the same time, variability of changes in inter-individuals. In addition, using the LGCM, investigating associated growth curve parameters among several variables and predictors can provide valuable information about individuals' changes and the associations between these individuals' changes in variables (Duncan, Duncan, & Strycker, 2006).

Analyses were conducted in three phases. First, three univariate growth curve parameters were computed for family economic pressure from 1990 to 1992, husbands' and wives' perceived spouse's hostile behaviors over time (1990, 1992, and 1994) to estimate initial status and rate of changes for three attributions separately. This procedure provided information on the initial status and rate of change in husbands' and wives' perceived spouse's hostile behaviors over time; and at the same time, variability of all husbands and wives' perceived spousal hostility. Second, the hypothesized models were tested within a Structural Equation Modeling (SEM) framework (*Mplus* 6.0). The associated and dyadic latent growth curves for three attributes were analyzed simultaneously including husbands' and wives' trait hostility and their depressive symptoms in a single analytical framework. Third, this study further investigated the association a potential moderating effect of hostility on the association between trajectories of family economic pressure and trajectories of husbands' and wives' perceived spousal hostility. Accordingly, direct effects of husbands' and wives' trait hostility on their own depressive symptoms were examined. All analyses were performed using *Mplus* version 6.0 under FIML estimation (i.e., Maximum Likelihood Estimation with robust standard errors). When the Root Mean Square Error of Approximation (RMSEA) value is close to or less than .06; and the Comparative Fit Index (CFI) value is close to or greater than .95 (favorable .90), this indicates that the model fits the data well (Hu & Bentler, 1999).

Results

Descriptive Statistics

Table 2.1 displays the descriptive statistics and the correlations for measures of trait hostility, family economic pressure, perceived marital hostile interactions, and depressive symptoms. The mean values of family economic pressure are 12.396, 12.744, and 12.095 from

1990, 1991, to 1992 respectively. In addition, on average, both husbands and wives reported low average levels of spousal hostility. Mean score comparisons between husbands and wives within each wave revealed statistical differences between them in all years except in 1994. Wives reported slightly lower levels of perceptions of spousal hostile behaviors compared to husbands' one ($p < .05$). Husbands' perceived spousal hostile behaviors were significantly correlated to wives' perceived spousal hostile behaviors, and correlation values for all observed variables ranged from .110 to .820.

Univariate Growth Curves

The estimate of growth curve parameters for family economic pressure and husbands' and wives' hostile marital behaviors are presented in Table 2.2. The growth curves for family economic pressure from 1990 to 1992 had a significant variance for both initial level and rate of change (value = 81.221, $p < .001$ for initial level; value = 9.220, $p < .01$ for rate of change). These outcomes indicated that there was significant variability around family economic pressure at the initial level and the rate of changes over time. The growth curves for perceptions of spouse's hostile behaviors for both husbands and wives had significant variances for intercept parameters (value = .413, $p < .001$ for husbands; value = .505, $p < .001$ for wives). This indicated that there was a significant variability around the husbands' and wives' mean of perception of spouse's hostile at the initial time. Only wives' perceptions of spouse's hostility has an increasing trend over time from 1990 to 1994 (value = .032, $p < .001$) and also there were substantial individuals' differences in changes for wives as well (value = .010, $p < .01$). There was a slight decreasing trend in husbands' perceptions of spousal hostility over time, however, the outcomes are marginally significant (value = -.020, $p < .10$). As there is a substantial

variability in those changes (value = .018, $p < .001$), various patterns of the changes in husbands' perceptions were existed.

Interlocking Trajectories of Family Economic Pressure and Marital Hostile Interactions

The study examined the associated growth curve for family economic pressure (from 1990 to 1992) and hostile marital interactions for husbands and wives (from 1990 to 1994) simultaneously including husbands' and wives' personality and depressive symptoms. As shown in Figure 2.2, consistent with the hypothesis, the unstandardized path coefficients between the initial levels of family economic pressure and initial levels of wives' and husbands' perceptions of spouse's hostile behaviors were closely associated ($\beta = .020$, $p < .01$ for wives; $\beta = .016$, $p < .01$ for husbands). This implies that higher level of family economic pressure in 1990 may predict high levels of wives' and husbands' perceptions of spousal hostility at the initial time. Consequently, only for wives, their initial levels of perceptions of spousal hostility were associated with their own depressive symptoms ($\beta = .230$, $p < .01$). In addition, the unstandardized path coefficients between the rate of changes of family economic pressure and the rate of changes of wives' and husbands' hostile marital behaviors were marginally associated ($\beta = .009$, $p < .05$ for wives; $\beta = .007$, $p = .069$ for husbands). Then, for both wives and husbands, the changes in their perceptions of spouse's hostile behaviors during these times were predictive of increases in their own depressive symptoms in 1994 ($\beta = 2.000$, $p < .01$ for wives; $\beta = .135$, $p < .01$ for husbands). This implies that increases of family economic pressure may predict increases in wives' and husbands' perceptions of their spouse's hostile marital behaviors over time, which in turn put husbands and wives at a higher risk of their own depressive symptoms. These findings showed an "interlocking trajectory" between family economic pressure and wives' and husbands' perceptions of spousal hostility. This pattern provides a

strong evidence that external stressors such as financial difficulties proliferate into marriage, shaping certain marital interactions, and the increases in marital distress eventually impact on depressive symptoms. However, no significant cross-effects of husbands' and wives' perceived spouse's hostile behaviors on depressive symptoms were found. In addition, the initial levels of, but not the rate of changes in, family economic pressure were directly associated with wives' and husbands' depressive symptoms ($\beta = 0.008, p < .05$ for wives; $\beta = .009, p < .01$ for husbands; not shown in the figures).

In addition, the results showed that the initial level of family economic pressure was negatively (but marginally) related to the changes in wives' perceptions of spouse's hostile behaviors ($\beta = -.002, p < .10$). In the univariate growth curve for wives, the rate of change of wives' hostile behaviors presented an increasing pattern. This specific path coefficient may indicate that different patterns exist rather than a simple linear pattern. In detail, especially for wives, some wives who experienced higher levels of economic pressure at the initial time, their perceptions of spouse's hostile behaviors could slightly increase or maintain over time. In contrast, for some wives who experienced low initial levels of and gradual increases in economic pressure, their perceptions of spouse's hostile behaviors rapidly increase over time. The outcomes suggest that once individuals experienced high levels of financial stress, they may not further experience significant increases in their perceptions of spousal hostility.

Effect of trait hostility. Considering the effects of husbands' and wives' trait hostility, only wives' trait hostility influenced the initial levels of their own perceptions of spouse's hostile behaviors ($\beta = .244, p < .01$), but did not influence the changes over time. However, no moderating effects of individuals' trait hostility were found for both husbands and wives. Both

wives' and husbands' trait hostility predicted their own depressive symptoms later while facing financial difficulties ($\beta = .246, p < .01$ for wives; $\beta = .139, p < .05$ for husbands).

Discussion

Growth curve models were used to examine hypothesized models whereby chronic family economic pressure and husbands' and wives' hostility may have shaped their marital interactions that eventually influenced their mental health. Consistent with the VSA model and the stress proliferation process, the findings demonstrated: first, family economic pressure (a contextual factor) and trait hostility (an individual factor) significantly affected changes in marriage, which in turn, influenced depressive symptoms; second, distinct effects of chronic exposure to family economic pressure on marital interactions existed, which influenced subsequent changes in couples' depressive symptoms. In addition, consistent with research (Yuan, 2008), increases in family financial distress were directly detrimental to the mental health of both husbands and wives.

Our results are consistent with earlier research (Neff & Karney, 2004) which has shown that external stressors negatively influence individuals' interpretations of their spouses' behaviors and marital perceptions. Using a longitudinal analysis, this study found that family financial stress increased the level of a spouse's perceived hostile behaviors on the part of both husbands and wives, not only initially but also over time under consistent economic pressure. The trajectories of family economic pressure and couples' perceptions of their spouse's hostility (both husbands and wives) were synchronically changed. These aligned changes indicated that when couples faced financial hardships consistently, their appraisals of spousal hostility for both husbands and wives, increased along with increasing financial stress during the period.

The evidence for the parallel associations that are found in this study expands on existing studies by documenting these parallel changes in financial and marital stress over time. Previous research has only focused on the associations between acute contextual stress (Neff & Karney, 2004) and individuals' perceptions of their partner's behaviors; and the investigation of average levels of financial strain (over 3 years) and changes in marital processes (Barton & Bryant, 2016). These parallel changes provide compelling evidence for systemic and dynamic associations between external stressors and marital processes over time and reinforce the role of chronic contextual stressors in altering and shaping marital interactions.

In addition, the findings partially supported previous research that examined the reciprocal influence processes in couples' responses to external stressors (Repetti, Wang, & Saxbe, 2009). The current study found that the levels of husbands' and wives' perceptions of their spouse's hostile behaviors initially were closely correlated. The trajectories of the husbands' and wives' perceptions were also parallel and progressive in a mutual way. These correlated changes of the trajectories indicate that as husbands have experienced increases in their perceived spouse' hostility, wives also may have experienced increases in their perceptions of their spouse's hostility as well.

Furthermore, for both husbands and wives, the perceptions of a spouse's hostility influenced their own depressive symptoms later but not their partners'. The results indicated that adverse contextual stress continued to proliferate through changes in spousal hostile appraisals, which led to individuals' negative mental health outcomes. While highlighting the stress-proliferation process, the current results did not reveal much evidence of reciprocity in developing depressive symptoms between husbands and wives. However, as previous research supported the reciprocal and spillover processes of exposed individuals' mood and perceptions

within couples (Bradbury & Fincham, 1992), it would be valuable to further explore couples' reciprocal processes in their perceptions of spouses' mood and behaviors, which can be consequential for husbands' and wives' mental health.

Regarding the effects of an individual's personality, only for wives, an individual's trait hostility had a direct effect on their perceptions of a spouse's hostile behaviors at the initial level. An individual's personal trait hostility seemed to have influences especially on wives' perceptions of their spouses' hostile behaviors. In contrast to our hypothesis, in this sample of adults, an individual's trait hostility did not seem to intensify hostile marital interactions under family economic stress circumstances. However, an individual's trait hostility directly influenced their depressive symptoms later. These outcomes are consistent with prior research which has shown that an individual's trait hostility is a powerful predictor of depression (Moreno et al., 1994). The trait hostility may not have a strong impact on intensifying husbands' and wives' appraisals of spousal hostility; however, its impact may gradually emerge over time. Thus, future research should explore the role of trait hostility in dynamics of financial stress, marital processes, and depressive symptoms within a larger sample in a more prolonged period.

Limitations should be considered when interpreting and discussing the findings of this study. First, the current study only considered the changes in individuals' perceptions of spouses' hostile behaviors as an indicator /a measure of how couples responded to financially stressful circumstances in their marriage. While the changes found in this study convey marital process as an interpersonal characteristic and project marital quality as a *dynamic concept* to some degree, this approach may not fully delineate the dyadic processes in married couples. Also, marital researchers have suggested that marital process or the quality of marriage can be viewed as a multidimensional construct, which needs to assess marital quality with various types

of interactions between spouses, such as observed behavioral exchange, communication skills, and conflict resolution styles (Custer, 2009). Thus, future research should consider this perspective in the assessing and examining marital processes and adjustments, which will provide rich explanations for changes in marriage.

Second, the present study only focused on marital hostility and its influence on depressive symptoms. However, with an increasing attention to healthy marriage, marital researchers have stated that understanding health is not merely the absence of illness, thus marital research should pay more attention to positive marital processes (Fincham, Stanley, & Beach, 2007; Fincham & Beach, 2010). In a similar vein, marital processes need to be much more attentive to positive context and transformative processes, such as forgiveness, commitment, and sacrifice points, which have become prevailing themes in emerging marital research (Fincham et al., 2007). Taking this approach into account, future research needs to further explore how the transformative process overrides negative marital relationships; and which specific positive contexts would be conducive for healthy marriage; and which specific populations need to be targeted for appropriate interventions.

Third, while highlighting the negative influences of chronic financial hardship on marriage, the current study was not able to investigate the impact of different levels of exposure to economic pressure on marital relationships due to limited sample size and complexity of the model. Previous research stated that low social economic status (SES) was strongly related to low marital quality and less frequent supportive interactions in a couple (Cutrona et al., 2003). In addition, various levels of family financial hardship have varied deleterious effects on depressive symptoms and physical health in adults' later lives (Wickrama et al., 2010). Thus, in future studies on continuity and changes in family economic hardship, it would be valuable to

examine dynamic associations between different groups (e.g., a financially disadvantage group, an increased financial hardship group, and an affluent group) and changes in marriage.

Based on the findings of this study, useful implications are presented for improving marital life. With an understanding of the significant influence of stressful life circumstances (such as financial difficulties) on marital relationships, much attention should be given to the importance of the integrated approach to marriage. In particular, greater attention can be devoted to contextual stressors such as chronic health problems and raising children with disabilities, which provide extreme challenges for couples and for their marital relationships. Interventions may need to focus on not only improving couples' personal skills and resources but also on collaborating with potential families and communities' resources to increase couples' resilience, which in turn may eventually improve their marital lives.

Identifying specific risk groups and factors would provide useful implications for improving marital life. With an understanding of the significant influence of financial difficulties on marriage and a strong relationship between low SES and low marital quality, previous research (Fincham & Beach, 2010) has pointed out that interventions developed for middle (or high) income households may fail to acknowledge the salient role of contextual stress in low income couples' marital lives. Therefore, practitioners may need to incorporate this concern into developing appropriate prevention and intervention programs for specific groups.

In addition, in light of the important role of individuals' perceptions of their spouse's hostile behaviors in term of the long-term risk of depressive symptoms and physical health, interventions may need to develop that focus on altering husbands' and wives' cognitive process, so they can re-interpret their spouse's hostile behaviors differently. The inventions can include externalization or separation the problems from the relationships, whereby shifting *global*

attribution (he is always hostile toward me) to *external attribution* (he is hostile because of financial stress; Bradbury & Fincham, 1992). Such external attribution can help spouses to respond with less hostility toward their wives/husbands again. Accordingly, these strategies can help couples to break and alter ongoing cycles of hostile interactions and to move toward positive marital interactions. A great need exists for further research on various factors that influence changes in marriage for a better understanding of marital processes, and this research will provide some guidance to further develop effective intervention and prevention programs related to marital relationships for middle-aged husbands and wives.

Table 2.1. *Correlation Matrix and Descriptive Statistics for Study 2 Variables (N= 370 married couples).*

	1	2	3	4	5	6	7	8	9	10
1. Trait Hostility 1990	1	.063	.055	.069	.165**	.222**	.124*	.251**	.279**	.269**
2. Family Eco. Pressure 1990	.173**	1	.777**	.712**	.235**	.190**	.163**	.086	.142**	.278**
3. Family Eco. Pressure 1991	.181**	.777**	1	.760**	.237**	.238**	.169**	.128*	.122*	.272**
4. Family Eco. Pressure 1992	.138**	.712**	.760**	1	.142**	.148**	.110*	.125*	.131*	.202**
5. Perceived Spouse's Hostile Behaviors 1990	.160**	.235**	.237**	.142**	1	.809**	.772**	.634**	.246**	.323**
6. Perceived Spouse's Hostile Behaviors 1991	.135*	.190**	.238**	.148**	.809**	1	.820**	.631**	.282**	.288**
7. Perceived Spouse's Hostile Behaviors 1992	.151**	.163**	.169**	.110*	.772**	.820**	1	.596**	.272**	.237**
8. Perceived Spouse's Hostile Behaviors 1994	.124*	.086	.128*	.125*	.634**	.631**	.596**	1	.292**	.227**
9. Dep. Symptoms 2001	.218**	.193**	.196**	.210**	.094	.091	.062	.095	1	.572**
10. Dep. Symptoms 1990	.272**	.247**	.280**	.164**	.168**	.115*	.125*	.085	.601**	1
Family Eco. Pressure (1990-94) (n = 345) / M (SD)	-	12.396 (9.546)	12.744 (10.078)	12.095 (9.241)	-	-	-	-	-	-
Wives (n = 327) M (SD)	2.399 ^a (.467)	-	-	-	1.902 ^a (.721)	1.927 ^a (.830)	1.933 ^a (.817)	2.013 (.709)	1.568 ^a (.561)	1.486 ^a (.467)
Husbands (n = 316) M (SD)	2.470 ^a (.458)	-	-	-	2.012 ^a (.709)	2.011 ^a (.731)	1.953 ^a (.683)	2.098 (.699)	1.365 ^a (.431)	1.326 ^a (.379)

Note. Wife correlations are above the diagonal, while husband correlations are below the diagonal. Means (*M*) and standard deviations (*SD*) are presented in the horizontal rows at bottom of the table. Letter superscript on mean value denotes significant gender difference. Family Eco. Pressure = Family Economic Pressure. Dep. Symptoms = Depressive Symptoms.

* $p < .05$. ** $p < .01$

Table 2.2. Estimate for Univariate Growth Curves of Family Economic Hardship and Perceived Spouse's Hostile Marital Behaviors for Husbands and Wives in 1990, 91, 92, and 94. (N=370 married couples).

	Initial Level		Rate of Change		RMSEA/CFI
	Mean	Variance	Mean	Variance	
Family Economic Pressure 1990, 1991, & 1992	12.525***	81.221***	-.184	9.220**	.039/.999
Husbands					
Perceived Hostile Behaviors	1.941***	.413***	-.020†	.018***	.061/.997
Wives					
Perceived Hostile Behaviors	1.893***	.505***	.032***	.010**	.068/.993

Note. RMSEA = root mean square error of approximation; CFI= comparative fit index.

Factor loadings for intercepts $\lambda_{11} = \lambda_{21} = \lambda_{31} = \lambda_{41}$; for slopes $\lambda_{12} = 0$, $\lambda_{22} = 1$, $\lambda_{32} = 2$, $\lambda_{42} = 4$ for the models of husbands and wives.

† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

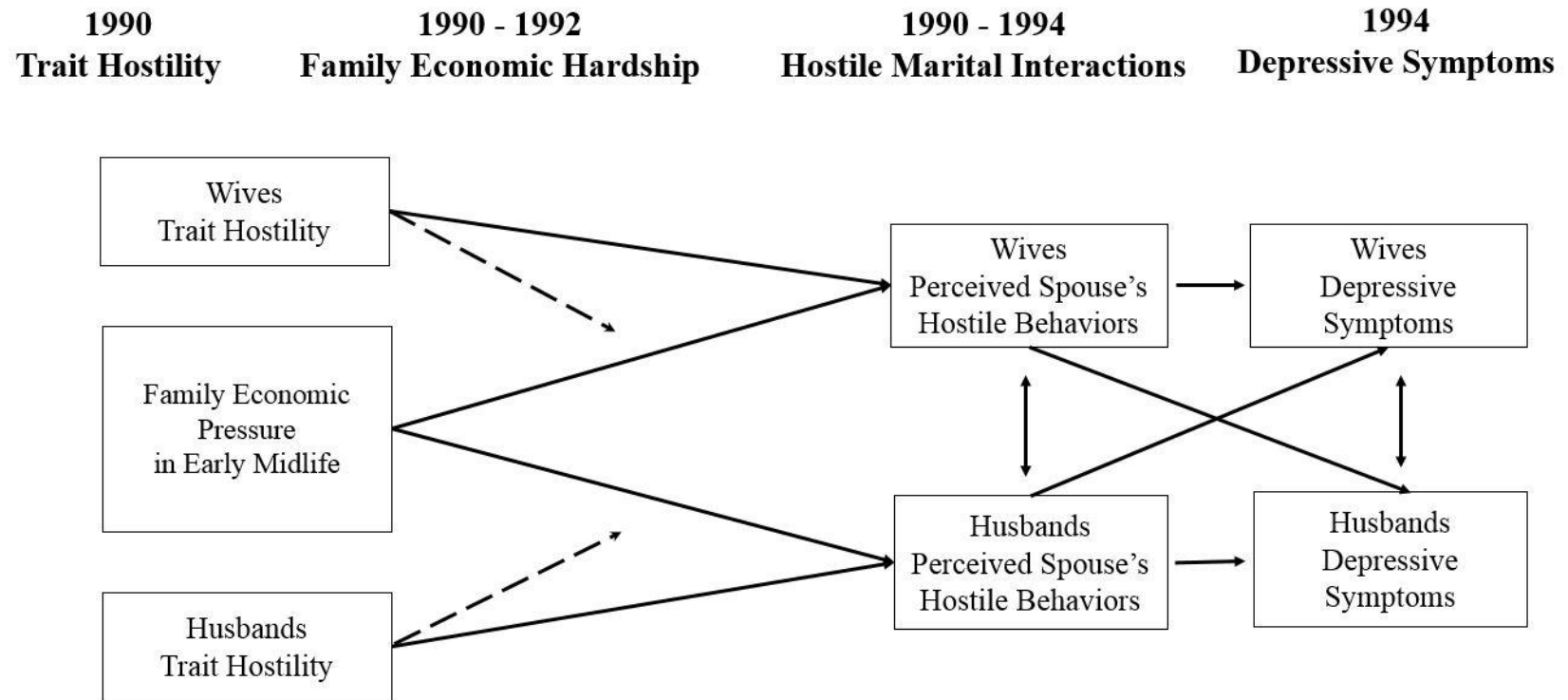


Figure 2.1 Conceptual Model of Study 1.

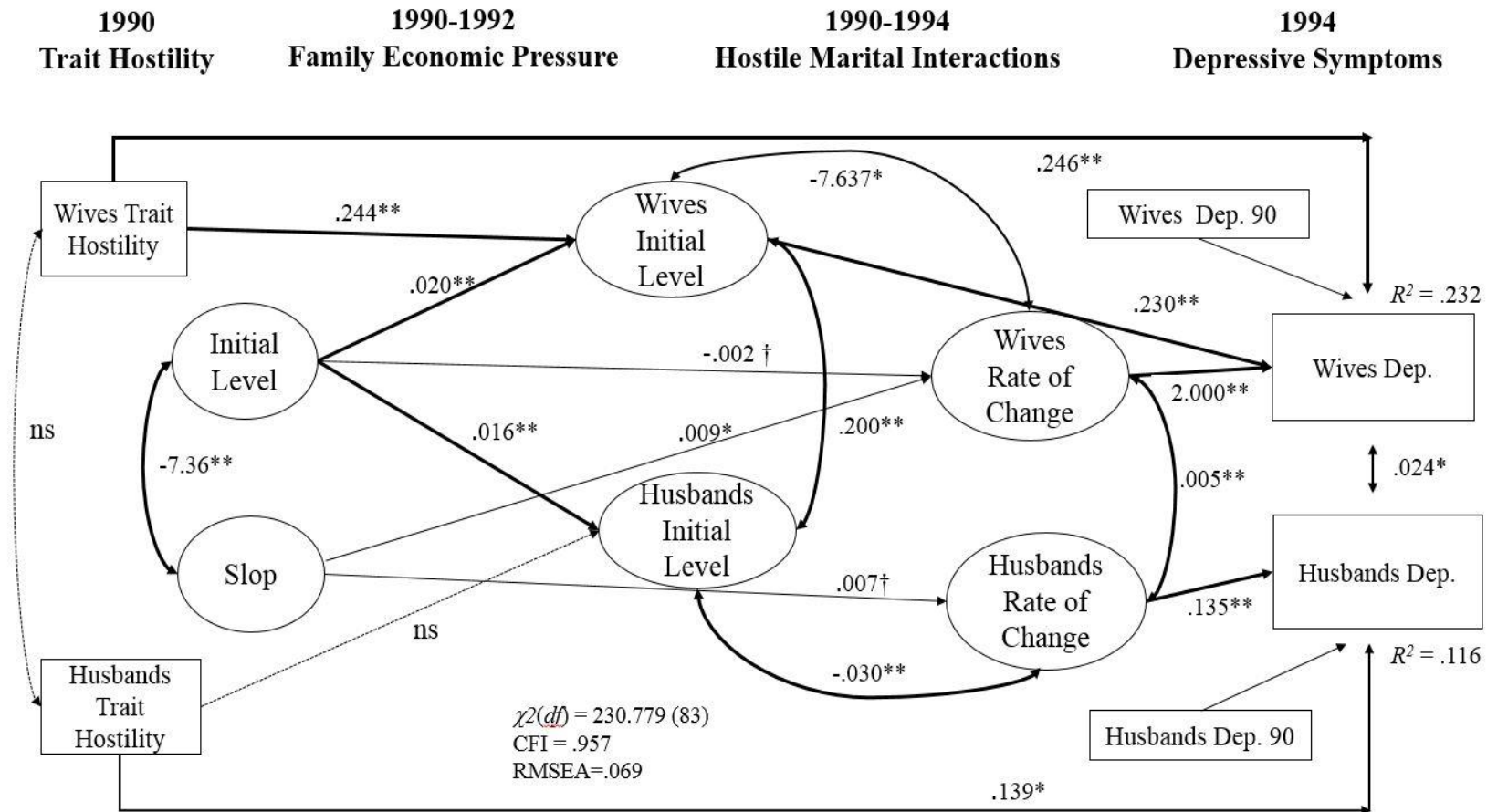


Figure 2.2. Trajectories of family economic pressure and perceived spousal hostile behaviors, trait hostility, and depressive symptoms in middle-aged husbands and wives (controlling for depressive symptoms). Unstandardized coefficients are presented. The partner effects from hostile marital interactions to depressive symptoms were not significant and not shown in the figure. Depressive symptoms = Dep. Note. RMSEA = root mean square error of approximation; CFI= comparative fit index
 * $p < .05$. ** $p < .01$.

CHAPTER 3

STUDY 2: THE ASSOCIATION BETWEEN CHRONIC MARITAL HOSTILITY AND PHYSICAL HEALTH OUTCOMES: THROUGH PHYSIOLOGICAL, PSYCHOLOGICAL, AND BEHAVIORAL MECHANISMS

Introduction

Research has shown that marriage can promote health as married individuals seem healthier and have lower mortality rates compared to the unmarried (Kaplan & Kronick, 2006). However, if the marriage is troubled, these benefits dissolve, and the stress from the troubled marriage is detrimental to mental and physical health (Kiecolt-Glaser & Newton, 2001; Wickrama, Lorenz, Conger, & Elder, 1997). Specifically, previous research has shown that marital discord is strongly associated with increased illnesses, depressive symptoms, health-risk behaviors (e.g., alcohol use, sleep disturbances, and less exercise), and stress-related physiological changes in body systems (e.g., changes in immune, cardiovascular, and metabolic systems; Kiecolt-Glaser et al., 1993; Troxel, Robles, Hall, & Buysse, 2007; Wickrama et al., 2001).

One of the primary explanations of the relationship between marriage and physical health is biological: stressful marital experiences provoke physiological reactivity in an individual leading to poor health outcomes later (McEwen, 1998; Kiecolt-Glaser, McGuire, Robles, & Glaser, 2002b). During the 2000s, medical technological advances in measuring biological markers (e.g., blood pressure, stress hormones, and inflammation) expanded our understanding of marital functioning and health (Robles et al., 2014). Empirical research has shown that

couples' negative interactions result in larger increases in systolic blood pressure, heart rate, and cardiovascular reactivity for both spouses (Nealey-Moore, Smith, Uchino, Hawkins, & Olson-Cerny, 2007). Greater cardiovascular reactivity in response to stressors has been found to be related to a greater risk of future heart diseases and faster disease progression (Treiber et al., 2003). In addition, hostile interactions between spouses were associated with both spouses' declining immunological functions (Kiecolt-Glaser et al., 1993) and slower recovery from blister wounds (Kiecolt-Glaser et al., 2005). As a result of chronic immune dysregulation, repeated inflammation can produce accumulating tissue damage, placing couples at a higher risk for infectious disease (Kiecolt-Glaser, McGuire, Robles, & Glaser, 2002a). The ample evidence provides an updated understanding of the key biological mechanisms, explaining how marital stress gets "under the skin."

In addition to the biological mechanisms, previous research has suggested that a stressful marriage may have emotional and behavioral responses that influence health risk behaviors and psychological distress, which in turn contribute to poor physical health (Whisman, Uebelacker, & Bruce, 2006). Indeed, understanding the complex interactions of physiological, psychological, and behavioral factors along with a mechanism of natural systems (i.e., our body system) is crucial to understand the linkage between marriage and health. Despite the extensive evidence, few studies have attempted to incorporate different aspects of health risk (e.g., psychological and behavioral) into marital research in a comprehensive manner.

Thus, the present study aims to quantify "biopsychosocial" links between marital hostility as a stressful marital context and physical health to explore the interplay between different health risks (e.g., behavioral, psychological, and physiological components), marital hostility, and physical health. In particular, the study examines potential mediating roles of physiological,

psychological, and behavioral processes between stressful hostile interactions and physical health outcomes. Unlike most other studies that have examined each mediating process separately, this present study investigates the mediating processes in the same analytical framework. This provides a comprehensive understanding of the influence of marital distress on physical health.

Furthermore, the present study focuses on the cumulative effects of a stressful marital context (marital hostility) on physical health using a longitudinal sample encompassing an eleven-year period of middle age. In doing so, the study provides unique information regarding the decade-long effects of marital stress on physical health for middle-aged couples who have remained married over eleven years.

Another significant aspect of the present study is the attention it devotes to the interdependency of married couples. Considering this aspect, marital scholars have emphasized that stress in a couple needs to be understood as a dyadic process (Bodenmann, Ledermann, & Bradbury, 2007). Therefore, the present study investigates how couples' hostile marital interactions affect not only their own later physical health, but also their marital partners' (referred to actor and partner effects, respectively) through the different mediating processes (i.e., behavioral, psychological, and physiological processes).

Literature Review

Theoretical Background: Biopsychosocial Perspective on Marriage and Physical Health

Research on the association between marital relationships and health has its roots in the biopsychosocial approach (Engel, 1983; Suls & Rothman, 2004). Compared to the biomedical model that was predominant in 1980s, Engle's approach emphasizes complex interactions among physiological, psychological, and behavioral (social) factors and their impacts on human health.

This approach has been used to explain the stress-health connection through different aspects of health mechanisms (Suls & Rothman, 2004). Influenced by this approach, marital researchers have suggested a comprehensive biopsychosocial perspective for marriage and health, which describes how physiological, psychological, and behavioral factors are interconnected, and this creates different pathways linking stressful marital experiences and health outcomes (Burman & Margolin, 1992; Kiecolt-Glaser & Newton, 2001). Within this broad biopsychosocial perspective, the present study incorporates the stress/social support health model (Burman & Margolin, 1992) and the stress-appraisal perspectives (Lazarus, 1999) to further explain behavioral, psychological, and physiological mechanisms.

Theoretical explanations for the link between marriage and health are related to understanding how different marital experiences may influence health. One of the prevailing explanatory models proposed to explain these processes is the stress/social support health model (Burman & Margolin, 1992; Kiecolt-Glaser & Newton, 2001), which accounts for the effects of both positive and negative aspects of marital experiences on health outcomes. The basic theme of this model is that spouses' support in marital relationships may promote individuals' mental and physical health, while negative marital interactions can impede their health (Burman & Margolin, 1992).

Specifically, research from laboratory experiments of social support demonstrated that individuals, especially men, showed significantly lower cortisol levels during acute psychological stress when they received social support from their partners compared to the support received from a stranger or no support (Kirschbaum, Prüssner, Stone, & Federenko, 1995). Multiple research studies examining the relationship between social support and health have revealed that social support received from one's spouse directly benefits immune,

cardiovascular, and endocrine systems as it reduces stress responses in the systems (Uchino, Cacioppo, & Kiecolt-Glaser, 1996).

In addition, while physiological responses to stressors are critical to the understanding of stress processes, Lazarus (1999) emphasizes that an individual's subjective appraisal of a stressful event or situation is also important. A stressful event or stressor influences an individual's perception of a stressful event, which refers to *appraisal* (Lazarus & Folkman, 1984). As such, if the person decides to use his/her personal resource to handle the stressors, this awareness influences the overall individual stress response (Boss, Bryant, & Mancini, 2017). When an individual perceives a stressful event as a severe stressor that will adversely affect the individual's life, the stressful event adversely impacts the person's life. That is, cognition and perception or appraisal may intensify the negative responses to a stressful event and circumstance (Lazarus, 1999). Thus, using husbands' and wives' subjective reports of their spousal hostile behaviors in the marital relationship (i.e., perceived spousal hostility), this study examines the cumulative effects of perceived hostile marital interactions on later physical health. The conceptual model of this study is shown in Figure 3.1 and further described below.

Mediating Pathways Linking Stressful Marital Experiences to Physical Health

Physiological pathway. Increased research has incorporated biological mediators to explain how stressful marital experiences affect physical health outcomes. As previously discussed, consistent with the stress-appraisal perspective (Lazarus, 1999), when an individual is exposed to a stimulus or a stressor (an event or a circumstance), he/she subjectively appraises the threat associated with it. If an individual perceives the stimulus as stressful, it invokes emotional, physiological, and behavioral responses that lead to allostasis (McEwen, 1998). Allostasis refers to physiological responses to various daily stresses to maintain homeostasis in

body systems, which is mainly involved in the cardiovascular, metabolic, and immune systems through neuroendocrine pathways. However, when chronically overworked, these regulating processes can accelerate functional impairments and increase susceptibility to illness (known as *allostatic load*) (McEwen, 1998; Kiecolt-Glaser et al., 2002b). Thus, continuous hostile marital interactions may operate as a chronic stressor, which may lead to “wear and tear on the body” and weaken the body’s immune system eventually inducing illness. This has received the most attention in the marital literature (Robles & Kiecolt-Glaser, 2003; Robles et al., 2014).

Considerable evidence has shown the strong association between stressful marital interactions and physiological changes in couples. Specifically, negative or hostile behaviors during the conflict discussion invoked endocrine changes such as increased epinephrine, norepinephrine, growth stress hormones, and adrenocorticotrophic hormones (ACTH) (Kiecolt-Glaser, Cacioppo, & MacCallum, 1997; Kiecolt-Glaser et al., 1993). Couples who display more negative or hostile behaviors experience more persistent elevations of these stress hormones (Kiecolt-Glaser, Glaser, Cacioppo, & Malarkey, 1998). Responding to the stressful marital discussion, the endocrine system produces epinephrine (commonly known as adrenaline). Rapid release of adrenaline causes an increase in blood flow to muscles, heart rate, and sugar metabolism to prepare the body for strenuous activity (McEwen, 1998), which is known as fight-or-flight response. The adrenaline and ACTH are involved in releasing cortisol into the bloodstream, making energy and strength available from stored carbohydrates and fats. Increases in metabolism accelerate fuel consumption. Accommodating the increase in fuel consumption, the body resorts to its stored fats, and this may cause weight loss if the body doesn’t receive sufficient fuel from the food (Mizock, 1995). However, when stress is constant, it results in the consistently elevated levels of cortisol (*allostatic overload*) in the body system.

Then, the cortisol becomes destructive, and it disturbs a regular metabolism process, resulting in inability of the body to consume glucose. This glucose is stored as fat (Mizock, 1995), usually in the abdominal area. Abdominal obesity can be understood as an important component of allostatic overload (Rosmond, Dallman, & Björntorp, 1998).

Previous research has found that severe obesity or being overweight was related to the quality of interpersonal relationships including friends, co-workers, and spouses. Specifically, severe obesity was related to higher level of experienced relational problems and low level of support in family relationships (Carr & Friedman, 2006). Individuals with higher exposure to negative experiences (e.g., frequent conflicts) in their close relationships were more likely have a greater increase in body mass index (BMI) and waist circumference (Kouvonen et al., 2011). Concerning specific effects of marital stress, greater exposure to chronic marital stress was associated with both spouses' increased waist circumference over time, especially among older couples (Birdit, Newton, Cranford, & Webster, 2016). Also, BMI was positively associated with husbands' and wives' depressive symptoms, and spouses' supportive behaviors influence this association (Wickrama & Bryant, 2012).

Obesity or high-BMI is a valid indicator of physiological dysregulation (McEwen, 1998; WHO, 2002). It is a medical condition in which an individual has accumulated an excessive amount of body fat. The condition may have negative short/long-term effects on physical health (WHO, 2002). Specifically, obesity can lead to different health consequences such as diabetes, heart disease, high blood pressure, a certain type of cancer, and orthopedic and endocrine health problems (WHO, 2002). Being overweight also increases the risk of developing rheumatoid arthritis that is a chronic inflammatory disease (de Hair et al., 2013), and the relative risk of arthritis caused by obesity increases over time with age (Stavropoulos-Kalinoglou, et al., 2007).

This can limit a person's physical function and mobility affecting his/her daily life, which may result in poor physical health conditions later.

As a screening tool, BMI has been increasingly used for identifying individuals at a higher risk of weight-related health problems in adults (Flegal, Carroll, Kit, & Ogden, 2012). As a direct biomarker of metabolic dysregulation, the use of this objective measure can benefit this line of study. Therefore, in the present study, BMI was used as a key indicator of physiological dysregulation of husbands and wives, which reflected metabolic dysregulation, cardiovascular problems, and inflammation. Using BMI, the present study examines the mediating process of physiological stress reactivity linking between stressful marital interactions and later physical health of husbands and wives.

Psychological pathway. The other plausible sequence of how stressful marital experiences influence physical health is through psychological distress. Psychological distress is the state in which individuals experience discomforting emotions in response to various life stressors, and this may harm the person, either temporarily or permanently (Ridner, 2004). As previously indicated, consistent with the stress-appraisal perspective (Lazarus, 1999), a spouse who perceives his/her partner's behaviors as hostile may anticipate the loss of the partnership and benefits, and other marital functions. If the stressor is chronic, this intra-individual process often leads to the elevation of distress feelings (e.g., depressive symptoms). Empirical research indicates that stressful marital experiences were reliably associated with increased psychological distress such as depressive symptoms (Fincham & Beach, 1999; Whisman, 2001). The primary source of the marital distress was the frequent marital conflicts and negative interactions in couples (Fincham & Beach, 1999). Research also found that marital arguments more significantly influence emotional distress in couples compared to any other common daily

stressors (Bolger, DeLongis, Kessler, & Schilling, 1989). Certain types of conflict behaviors (e.g., dyadic withdrawn) were also strongly associated with distressed emotions such as crying and trembling, especially for wives (Papp, Goeke-Morey, & Cummings, 2007).

Psychological distress influenced by the stress-exposure uniquely contributes to physiological dysregulation of the body systems. The salient role of psychological factors in the development and progression of poor physical health has already been established (Kiecolt-Glaser et al., 2002a). Psychological processes, such as the interactions between marital distress and depression, elevate physiological processes, which often occur simultaneously and may have synergistic effects on couples. The synergistic effects of the marital and psychological distress can fuel immune dysregulation such as elevating inflammation (Jaremka, Lindgren, & Kiecolt-Glaser, 2013).

Depression is the most common psychological symptoms that has received attention in the psychological process affecting health directly and indirectly. Negative emotions and depressed symptoms caused by stressors can directly stimulate reactivities of proinflammatory cytokines, which can influence the development of a spectrum of conditions associated with aging, cardiovascular disease, osteoporosis, arthritis, diabetes, and certain cancers (Kiecolt-Glaser & Glaser, 2002). Depression can also indirectly influence proinflammatory processes. Depressive symptoms evoke the dysregulation of cellular immune responses resulting in prolonged infection and delayed wound healing (Kiecolt-Glaser, Marucha, Mercado, Malarkey, & Glaser, 1995), which in turn, prolongs the proinflammatory response. The prolonged proinflammatory state can serve to inhibit certain aspects of immune responses, and this results in an inability to reduce inflammation or prevent infection (Dinarello, 2000). Chronic inflammation has been known as an important biological mechanism that may propel declines in

physical functions with age, which lead to mobility impairment or disability in later lives (Kiecolt-Glaser & Glaser, 2002).

In addition, irritable-hostile depression has been discreetly understood as a depressive subtype and recently received some attention in research because the high prevalence of the hostile tendency was found in depressed individuals (Benazzi & Akiskal, 2005). In a text revision of the DSM-IV (Diagnostic and Statistical Manual of Mental Disorder), irritability was defined as the state associated with various features of hostility and anger (APA, 2000). Many depressive individuals reported that depressive episodes often came along with frequently being irritable, hostile, and unnecessarily angry. Also, the irritability, hostility, and explosion of anger were closely related to depressive recurrence and delayed depressive recovery (Snaith & Taylor, 1985).

Along with depression and hostility, anxiety associated with psychosocial stressors provokes autonomic arousal in the autonomic nervous system, (also known as “fight or flight response”), which promotes circulation of hormones in the blood stream. The main function of the autonomic nerve system is to control the function of internal organs. This heightened arousal promotes circulation of hormones, which results in increases in heart rates, blood pressure, and energy generations. This arousal state was commonly associated with hypertension, a pro-inflammatory state, and consequently a higher risk for coronary heart diseases and other negative health outcomes (Player & Peterson, 2011). Given the complex features of psychological distress and its effects on physiological mechanisms, the present study considers psychological distress as a composite of three different characteristics: depressive, anxious, and hostile symptoms. The study intends to investigate a potential mediating role of psychological distress between marital distress and spouses’ physical health.

Behavioral pathway. Another way in which stressful marital experiences influence an individual's physical health is through health-related behaviors such as alcohol/drug use, smoking, diet, and exercise. The social support- health perspective (Cohen, 1988; Uchino et al., 1996) emphasizes the health benefits of spousal support in marriage. Efforts to understand the link between marriage and health behaviors have focused on the influence of social support of spouses, which is positively associated with practices to enhance health such as eating breakfast, consuming a moderate amount of alcohol, sleeping at night, and regularly doing exercises (Cohen, 1988). In addition, marriage provides an important context for spouses to monitor and control health-related behaviors (Uchino et al., 1996). Positive influences of social support from marital relationships may promote individuals' social control, which in turn, encourages health-enhancing behaviors and deters health-compromising behaviors such as excessive drinking, smoking, or drug use (Lewis & Rook, 1999; Umberson, 1987). Positive marriage interactions can significantly reduce risky lifestyles such as poor eating habits, heavy drinking, and inadequate sleep (Wickrama et al., 1997). Research found that couples' satisfaction of family relationships was associated with healthy eating and sleeping behaviors (O'Neal, Lucier-Greer, Mancini, Ferraro, & Ross, 2016).

In contrast, distressed marital relationships can erode personal control, leading to less practice of health-promoting behaviors and poorer physical health (Mirowsky & Ross, 2003). More specifically, previous research found that couples who had higher levels of conflicts or lower satisfaction were at a greater risk for future alcohol use disorder (Whisman et al., 2006). A meta-analysis suggests that unhealthy marital relationship may influence sleep disturbance by spouses' engaging in alcohol/substance use or altering regular sleep time and patterns (see Troxel et al., 2007). Negative marital functions were also related to health-risk behaviors such

as excessive drinking or smoking which can impact health outcomes (Kiecolt-Glaser & Newton, 2001). Those health-risk behaviors are specifically important as they closely relate to physiological processes, whereby the behaviors such as heavy drinking, less exercise, inappropriate sleep, and poor nutrition are related to negative immunological consequences and potentially cardiovascular diseases (Kiecolt-Glaser & Glaser, 1988).

Dyadic Physiological Processes

Husbands' and wives' physiological reactivity to negative marital interactions can be interdependently linked to each other. Family systems theoretical perspective emphasizes interdependent nature of marital couple (O'Brien, 2005). Marital couples commonly share space, time, and life experiences. Because of the nature of the relationships, it is obvious that one partner's feelings, thoughts, and behaviors influence the other partner's (Karney & Bradbury, 1997; O'Brien, 2005). The reciprocal processes occur between spouses, which describe how one person's behaviors affects the other partner's, whose responses then change the reactions of the first person, which again affects the other's responses (O'Brien, 2005). As spouses are constantly interacting with each other, they also experience stress together and not independently. In a similar way, physiological responses between spouses can be reciprocally transferred, and they may escalate and become entrenched over time (see Timmons, Margolin, & Saxbe, 2015).

Research on physiological linkage has been advancing, and ample evidence partially supports the physiological linkage between spouses (see Timmons et al., 2015). For example, out of several kinds of hormones, cortisol has been considered as the strongest evidence of the physiological linkage between husbands and wives. Changes in cortisol levels as stress responses between a husband and a wife were interconnected, and the linkage was more

noticeably observed when spouses were together at home (Saxbe & Repetti, 2010) than when they were apart working at workplaces.

Thus, emphasizing the interplay between interpersonal interactions and biological states (Malarkey, Kiecolt-Glaser, Pearl, & Glaser, 1994), the present study focuses on stressful marital interpersonal experiences (rather than self-reported marital satisfaction) and their impact on physical health. In addition, focusing on reciprocal processes and the physiological linkage in couples, the study will examine the transactional and reciprocal processes between husbands and wives, and expect that perceived spousal hostile behaviors can affect not only their own, but also their spouse's later physical health.

Gender Differences

Previous research found a differential impact of marital distress for women and men on developing health consequences (Wanic & Kulik, 2011). Laboratory studies showed that women experienced more physiological distress during negative marital interactions compared to men (Kiecolt-Glaser et al., 1993; Malarkey et al., 1994). Additionally, previous researchers also found that multiple domains of chronic life stress were associated with physiological dysregulation in middle-aged women (Gallo, Jiménez, Shivpuri, De Los Monteros, & Mills, 2011). One explanation for these differences is that women's personal relevance or gender related factors (e.g., relationally inter-dependent; more attentive to others; sensitive to social relationships) may be involved in stronger physiological responses to negative marital interactions (Kiecolt-Glaser & Newton, 2001). This personal relevance can significantly influence perceptions of stressors impacting specific stress-responses psychologically and biologically (Lazarus, 1999). When experiencing hostile marital interactions consistently, women may show greater physiological responses to these relational stressors compared to men.

Furthermore, some researchers argued that women generally had a strong desire to be connected to others when they were under conditions of stress (Taylor et al., 2000). This tendency may lead women to seek emotional support from their spouses or families when they manage various life challenges. However, when these desires are not fulfilled as evidenced by having marital conflicts and stressful family life events in which families became a source of chronic stress, women can become strongly affected by these family-related stressors. Thus, the current study seeks to explore potential gender differences in the ways in which husbands and wives go through the various mechanisms linking hostile marital interactions to physical health consequences.

The Present Study

Drawing from prevailing theoretical perspectives and empirical research, Figure 3.1 offers an integrative summary of different ways that stressful marital experiences affect later physical health through behavioral, psychosocial, and physiological processes. The figure shows mediating pathways linking between perceived hostile marital interactions and later physical health. The pathways reflect biopsychosocial processes, which address how early and cumulative hostile marital interactions may contribute to premature aging and influence couples' physical health conditions in later years. Specific mechanisms were examined focusing on changes in health-risk behaviors, psychological distress, and BMI. In addition, previous research has shown that the detrimental effects of stressful marital interactions on health increased with advancing age (Umberson et al., 2006).

Therefore, this present study focuses on cumulative effects of marital distress on physical health; how continuous negative marital interactions accelerate premature aging and influence other negative physical health conditions later in lives. Especially, to investigate cumulative

effects of marital discord on physical health extensively, the current study uses three different aspects of physical health, such as global health, physical illness, and physical impairment as subsequent health outcomes.

In summary, this study hypothesizes the following:

- 1) Different trajectories of perceived spouse's hostile behaviors for husbands and wives will exist across the entire sample;
- 2) Trajectories of husbands' and wives' perceived spouse's hostile behaviors (specifically, initial level and rate of change) will be associated with physical global health through behavioral, psychological, and physiological pathways (health risk behaviors, psychological distress, and BMI levels);
- 3) Trajectories of husbands' and wives' perceived spouse's hostile behaviors (specifically, initial level and rate of change) will be associated with physical illness through behavioral, psychological, and physiological pathways (health risk behaviors, psychological distress, and BMI levels);
- 4) Trajectories of husbands' and wives' perceived spouse's hostile behaviors (specifically, initial level and rate of change) will be associated with physical impairment through behavioral, psychological, and physiological pathways (health risk behaviors, psychological distress, and BMI levels);
- 5) Perceived spouses' hostile marital behaviors will affect not only their own (actor effect) but also their marital partner's later physical health (partner effect; global health, physical illness, and physical impairment).

Method

Sample

The sample for the study comes from the Iowa Midlife Transition Project, specifically couples who originally participated in the Iowa Youth and Family Project (IYFP) between 1989 and 1994 and continued to participate in the project in 2001. The main purpose of the IYFP is to explore the impact of economic hardships on the changes in family life including developmental outcomes of a child, changes in parent-child relationships, and the psychological well-being of each family member (Conger & Elder, 1994). The participants were identified and recruited through public schools. The document of the project description was sent to families by mail, the families were asked to participate in the study by phone, and then the consent of the families was obtained. At the time of the initial wave in 1989, 34% of the families lived on a farm, 54% of the families lived in rural communities (approximately 5,000 people), and 12% of the families resided in rural areas but not on a farm. Trained field interviewers visited families at their homes at two different times in a year; during the visits, each family member was independently asked about family economic circumstances, the relationship with children (parents), individual well-being, and marital relationships. Subsequent visits were conducted annually. In 1989, when the families began to participate in the study, the median ages for the husbands, the wives, and adolescent children were 39, 37, and 12 years, respectively. The median year of education for both husbands and wives was 13 years, and couples had been married for at least 14 years in 1989. A family was selected for the study if the family included a target child in the seventh grade. Additionally, if the target child had a sibling, that sibling had to have been within four years of age of the target child, and the entire family had to live all together.

From the larger sample of 450 couples, the present study selected only 368 couples who had remained married (since 1989) and continued to participate in the Iowa Midlife Transition Project in 2001. Some participants were excluded because they had possibly relocated to different places, had terminated their marital relationships, or had indicated that they were no longer able to participate in the study. Although the data of the study mainly reflects the experiences of families who live in rural areas during specific economic hard-times, the families share similar experiences of significant financial hardship caused by various life challenges. Thus, this study will provide valuable insights into the understanding of how families are affected when undergoing stressful times, and how they adapt to the situations.

Measures

Perceived spousal hostile marital behaviors. Fifteen items from the behavioral/affect questionnaire (Conger, 1988) were used to ask each spouse about his/her partner's hostile behaviors during the past month. In 1990, 1992, and 1994, respondents were asked to indicate on a 7-point scale, ranging from 1 (*always*) to 7 (*never*), to each of 15 hostile behaviors based on the question, "during the past month when you and your spouse have spent time talking or doing things together, how often did your spouse do toward you?" The list of 15 hostile behaviors included items such as "get angry at you," "shout or yell at you," and "make you feel guilty." The measure was constructed by summing up the husbands' and wives' responses to each of the items with higher scores representing a higher level of hostility (Cronbach's $\alpha = .89$ to $.91$ for husbands and wives across years).

Health-risk behaviors. An index for health-risk behaviors were constructed using measures from the 1994 survey. The index included six behaviors: a) sleep disturbance, measured in hours of sleep in a 24-hour period (less than 7 hours = 1/ more than or equal to 7

hours = 0); b) doing regular physical exercise, was measured using a question “how often do you get physical exercise either on your job or in a recreational activity?” (occasionally, seldom, and never = 1/ regularly = 0); c) smoking (yes = 1/ no = 0) was defined if an individual currently uses tobacco; d) illegal drug use (yes = 1/ no=0) was defined if an individual has used any illegal drugs during the past 12 months; 5) excessive drinking (yes =1 / no= 0) was defined if an individual had more than four alcoholic drinks in a row on the same day for at least 15 days a month; 6) unhealthy eating (rarely or sometimes = 1 / always or most of the time = 0) was defined if an individual rarely had three balanced meal a day. Higher scores reflected greater involvements in health-risk behaviors.

Psychological distress. A latent variable capturing psychological distress was comprised of hostility, anxiety, and depressive symptoms. In 1994, hostility, anxiety, and depressive symptoms were measured using the Symptoms Checklist-90-revised (SCL-90-R) psychological problems scale (Derogatis, 1996). Respondents were asked their level of distress (1 = *not at all* to 5 = *extremely*) during the previous week. Responses to 6 symptoms of hostility, including feeling easily annoyed or irritated, and getting into frequent arguments, were appropriately coded and averaged, with higher scores representing higher levels of distress. Also, 10 symptoms of anxiety from SCL-90-R, including feeling fearful, and feeling tense or keyed up, captured respondents’ anxiety symptoms. Responses to these symptoms were averaged, with higher scores reflecting a higher level of anxiety. For depressive symptoms, responses to 13 symptoms, including feeling down, crying easily, and feeling no interest in things, were averaged. A higher score represents a higher level of depressive symptoms. Then, the latent variable of psychological distress was comprised of these measures, higher scores of the latent variable reflect a higher level of psychological distress. (Cronbach’s $\alpha = .91$, for both husbands’

and wives' depressive symptoms; Cronbach's $\alpha = .86$, for both husbands' and wives' anxiety; Cronbach's $\alpha = .75$ and $.72$, for husbands' and wives' hostility respectively).

Body mass index (BMI). Respondents were asked their height and weight in 1994. From these measurements, BMI was calculated, the ratio of weight to height squared ($[\text{lbs.} \times 703] / \text{inches}^2$). The range of BMI for husbands and wives are 17.33 to 52.89 and 18.01 to 64.01 respectively.

Global health. In 2001, the global health for husbands and wives were measured by a list of 3-items about their overall physical health (Conger, 1988). Respondents were asked to indicate on a 5- point scale (1 = *excellent*, 5 = *poor*); "How would you rate your overall physical health," (1 = *much better*, 5 = *much worse*); "Would you say your overall physical health is better or worse than other people your age?" (1 = *much better now than one year ago*, 5 = *much worse now than one year ago*); and "Compared to one year ago, how would you rate your physical health in general now" (1 = *much better now than one year ago*, 5 = *much worse now than one year ago*). Responses were appropriately coded and averaged, with higher scores representing a higher level of poor global health. (Cronbach's $\alpha = .66$ and $.71$, for husbands and wives, respectively).

Physical illness. Physical illness was measured by counting the number of self-reported symptoms or diseases from a list of 56 illnesses in 2001 (Conger, 1988). The symptoms and illness included asthma, irregular heartbeats, high blood pressure, chest pain, blood clot in lungs, blood clot in vessels, heart attack, breast cancer, and high cholesterol. Respondents were asked to answer "1" if they had symptoms or diseases in the past two years; or "0" if they had no symptoms or disease during past two years. The measure was constructed by summing up the

husbands' and wives' responses to each of the symptoms with higher scores representing having more physical symptoms and illness.

Physical impairment. In 2001, the degree of physical impairment was measured by a list of 10-items adapted from the Rand Health Science Program in Health Survey 1.0 (1986). Respondents were asked to indicate on a 3- point scale, ranging from 1 (*no, not at all*) to 3 (*yes, limited a lot*), how much their health condition or a memory problem limited their daily activities such as dressing, getting in or out of bed, or bathing or showering. Responses were appropriately coded and averaged, with higher scores representing a higher level of physical impairment. (Cronbach's $\alpha = .88$ and $.91$, for husbands and wives, respectively).

Analysis

The present study used Structural Equation Modeling (SEM), including Latent Growth Curve Modeling (GCM), to investigate the proposed model. Analyses were conducted in three phases. First, using the latent growth curve analysis technique, this study identified trajectories of husbands' and wives' perceived hostile marital interactions from 1990 to 1994. This procedure produced information on initial level and rate of change in husbands' and wives' perceived spousal hostile behaviors over time (1990 – 1994); and at the same time, variability of all husbands and wives' perceived spousal hostile behaviors during those years. Second, using the structural equation modeling, the study investigated the proposed theoretical models with all variables, using three different aspects of physical health such as global health, physical illness, and physical impairment, the three models were investigated separately. Third, using a multiple group comparison analysis, the present study investigated gender differences for the associations between variables for each health outcome model. All analyses were performed using *Mplus* version 6.0 under ML estimation (i.e., Maximum Likelihood Estimation with robust standard

errors). For the model indices, the present study used previously recommended fit criteria. When the Root Mean Square Error of Approximation (RMSEA) value is close to or less than .06, and the Comparative Fit Index (CFI) value is close to or greater than .95 (favorable .90), this indicates that the model fits the data well (Hu & Bentler, 1999).

Results

Descriptive Statistics

Descriptive statistics for all study variables are shown in Table 3.1. Regarding couples' hostile marital interaction during these years, significant differences were found between husbands and wives in all three years (1990, 1992, and 1992), but not in 1994. Compared to wives, husbands' perceived spouse's hostile behaviors were slightly higher than those of wives: 2.012 (1.902), 2.011(1.927), and 1.953 (1.933) in 1990, 1991, 1992, and 1994 respectively, wives' perceived husbands' hostile behaviors are in the parentheses. In addition, wives' depressive symptoms in 1994 was higher than husbands' (1.568 and 1.365 for husbands and wives respectively).

Univariate Growth Curve

Before estimating our theoretical model, univariate growth curves of perceived spouse's hostile behaviors were estimated in the same analysis using repeated measure in 1990, 1991, 1992, and 1994. The estimates of growth curve parameters are presented in Table 3.2. For both wives and husbands, their perceived spouses' hostile behaviors had significant variances in the initial level (.524, $p < .001$; .413, $p < .001$, respectively). These results indicated that there was significant variability around individuals' average of the perceived spouse' hostile behaviors at the initial time. Across the sample, only for husbands, there was a slight decreasing trend in husbands' perceptions of their wives' hostile behaviors over time (mean slope of - .02, $p < .10$),

however, the outcomes were marginally significant. As there was a substantial variability in those changes (value =.018, $p < .001$), various patterns of the changes in husbands' perceptions existed. The variances of change for the perceived spouse's hostile behaviors of wives were also significant (value =.020, $p < .001$). These results demonstrated that significant individuals' variations were found in both wives' and husbands' rates of changes for their perceived spouse's hostile behaviors from 1990 to 1994. Linear growth curves of the perceived spouse's hostile behaviors of husbands and wives showed an adequate fit with the data (RMSEA/ CFI = 061/.997 for husbands; 068/.993 for wives).

Testing the Hypothesized Model

The proposed theoretical models were examined in the second analytic stage. Structural Equation Modeling (SEM) and Latent Growth Curves model (GCM) were used to investigate how husbands' and wives' trajectories of hostile behaviors (in 1990, 1992, and 1994) are associated with their own and partners' physical health in 2001 (Using Mplus 7.0) through psychological distress, health- risk behaviors, and BMI in 1994. The current study used three different aspects of physical health (global health, physical illness, and physical impairment) and estimated each model separately.

Global health model. As shown in Figure 3.2, the outcomes showed that only the initial levels of wives' perceived husbands' hostile behaviors predicted increases in their own psychological distress ($b=.120$, $p < .01$), and changes in wives' perceived husbands' hostile behaviors predicted increases in husbands' psychological distress in 1994 ($b=1.080$, $p<.001$). In addition, the initial levels of, and changes in, husbands' perceptions of wives' hostile behaviors (from 1990 to 1994) were consequential for their own increased psychological distress in 1994 ($b=.121$, $p<.01$; $b=1.757$, $p<.001$, respectively). Then, for both wives and husbands, high levels

of their psychological distress predicted their own poor global health later ($b = .590, p < .001$; $b = .417, p < .05$ respectively). Regarding health risk behaviors, the rate of changes in both wives' and husbands' perceived spouse' hostile behaviors predicted increases in husbands' psychological distress in 1994 ($b = 1.355, p < .05$; $b = 2.129, p < .001$, respectively). These outcomes indicated that especially for husbands, not only their perceived wives' hostility but also wives' perceived husbands' hostility influenced the increases in their health-risk behaviors. In other words, longitudinal crossover associations between spouses existed especially for husbands' risk behaviors. However, no associations between health risk behaviors and later global health were found in both husbands and wives. Regarding biological mechanisms, both the initial levels and changes in husbands' perceptions of wives' hostile behaviors predicted changes in their own higher levels of BMI in 1994 ($b = 2.697, p < .01$; $b = 38.525, p < .001$, respectively). The rate of changes in wives' perceived hostility was also consequential for husbands' increased psychological distress in 1994 ($b = 15.549, p < .01$) (partner effect). In addition, the changes in husbands' perceptions of wives' hostility predicted wives' high levels of BMI in 1994 ($b = 7.490, p < .05$) (partner effect). However, no associations were found between the BMI level in 1994 and later global health for husbands and wives in 2001. For the model predicting husbands' and wives' global health reflected an acceptable model (CFI/TLI = .911/.877; RMSEA = .077).

Physical illness model. As shown in Figure 3.3, the outcomes illustrated that both the initial levels of and changes in husbands' perceived wives' hostile behaviors predicted increases in their own psychological distress in 1994 ($b = .171, p < .001$; $b = 1.816, p < .001$). The changes in wives' perceived husbands' hostile behaviors also predicted increases in husbands' psychological distress in 1994 ($b = .659, p < .05$) (partner effect for husbands). However, only the

initial levels of wives' perceived husbands' behaviors (from 1990 to 1994) were consequential for their own increased psychological distress in 1994 ($b=.143, p<.001$). Then, for both wives and husbands, high levels of their psychological distress in 1994 predicted an increased risk for husbands' physical illness in 2001 ($b= 1.997, p<.01$; $b=1.590, p<.01$, respectively). For behavioral mechanisms, the rate of change in both husbands' and wives' perceptions of their spouses' hostile behaviors predicted increases in only husbands' health risk behaviors in 1994 ($b=1.433, p <.10$; $b= 2.382, p<.001$, respectively). In addition, only for husbands, there was a marginally significant association between health risk behaviors and later physical illness ($b=.268, p <.10$). Regarding biological mechanisms, for husbands, both the initial levels and changes in their perceptions of wives' hostile behaviors predicted their own higher levels of BMI in 1994 ($b=3.362, p<.001$; $b=44.280, p<.001$, respectively). Only changes in husbands' perceptions of wives' hostility was consequential for wives' higher levels of BMI in 1994 ($b=10.653, p<.05$) (partner effect). Then, only wives' levels of BMI were associated with an increased risk of physical illness for wives in 2001 ($b=.087, p<.01$). For the model predicting husbands' and wives' physical illness showed an acceptable fit with the data (RMSEA= .075; CFI/TLI= .917/.883).

Physical impairment model. As shown in Figure 3.4, the outcomes illustrated that both the initial levels of and changes in husbands' perceived wives' hostile behaviors predicted increases in their own psychological distress in 1994 ($b=.161, p <.001$; $b=1.230, p <.001$). The changes in wives' perceptions of husbands' hostile behaviors also predicted increases in husbands' psychological distress in 1994 ($b=.796, p <.05$). However, for wives, only the initial levels of wives' perceived husbands' behaviors were consequential for their own' psychological distress in 1994 ($b=.184, p<.001$). Then, for both wives and husbands, the high levels of their

psychological distress in 1994, significantly but marginally, predicted an increased risk for their own physical impairment in 2001 ($b = .151, p < .10$; $b = .150, p < .10$, respectively). For behavioral mechanisms, the rate of changes in both husbands' and wives' perceived their spouse' hostile behaviors predicted increases in husbands' health risk behaviors in 1994 ($b = 1.568, p < .05$; $b = 1.682, p < .05$, respectively). For wives, the initial levels of the wives' perceived spouse's hostile behaviors were associated with their own health risk behaviors in 1994 ($b = .276, p < .05$).

However, no association was found between health risk behaviors and physical impairment in 2001 in both husbands and wives. Regarding biological mechanisms, for husbands, both the initial levels and changes in their' perceived wives' hostile behaviors predicted their own higher levels of BMI in 1994 ($b = 3.147, p < .01$; $b = 30.507, p < .001$, respectively). Changes in wives' perceived husbands' hostile behaviors also predicted husbands' higher levels of BMI in 1994 ($b = 16.571, p < .05$) (partner effect). However, no association was found between psychological distress and the levels of BMI for wives. Actor and partner effects were evident in the associations between the levels of BMI and physical impairment for both husbands and wives. Husbands' higher levels of BMI were associated with an increased risk of physical impairment for both their own and partner's ($b = .008, p < .05$; $b = .006, p < .10$). Wives' higher levels of BMI predicted increased risk of physical impairment for both their own and partner's ($b = .014, p < .001$; $b = .006, p < .10$, respectively). For the model predicting husbands' and wives' physical impairment reflected an acceptable model (RMSEA = .078; CFI/TLI = .909/.873).

Gender differences. To examine gender differences on the associations in the three models, the current study performed a multiple group comparison. Starting with the fully unstrained model, parameters were constrained one by one, and then the difference of chi-square model fit between unstrained and strained models were examined to see if there was a

statistically significant change in the model fit. The outcomes of gender comparison analysis are presented in Table 3.3. The outcomes showed significant gender effects on several associations for the three different models. First, for all three different models (i.e., global health model, physical illness model, and physical impairment), the associations between the initial levels of couples' perceived spouse's hostile behaviors and their own levels of BMI were significantly different between husbands and wives $\Delta\chi^2(1, N = 370) = 3.873(1), p < .05$; $\Delta\chi^2(1, N = 370) = 4.988, p < .05$; $\Delta\chi^2(1, N = 370) = 3.91, p < .05$, respectively. In addition, in the physical impairment model, only husbands, not wives, had a strong association between the changes in perceived spouse's hostile behaviors and the level of BMI. These outcomes indicated that couples' perceptions of spousal hostile behaviors were strongly associated with the levels of BMI only for husbands, not for wives. Second, especially for the global health model, only husbands had a strong association between the changes in husbands' perceived spouse's hostile behaviors and their own health risk behaviors $\Delta\chi^2(1, N = 370) = 11.523, p < .001$. Likewise, in the physical illness model, only husbands had a strong association between the changes in husbands' perceived wives' hostile behaviors and their own psychological distress ($\Delta\chi^2(1, N = 370) = 3.984, p < .05$). However, only for wives, a strong association was found between the level of BMI and physical illness ($\Delta\chi^2(1, N = 370) = 9.937, p < .001$). However, for the physical impairment model, only husbands had a strong association between the changes in husbands' perceived spouse's hostile behaviors and their BMI levels $\Delta\chi^2(1, N = 370) = 5.941, p < .05$.

Discussion

Summary of Results

The current study confirms the detrimental effects of husbands' and wives' continuous stressful marital experiences on physical health outcomes through physiological, psychological,

and behavioral mechanisms. Consistent with the stress/social support-health model and biopsychosocial model, this study reinforces the notion that stressful marital relationships could serve as chronic stressors that can increase vulnerability to later physical health problems. Specifically, the sustained and stressed physiological activation caused by chronic hostile marital interactions can impair normal stress-responses, degrade regulation systems, and negatively shape subsequent physiological consequences. These outcomes also emphasize a unique view of health, in which the complex interactions of biological, psychological, and social factors contribute to poor health and illness.

These results add to a growing body of literature on biological and psychological mechanisms that link marital relationships to mental and physical health outcomes. Previous research showed that marital distress was closely associated with progression of disease and key physical outcomes (such as immunological dysregulation) through various mechanisms (Kiecolt-Glaser & Newton, 2001; Robles et al., 2014). This current research extends the existing evidence by examining the relationships between hostile marital interactions and various physical health outcomes through biopsychosocial mechanisms over a decade. Unlike several previous studies that examined these biopsychosocial mechanisms separately, the current study incorporated the stress-related mechanisms in the same analytical framework. This comprehensive investigation warrants an enhanced understanding of the processes, in which marital distress gets “under the skin” of married individuals.

In addition, using the BMI level, self-reported health, physical illness, and physical functional impairment, the current study explicitly illustrated the pathways linking marital distress and physical health. Previous research suggests that the most effective way to examine the relationship between marriage and health is to confirm the direct effects of marital

interactions on physiological changes in individuals (Kiecolt-Glaser & Newton, 2001), which can result in an increased risk of developing health problems. Related to this, many studies of marital distress and health have focused on allostatic processes as biological mediators, such as acute changes in stress-related hormones and immune responses (Robles & Kiecolt-Glaser, 2003). However, some researchers have argued that acute changes of biomarkers in response to short term stressors such as marital conflict discussions may not be sufficient to indicate the surrogate status, leading to a conclusion that clinical harm will occur (Kiecolt-Glaser, Cacioppo, Malarkey, & Glaser, 1992).

Thus, beyond immediate responses to marital distress, a need exists for rigorous studies that employ various measures, such as BMI, ambulatory blood pressure, self-reported health, physical symptoms, or functional impairment to incorporate clinical status for further evaluating the stress-related mechanisms (Manolio, 2003; Robles et al., 2014). Through the use of BMI and three different physical health outcomes (physical illness, physical impairment, and self-reported physical health), this study extended existing evidence by providing explicit information about the long-term associations between stressful marital context and physical health outcomes for husbands and wives.

In addition, through analyzing data longitudinally rather than at a single time point, the results illustrated that early continuous hostile marital interactions initiated various stress-related mechanisms that could lead to middle-aged couples' health risks in their later years. These findings contribute to the notion that earlier continuous stressors exert long-term damage at a later point in time and may accelerate premature aging that can lead to negative physical health conditions. Furthermore, most previous studies have often focused on single or limited health outcomes (e.g., hypertension) (Aneshensel, 2005; Wickrama et al., 2001). In these studies,

people with general health problems other than the specific disease or symptoms were implicitly identified as being in good health. These models that investigated a single health problem might not be appropriate when investigating the consequences of a long-term stressful marital context because health consequences related to marital discord might not be limited to one particular illness. Consequently, the health impacts of long-term stressful marital context are underestimated in these models. Focusing on broad spectrums of physical health, the current study provides extensive and explicit information about health consequences of chronic marital distress.

The findings also supported the stress-related dyadic processes in couples as previous researchers had emphasized (Timmons et al., 2015). The investigation captured couples' dyadic processes of stress responses between husbands and wives. The outcomes confirmed the notion that hostile marital interactions affected not only their own later physical health but also their marital spouses' health through the various linking processes. Specifically, these reciprocal processes were explicit in the relationships between marital distress and psychological distress in the current study. When husbands and wives perceived their spouse's behaviors as hostile toward them, these stressful experiences significantly influenced changes in their own psychological distress and their partners' psychological distress as well. Consequently, increased levels of psychological distress experienced by spouses contributed to a higher risk of husbands' and wives' own poor health outcomes. These results are consistent with Lazarus' theoretical perspective, which emphasizes a unique role of personal appraisal of stressful events (perceived spouses' behaviors as hostile and stressors) in modulating responses to stressors (Lazarus, 1993).

Consistent with the hypothesis of physical dyadic processes, the current study confirmed physical dyadic processes in couples, which explained that physiological stress-related responses between spouses were reciprocally transferred. Specifically, the past BMI level of husbands and wives affected not only their own physical impairment, but also their partners'. The past BMI level was a strong predictor of a long-term risk of mobility problems in both husbands and wives. Prior research has suggested that couples are jointly motivated to engage in health-enhancing behaviors as well as health risk behaviors (Light, Grewen, & Amico, 2005; Meyer, Stimpson, & Peek, 2007). For health risk behaviors, apparently the reciprocal process may become entrenched and exert a long-term damage at a later point in time. Thus, the current study reinforces the concordant health status in couples and provides specific information about reciprocal processes of health concordance in couples.

Among the three different health aspects, psychological distress seems to be a strong predictor of a long-term risk for both husbands' and wives' physical health. Our results showed that for both husbands and wives, psychological distress was closely associated to all three features of physical health (global health, physical illness, and physical impairment). These findings reinforce the salient role of negative psychological factors in the development of poor physical health, which has already been supported by previous research (Jaremka et al., 2013).

In addition, while the results showed that hostile marital experiences were associated with various health aspects (i.e. global health, physical impairment, and physical illness) through the biopsychosocial mechanisms, each pathway seems to play a different role in the associations. Specifically, health risk behaviors were strong predictors for long-term risks for physical illness only for husbands, and the past BMI level was closely related to physical illness only for wives. Regarding physical impairment, the past BMI level was a strong predictor for a long-term risk of

mobility problems for both husbands and wives. These results were consistent with the previous research that past high BMI level strongly influenced increases in a risk of mobility disability in middle-aged individuals (Launer, Harris, Rumpel, & Madans, 1994).

Furthermore, the sample represents an important subgroup of married couples; couples with marriages lasting over 20 years. This sample provides key insights into long lasting intimate partner relationships, which reinforces the notion that even for long-lasting marriages, if couples experienced hostile marital interactions consistently, the experiences can significantly impact couples' health in later lives.

Limitations

The findings of the current study should be considered in the context of several limitations. The first limitation relates to the general applicability of the results. The study sample comprised of 100% Caucasian individuals who lived in rural areas. Prior research suggested that unique social and cultural backgrounds may shape families' values and life styles differently (Bryant et al., 2010). Thus, replication of these analyses with different racial groups or individuals with different social and economic backgrounds would provide valuable implications for a broader population.

Second, given the empirical evidence of bidirectional association between marital discord and depression, future research needs to further explore the bidirectional association. Depressive mood has a harmful effect on individuals' abilities to regulate emotional responses and manage conflicts effectively. Also, individuals who had depressive symptoms likely had more frequent negative behaviors toward their partners and less frequent positive interactions (Rehman, Gollan, & Mortimer, 2008). These continued unpleasant marital interactions may influence marital dissatisfaction, which in turn promote further depression and concomitant poor physical health in

later years. Lack of energy and motivation may also negatively influence individuals' healthy lifestyle such as failure to maintain regular exercise and physical activity, poor diet and sleep deprivation, and increased substance abuse. Prior research found that the unhealthy eating and irregular exercise were associated with increases in higher BMI level and the correlations appeared explicit with advancing age (Kushner & Choi, 2010). Thus, although the current study provided strong evidence of biopsychosocial mechanisms that link marital distress and physical health, potential reverse influences may exist; as a result, further exploration of the bidirectional association between marriage and health should be pursued in future research.

Implications

The current study provides useful implications for improving couple relationships through considering health outcomes related to stressful marital interactions. First, our findings confirm that continuous and stressful couples' marital interactions affect not only husbands' and wives' own physical health but also their partner's later health. Appropriate interventions need to be developed for couples to break reciprocal cycles of hostile behaviors toward each other, to manage conflicts effectively, and to prevent psychological and physiological health problems.

Second, an understanding of the relationships among biological, psychological, and behavioral processes influencing an individual's physical health may lead to develop appropriate intervention. The intervention may focus on improving healthy lifestyle involving in behavioral changes such as stress relaxation techniques beyond practicing conflict management skills. Such behavioral change toward more engagement of health-enhancing behaviors (i.e., healthy eating and regular exercise and sleep) can attenuate the negative impact of chronic marital distress on psychological and physical health, as a result, increase individuals' overall health.

Third, given that serious health consequences of chronic stress are greater than the one of periodic or acute stress (Kahn & Pearlin, 2006), more attention should be given to the role of a restoration period. When couples experience continuous marital difficulties and conflicts, counselors can guide husbands and wives to break ongoing cycles of stressors by pausing and restoring themselves back to an optimum state of marriage. These couple-dynamic focused interventions may have biological effects that would lead couples to improve their health practices and eventually reduce a high risk of poor health outcomes in their later lives.

Conclusion

This study offers initial support for the proposed hypotheses that earlier sustained stressful marital experiences (1991-1994) are linked to physical health a decade later (2001) through psychological, behavioral, and physiological mechanisms. The research can guide efforts to identify couples with specific characteristics that place them at a higher risk, and practitioners can utilize and initiate interventions toward this population. Furthermore, considering the detrimental biological effects of marital distress, marital interventions can be served as preventive medicine or as a part of the treatment for individuals with health problems. It needs considerable efforts to foster greater understanding of the unique role of marital context in medical setting, and health care providers may make collaborative efforts to incorporate couple-based interventions in patient care with related professionals.

Table 3.1. *Correlation Matrix and Descriptive Statistics for Study 2 Variables (N= 370 married couples).*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Perceived Spouse's Hostile Behaviors 1990	1	.809**	.772**	.634**	.122*	.175**	.246**	.263**	.023	.023	.204**	.047	.103*	.042	.065
2. Perceived Spouse's Hostile Behaviors 1991	.761**	1	.820**	.631**	.179**	.230**	.282**	.345**	.002	.120*	.197**	.117*	.152**	.104	.117*
3. Perceived Spouse's Hostile Behaviors 1992	.718**	.785**	1	.596**	.177**	.198**	.272**	.276**	.008	.044	.150**	.077	.101	-.018	.029
4. Perceived Spouse's Hostile Behaviors 1994	.693**	.726**	.693**	1	.067	.268**	.292**	.205**	.037	.007	.161**	.131*	.128*	.047	.089
5. Health Risk Bev. 1994	.107*	.075	.084	.089	1	.103*	.170**	.182**	-.042	.166**	.229**	.056	.095	.076	.054
6. Hostility 1994	.078	.157**	.153**	.245**	.033	1	.664**	.564**	.194**	.260**	.167*	.290**	.265**	.242**	.013
7. Dep. Symptoms 1994	.202**	.213**	.152**	.221**	.057	.619**	1	.727**	.166**	.267**	.317**	.301**	.335**	.182**	.215**
8. Anxiety 1994	.164**	.217**	.172**	.176**	.050	.634**	.793**	1	.119*	.260**	.254**	.277**	.355**	.168**	.152**
9. BMI 1994	.149**	.115*	.135*	.121*	.078	.137*	.099	.124*	1	.359**	.215**	.295**	.210**	.315**	.076
10. Global Health 2001	.056	.007	-.005	.041	.238**	.179**	.290**	.230**	.259**	1	.366**	.419**	.223**	.445**	.131*
11. Global Health 1990	.147**	.044	.135*	.139*	.232**	.097	.188**	.162**	.263**	.521**	1	.279**	.301**	.239**	.411**
12. Physical Ill. 2001	.007	-.018	-.068	.005	.170**	.214**	.280**	.164**	.123*	.413**	.350**	1	.482**	.399**	.265**
13. Physical Ill. 1990	.027	-.013	.000	.070	.130*	.127*	.184**	.079	.109*	.291**	.324**	.381**	1	.281**	.242**
14. Physical Imp. 2001	.060	.076	.046	.105	.187**	.178**	.278**	.253**	.334**	.474**	.368**	.324**	.204**	1	.248**
15. Physical Imp. 1990	.091	.053	.007	.066	.138*	.154**	.179**	.198**	.127*	.321**	.408**	.298**	.331**	.379**	1
Wives (n = 321)	1.902 ^a	1.927 ^a	1.933 ^a	2.013	1.735 ^a	1.304 ^a	1.568 ^a	1.260 ^a	26.902 ^a	2.770	2.071 ^a	5.290 ^a	3.948 ^a	1.304 ^a	1.192
M (SD)	(.721)	(.830)	(.817)	(.709)	(1.006)	(.366)	(.561)	(.414)	(6.365)	(.637)	(.813)	(3.977)	(2.209)	(.390)	(.576)
Husbands (n = 304)	2.012 ^a	2.011 ^a	1.953 ^a	2.098	1.847 ^a	1.248 ^a	1.365 ^a	1.174 ^a	28.361 ^a	2.777	2.201 ^a	4.268 ^a	3.163 ^a	1.238 ^a	1.181
M (SD)	(.709)	(.731)	(.683)	(.699)	(1.097)	(.315)	(.432)	(.314)	(4.691)	(.607)	(.794)	(3.125)	(1.90)	(.334)	(.585)

Note. Wife correlations are above while husband correlations are below the diagonal. Means (*M*) and standard deviations (*SD*) are presented in the horizontal rows at bottom of the table. Letter superscript (a) on mean value denotes significant gender difference. Health Risk. Bev. = Health Risk Behaviors. Dep. Symptoms = Depressive Symptoms. BMI = Body Mass Index. Physical Ill. = Physical Illness. Physical Imp. = Physical Impairment. * $p < .05$. ** $p < .01$.

Table 3.2. *Estimate for Univariate Growth Curves of Perceived Spouse's Hostile Marital Behaviors for Husbands and Wives in 1990, 91, 92, and 94. (N=370 married couples).*

	Initial Level		Rate of Change		RMSEA/ CFI
	Mean	Variance	Mean	Variance	
Husbands					
Perceived Hostile Behaviors	1.941***	.413***	-.020 [†]	.018***	.061/.997
Wives					
Perceived Hostile Behaviors	1.852***	.524***	.011	.020***	.068/.993

Note. RMSEA = root mean square error of approximation; CFI= comparative fit index.

Factor loadings for intercepts $\lambda_{11} = \lambda_{21} = \lambda_{31} = \lambda_{41}$; for slopes $\lambda_{12} = 0, \lambda_{22} = 1, \lambda_{32} = 2, \lambda_{42} = 4$ for the models of husbands and wives.

[†] $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 3.3. *Comparison for Associations between Husbands and Wives (N=370 married couples).*

	$\Delta\chi^2$ (df)
Global Health Model	
The Changes in Perceived Spouse' Hostile Behaviors – Health Risk Behaviors	11.523(1), $p < .001$
The Initial levels of Perceived Spouse' Hostile Behaviors – BMI	3.873 (1), $p < .05$
Physical Illness Model	
The Changes in Perceived Spouse' Hostile Behaviors – Psych. Distress	3.984(1), $p < .05$
The Initial Levels of Perceived Spouse' Hostile Behaviors – BMI	4.988(1), $p < .05$
BMI – Physical Illness	9.937(1), $p < .001$
Physical Impairment Model	
The Initial Levels of Perceived Spouse' Hostile Behaviors – BMI	3.91(1), $p < .05$
The Changes in Perceived Spouses 'Hostile Behaviors – BMI	5.941(1), $p < .05$

Note. Only significant different associations between husbands and wives were reported.
 BMI = Body Mass Index. Psy. Distress = Psychological Distress

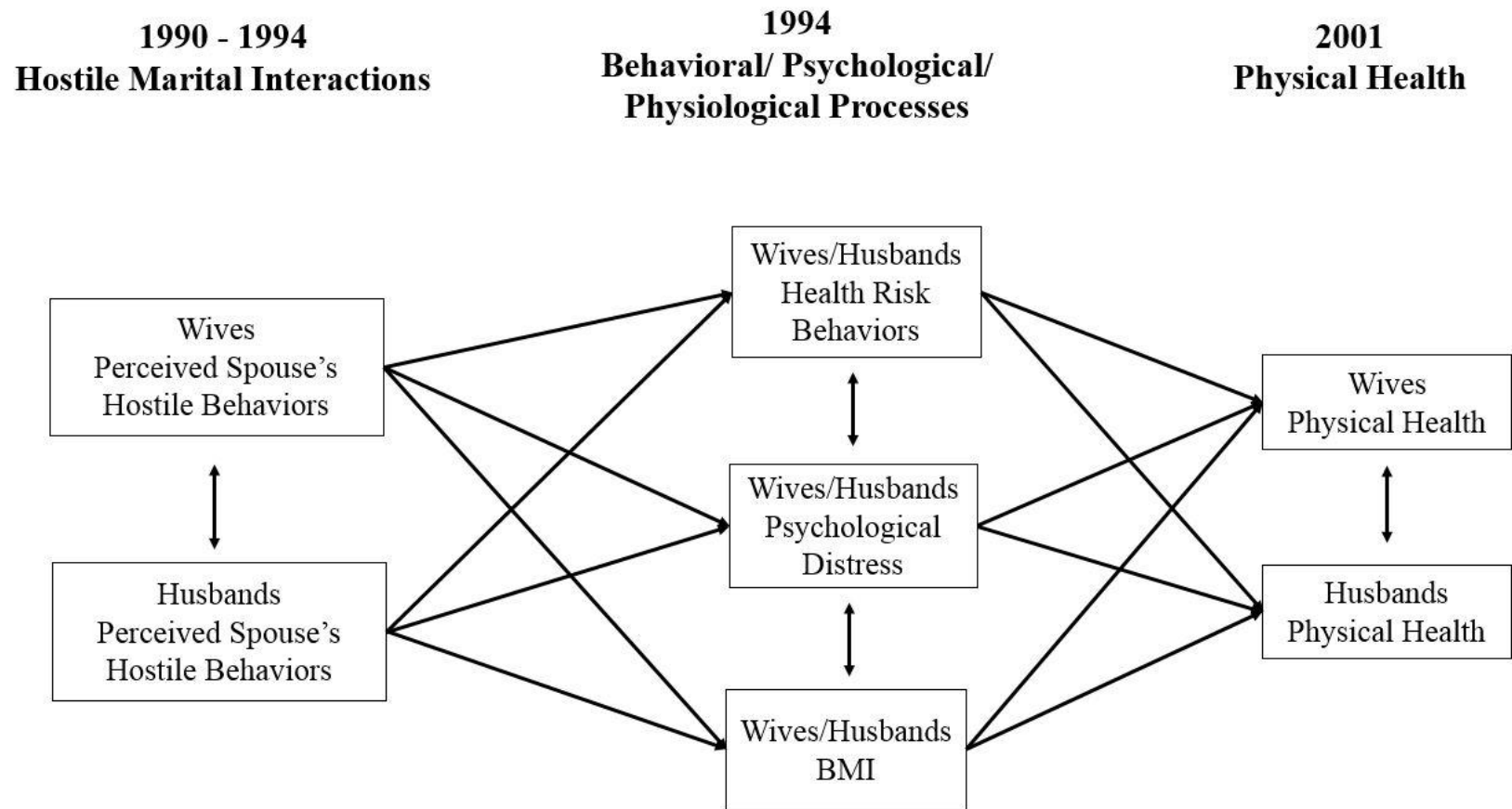


Figure 3.1. Conceptual Model of Study 2.

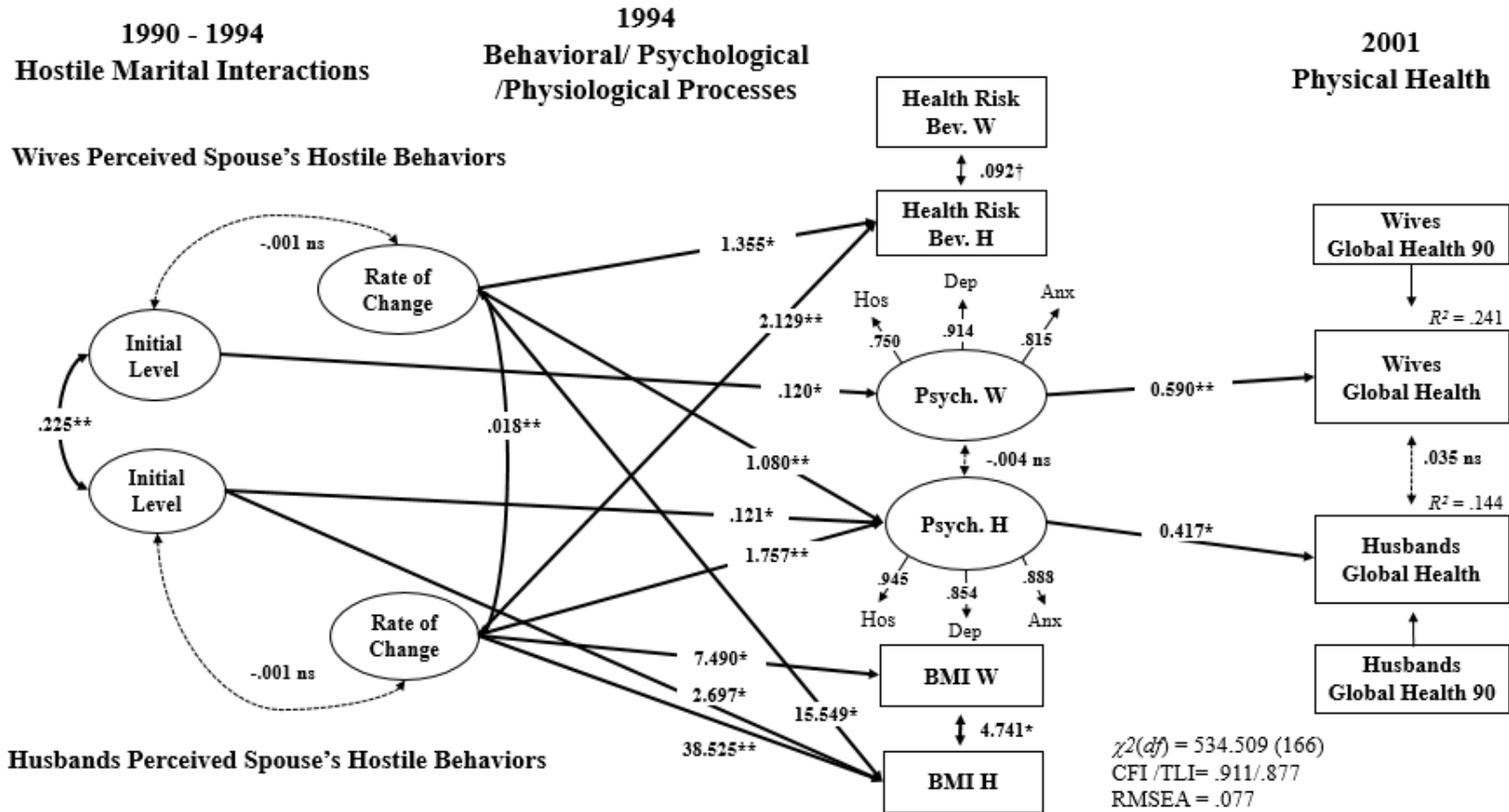


Figure 3.2. The effects of husbands' and wives' hostile marital interactions on global health through health-risk behaviors, psychological distress, and body mass index. Note: Unstandardized regression coefficients are presented. Psych. H (W) = Psychological Distress of Husbands (Wives). Behavior H (W) = Health-Risk Behaviors of Husbands (Wives). BMI H (W) = Body Mass Index of Husbands (Wives).

†*p* < .1. **p* < .05. ***p* < .01

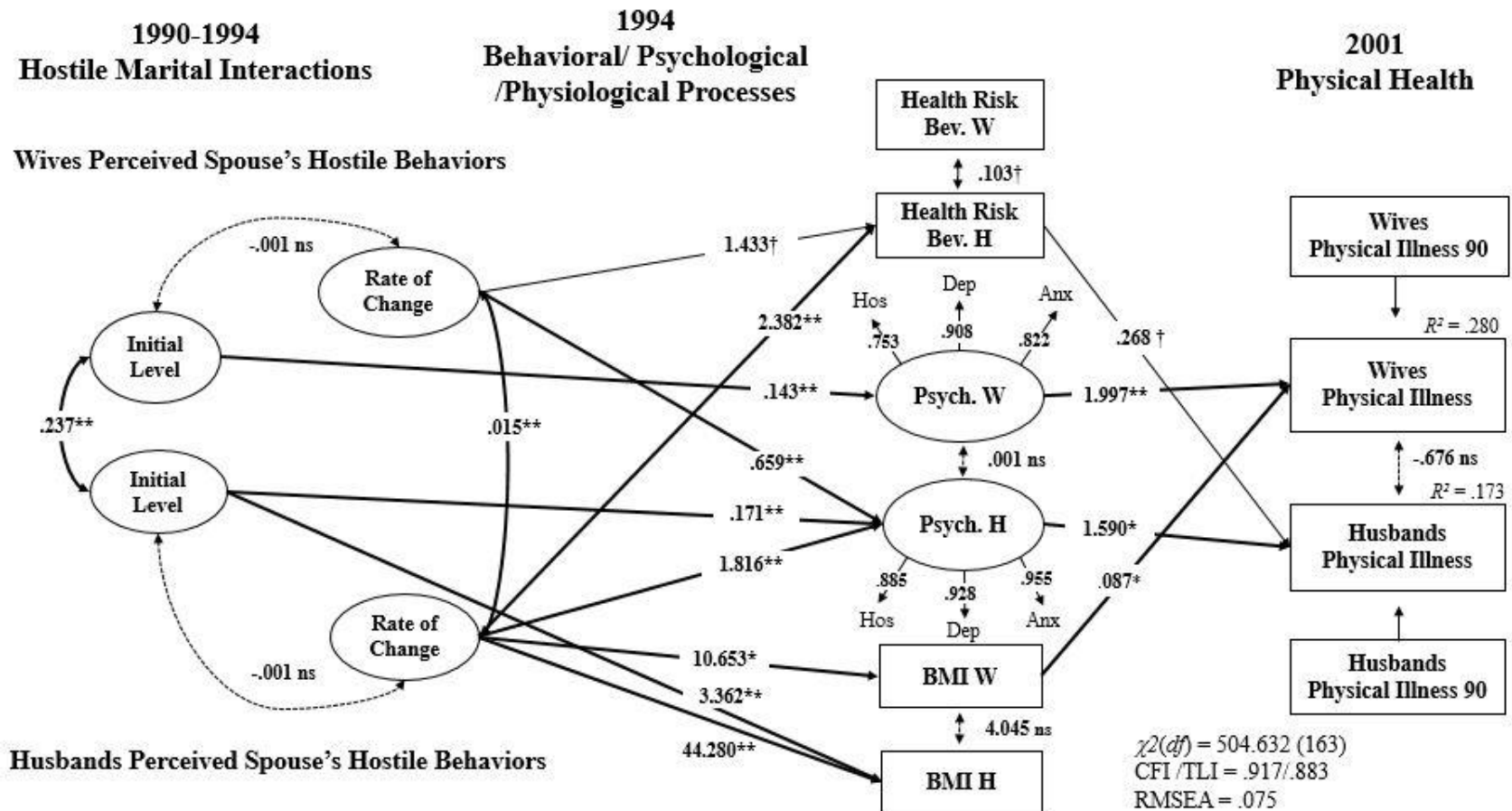


Figure 3.3. The effects of husbands' and wives' hostile marital interactions on physical illness through health-risk behaviors, psychological distress, and body mass index. Note: Unstandardized regression coefficients are presented. Psych. H (W) = Psychological Distress of Husbands (Wives). Behavior H (W) = Health-Risk Behaviors of Husbands (Wives). BMI H (W) = Body Mass Index of Husbands (Wives).

† $p < .1$. * $p < .05$. ** $p < .01$.

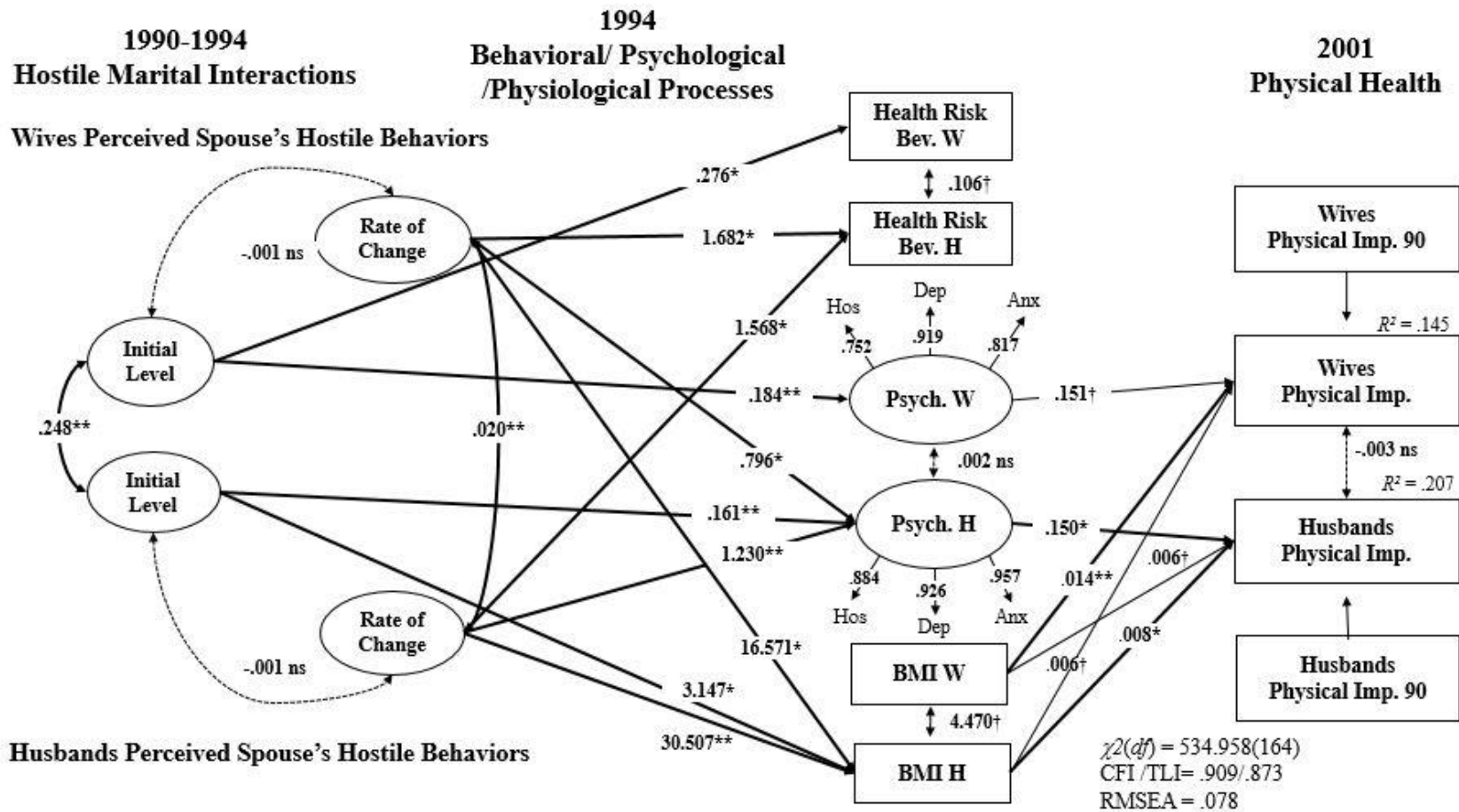


Figure 3.4. The effects of husbands' and wives' hostile marital interactions on physical impairment through health-risk behaviors, psychological distress, and body mass index. Note: Unstandardized regression coefficients are presented. Psych. H (W) = Psychological Distress of Husbands (Wives). Behavior H (W) = Health-Risk Behaviors of Husbands (Wives). BMI H (W) = Body Mass Index of Husbands (Wives).

† $p < .1$. * $p < .05$. ** $p < .01$.

CHAPTER 4

DISCUSSION AND CONCLUSION

Discussion

Understanding the complex relationship between marriage and health has become essential to marital research. Historically, family and psychological researchers have focused on mostly marital outcomes rather than on marital processes. However, a marriage is embedded in social and economic contexts (Karney & Bradbury, 1995), and marital relationships continue to evolve over time and interact with their social contexts. Previous research has documented that stressful circumstances surrounding marriage influence not only marital outcomes, but also adaptive marital processes in a marriage (Neff & Karney, 2004). In particular, for couples that live under stressful circumstances, these external stressors may spill over into a marriage to shape marital adaptive process, and these processes can lead to negative health consequences. However, the association between external stressors and marital processes has received substantial theoretical attention but less empirical investigation has occurred. As such, marital research has paid less attention to the interplay between contextual and individual factors and their effects on marital processes beyond marital outcomes within a long-term marital context.

Considering negative health consequences, biopsychosocial clinical research has long focused on psychological and physiological activations responding to marital distress in laboratory settings. However, less research has investigated the cumulative effects of marital distress within a longitudinal life time context. Examination of acute physiological responses caused by hostile marital interactions in a laboratory setting may provide a one-sided

understanding of marital discord and physical health. Since physiological stress- responses occur simultaneously with psychological and behavioral processes, and the effects of these processes may not appear immediately, these various mechanisms need to be understood in an integrated manner within a longitudinal context.

These two connected studies provide additional insights into this pressing area of marital research by examining interactions between financial stress, individual vulnerabilities, and their effects on hostile marital interactions over a long-period as well as bio-psycho-behavioral mechanisms that link marital discord and physical health outcomes. A summary of the current studies and implications of the findings for practitioners as well as the direction of future research are presented below.

Summary of Results

Focusing first on Study 1, growth curve models were used to explore the longitudinal associations between external stress and marital processes, which in turn sought to predict depressive symptoms. Previous research has shown greater financial distress to be associated with lower initial levels and steeper declines in husbands and wives' perception of spousal warmth (Barton & Bryant, 2016). Building on this previous research, the current study confirmed that longitudinal associations existed between family financial stress and husbands' and wives' perceptions of spousal hostility. This finding indicates financial stress influences husbands' and wives' perceptions of spousal hostile behaviors. Their increases were synchronically changed in a mutual way, such that couples' appraisals of spousal hostility were increased along with elevated family financial hardship. In addition, high levels of husbands' and wives' spousal hostility were consequential for increased depressive symptoms. The findings between financial stress and spousal perception align with existing research, which

showed that individuals with high level of stress were more likely to report lower marital relationship quality and perceived their spouse's behaviors to be problematic (Neff & Karney, 2004). In addition, the findings affirmed stress proliferation processes across one life domain (financial stress) to another (marital relationship). In contrast to the proposed hypothesis, the trait hostility did not appear to intensify hostile marital interactions over time when couples consistently faced financial difficulties. Only for wives, individuals' trait hostility had an impact on their own perceptions of spousal hostility at the starting point.

Expanding the model of Study 1, Study 2 investigated, beyond mental health, various mechanisms (behavioral, psychosocial, physiological stress processes) that link sustained hostile interactions between husbands and wives to physical health. Examination of these mechanisms in the same analytical framework is valuable because it has taken into account dependencies between these mechanisms. Thus, the results offer compelling evidence for the relationship between marital distress and health outcomes. Results illustrated that continuous hostile marital interactions initiated various stress-related responses physically, psychologically, and behaviorally, which degraded regulation systems and shaped subsequent physiological health consequences. Each stress-response seems to have different influences on husbands and wives. For husbands, health-risk behaviors were a strong predictor for physical illness. However, for wives, their past BMI levels were more closely related to physical illness than for husbands. In addition, the past BMI levels for husbands and wives were also associated with functional problems in their later lives. Psychological distress consistently impacted both husbands and wives in all aspects of physical health. The current study also reinforces concordant health patterns in couples and indicates physiological stress-related responses are reciprocally transferred each other.

In summary, the current collection of studies provided general support for the Vulnerability-Stress-Adaption model of marital adaptive process (Karney & Bradbury, 1995), Stress Proliferation process, and the Biopsychosocial model framed this study. In addition, as discussed above, the findings of the study expands the knowledge of stress adaptation in marriage and its impact on physical health within a long-term life time context. Despite the empirical evidence, the findings of this study should be considered in terms of several limitations as discussed in the Chapter 2 and Chapter 3.

Implications

The followings are implications of the results that focus on how to maintain a healthy marriage; how to prevent poor health outcomes; and how to increase married individuals' overall well-being.

Couples therapy. How to improve marital quality and maintain a healthy marriage has been a central theme in marital research, and this theme challenges practitioners and clinicians consistently. As one of many interventions, communication-skill based couple therapy/educational programs have been successfully and widely used. However, previous research has produced mixed findings. While effective communication and conflict management in couples are considered to be important elements in maintaining a healthy marriage, previous research found that having effective communication skills did not predict relationship satisfaction, and some couples could not use the strategies that they learned when they were most needed (Hawkins, Blanchard, Baldwin, & Fawcett, 2008). Stressful circumstances may interfere with couples' communication skills and hinder their effective performance of certain skills, resulting in unresolved conflicts and mismanagement of various marital issues. Recognizing this limitation, one possible suggestion is to increase couples' awareness of their repetitive and

circular dynamics of conflicts and hostile interactions and to help couples develop their own strategies to break or alter ongoing cycles of negative interaction. Specifically, Horwitz and her colleagues suggested specific interventions that focused on constructing *patterns of unresolved conflict and pathways to resolution* with clients (Horwitz, Santiago, Pearson, & LaRussa-Trott, 2009). In detail, therapists construct a map presenting a couple's repetitive and circular dynamics of negative interactions while mapping their escalating intense emotional interactions. Then, therapists guide the couple to construct another map of new interactions, which creates a new sequence of behaviors that consist of actions they can perform to interrupt intense emotional interactions, so they avoid triggering each other's intense emotions (Horwitz et al., 2009). Through the process of improving cognitive and behavioral changes, couples can become aware of and act on a critical point when they most need to interrupt, and alter the negative reciprocal interactions to neutral or positive interactions. Bradbury and Karney (2004) also highlighted a similar point: conflicts are necessary for couples; however, it is important to make conflict less critical for the couples when it happens.

Transformative process. Overt conflict behaviors are risk factors that predict negative marital outcomes, such as divorce (Fincham & Beach, 2010; Huston, Caughlin, Houts, Smith, & George, 2001) and deterioration of marital satisfaction (Karney & Bradbury, 1997). However, previous research produced inconsistent outcomes, which suggested reversal effects of negative marital behaviors that intrigued marital researchers. Husbands' negative behaviors were marginally predictive of decline in wives' satisfaction but were not associated with changes in husbands' own satisfaction (Karney & Bradbury, 1997). In the other study, wives' negative behaviors were associated with positive changes in both husbands' and wives' marital satisfaction (Karney & Bradbury, 1997). These outcomes suggested that researchers need to

consider greater complexity in the linkage between negative behaviors and marital outcomes (Fincham & Beach, 1999), rather than examining a simple linear connection between them. (Huston et al., 2001). This approach has led researchers to become more attentive to transformative process, in which a spouse has momentum maintaining his or her successful marriage, such as he or she can acknowledge that ‘a good marriage brings him/her sense of meaning in his/her life’ (Aldous, 1996; Fincham et al., 2007). Such momentum can be present when there is forgiveness, commitment, and sanctification (Fincham et al., 2007). In addition, Gottman and his colleague (2002) noted that a long-running sequence of behavioral interactions can produce sudden change such as *discontinuity* or a *jump* in the behaviors of a couple’s system (Gottman, Swanson, & Swanson, 2002). This change takes the system from one state to a different state, which results in transition of marital function (Nowak & Vallcher, 1998). These changes in marriage seem to occur unexpectedly or unnecessarily in linear changes.

Understanding transformative processes can provide additional information, which is necessary regarding how to repair distressed relationships, ultimately leading to relationship transformation (Fincham et al., 2007). While more empirical research is needed to assess transformative processes, this emerging trend provides valuable insights for clinicians and practitioners who work with couples experiencing marital distress. Clinicians may need to seek, observe, and attend to the potential transformative moments that individuals express or mention; the clinicians then strengthen those experiences and guide the couples to connect those experiences to changes in their marriages.

Preventive medicine. Longitudinal studies offer strong evidence that marital distress can be a potential causal risk factor for future health problems (Robles et al., 2014; Wickrama et al., 1997). The relevant question is whether marital interventions can attenuate the deleterious

effects of marital distress on future health outcomes (Robles et al., 2014). Previous research showed that an intimate partner played an important role in the treatment of a psychological disorder (Whisman, Uebelacker, & Bruce, 2006) and couple-oriented intervention was effective in treating depression and substance abuse (Beach, Sandeen, O'Leary, & Barlow, 1990). Even more, psychosocial and behavioral interventions that targeted both a patient and his/her partner were effective in treating chronic pain and illness (Martire, Schulz, Helgeson, Small, & Saghafi, 2010), which suggested that couple-oriented interventions are necessary, especially for couples with high, illness-related conflicts or low partner support.

Marital intervention has extended its use for cancer patients as well. Specifically, couple-based relationship enhancement interventions effectively helped women with a breast cancer to improve individual psychological, medical, and relationship functioning at 1-year follow-up (Baucom et al., 2008). Another study found that marital distress was associated with an increased risk of recurrent coronary events for women who had been hospitalized for coronary heart disease (Orth-Gomer et al., 2000). These outcomes provide extensive implications relating to patient care in a medical setting. Given the fact that biological effects of couple-based intervention exist, marital intervention can be further developed as a form of preventive medicine (Robles et al., 2014), which can improve the quality of patient care. Furthermore, incorporating psychosocial and marital factors, health promotion and disease preventive programs may need to be more appropriately designed.

Future Directions

Considering transitional life events in middle years. As multiple transitional life events in later years can result in various changes in trajectories of marital functioning and health (Wickrama, O'Neal, & Lorenz, 2013), future research needs to consider the additive and

multiplicative effects of transitional life events on marital processes and health outcomes in later middle years.

Specifically, for middle-aged couples, transitional life events, such as retirement, spouse losses, and relocation may lead to changes in marital relationships including turning, disrupting, and steeply increasing and decreasing changes in marital function at a certain time point or over years (Wickrama et al., 2013). While considerable studies have shown stability or improvement in marital functioning during or after retirement transition, some research has argued that retirement can cause declines in marital quality for some couples. When individuals retire, they might experience losses of self-esteem, stable income, life goal, and social relationships, which can cause declines in marital satisfaction (Myers & Booth, 1996). In contrast, leaving a high-stress job such as work conditions with high demand, frequent work-family conflicts, and low control, may lead to improve marital quality and health (Myers & Booth, 1996). These improvements in marital quality over retirement are likely related to having more quality time, pursuing couple activities together, and having less stress related to work (Szinovacz & Schaffer, 2000). However, some couples who experience financial hardships or difficulties of dealing with a spouse's health issues may postpone their retirement in order to save for future cost of living and health care. The decision could contribute to increased stress associated with retirement (Bidewell, Griffin, & Hesketh, 2006). Thus, future research needs to pay considerable attention to the role of transitional life events in shaping couples' lives, especially in later years.

Incorporating longitudinal/dyadic associations in marriage. Examining dyadic process in marriage for a long period of time has become an increasingly important topic in marital research. With advancing age, intimate relationships became most important source of emotional support for individuals (Levenson, Carstensen, & Gottman, 1994); thus, their marital

contexts become more salient (Berg, Johnson, Meegan, & Strough, 2003). In addition, family research has shown general continuity in marital interactions across the life course (Conger, Cui, Bryant, & Elder, 2001) as results of routinizing patterns of interactions through negotiating role expectations over time (Smith & Huston, 2004). However, while maintaining the continuity in certain characteristics of marital interactions, changes in levels of certain characteristics of marital interactions may occur over long periods of time (Wickrama et al., 2013). Older couples have a long-shared history and many life experiences together, which may increase the strength of cross-spouse effects and present concurrent health status between spouses. In addition, existing research states that stressful circumstances and major life events, such as retirement transitions, are phenomena that require a relative adjustment from on both spouses. Furthermore, adverse effects of various stressful circumstances on couples' health may appear over long periods of time rather than immediately. Therefore, future research should place a value on dyadic processes in couples and further explore the associations between marriage and health in the longitudinal and dyadic contexts.

Considering bidirectional process. Despite the potential bidirectional association between marital distress and depression, marital research has less explored this association in a comprehensive way. Marital distress predicts a great risk for incidence of depressive episodes (Whisman & Bruce, 1999; Fincham & Beach, 1999). Conversely, negative or positive experiences in interpersonal relationships have an important role in onset, remission, relapse, and treatment for individuals with depressive symptoms (Beach et al., 1990). Specifically, individuals with depression may behave in certain ways (dysphoria or being anxious and hostile) that contribute to interpersonal stress, which can result in the continuation or exacerbation of the depressive symptoms. Also, increased levels of depressive symptoms may influence declines in

their relational satisfaction, which in turn can result in increases in depressive symptoms again (Davila, Karney, Hall, & Bradbury, 2003).

A variety of longitudinal analyses that involve diverse methodologies has found associations between marital dysfunction and depression to be directional (Whisman, 2001; Davila et al., 2003). Methods such as multiple regression, cross-lagged correlation, and growth curve analysis possess certain advantages, however may not fully convey the bidirectional processes because techniques (e.g., multiple regression) have only examined the associations between a single variable and residual change of the other variable (Fincham, Beach, Harold, & Osborne, 1997; Davila et al., 2003), and other techniques (e.g., growth curve analysis) have investigated how one predictor at a single point induces changes in trajectories of another variable (Karney & Bradbury, 1997; Davila, et al., 2003). Thus, little is known about how changes in the levels of a spouse's depression relates to changes in his/her spouse's interpersonal functions, which in turn influence changes in the spouse's depressive symptoms (Davila, et al., 2003). In addition, previous research emphasized that these psychological processes, as well as the interactions between marital distress and depression, elevate physiological processes and such processes often occur simultaneously or sometimes as bidirectional (Jaremka et al., 2013).

Therefore, when considering the salient role of psychological processes in marriage and health, future research needs to pay attention to bidirectional processes and especially focus on how these variables affect each other within longitudinal and dyadic contexts.

Considering gene–environment interplay. Genetic research has found that individuals' genes (genetic polymorphisms) may have an impact on shaping their behavioral trajectories when they are exposed to different environmental contexts (Caspi & Moffitt, 2006; Rutter, Moffitt, & Caspi, 2006). Incorporating genetic markers into family research seems valuable and

much needed in the future. Previous research found that certain types of genes (alleles or polymorphism) influenced individuals' susceptibility to major transitional life events, which resulted in different behavioral outcomes. Specifically, when facing a stressful retirement transition, men with genetic polymorphisms such as the Monoamine oxidase A (MAOA) and 5HTTLPR gene displayed more negative behavioral and psychological problems compared to men without this gene. In positive environmental contexts (e.g., a successful retirement transition), the same genetic variants were present, which led to positive outcomes (Belsky, Bakersmans-Kranenburg, & Van IJzendoorn, 2007). This gene seems to have influence on individuals to be more susceptible to contextual circumstances, either for better or for worse, depending on the circumstances.

In addition to gene-environment interaction effects, a risk genotype was also directly related to differences in children's antisocial symptoms as measured by negative affect, hyperactivity, and peer problems (Button, Scourfield, Martin, Purcell, & McGuffin, 2005). The outcomes suggest that genetic markers may have an influence on preexisting variances in individuals' personality and temperament that may lead to social behavioral problems. Furthermore, multiple genes may jointly and cumulatively influence individuals' lives, which may result in the effects of interplay between genes and environments multiplied as age advances (Belsky & Beaver, 2011). Future marital research should pay considerable attention to the role of genotypes in shaping middle-aged couples' lives.

Conclusion

Results from the current set of studies advances existing research by highlighting the significant impact of external stress on marriage and its multiplied effects on health outcomes in later years. The current studies delineate pathways through which biopsychosocial mechanisms

can influence health outcomes. In addition, the findings provide additional insight into how to intervene and alter a result or a sequence of hostile behaviors in couples and how to prevent and reduce the risk of developing health problems in the future. As previous researchers have emphasized the central impact of marriage on individuals' health and well-being, families' lives, and communities (Wilcox et al., 2011), marital researchers' continued attention to improving healthy marriages will positively and significantly impact many aspects of individuals' lives and our larger society as well.

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