

The influence of chronic physiological stress on financial health perceptions

by

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AN ABSTRACT OF A DISSERTATION

submitted in partial fulfillment of the requirements for the degree

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School of Family Studies and Human Services  
College of Human Ecology

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Manhattan, Kansas

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## **Abstract**

There is limited research on physiological stress in the financial planning field. While the literature shows a clear relationship between physiological stress and physical health, little is known about the relationship between physiological stress and financial health perceptions. With Lazarus and Folkman's (1984) theory of cognitive appraisal serving as the framework for this study, three multivariate regressions investigated the relationship between chronic physiological stress and financial health perceptions as measured by changes in financial satisfaction, changes in financial strain, and expectations about one's financial situation in the future.

The sample consisted of 703 individuals that were recruited from 2011-2014 to participate in the Midlife in the United States Refresher study. Based on non-imputed data, respondents were evenly split between male and female and between 25 and 76 years old with a mean age of 51 years old. Respondents were also mostly white, working, married, and had some college education. The sample reported mean household income of \$71,052 and a net worth of \$586,329. The mean salivary cortisol level was 16.06 Nanomoles per litre (nmol/L), and respondents reported better than the median score for self-reported health status. When comparing before the recession to present day, the mean responses from respondents indicated that their financial strain remained about the same, but financial satisfaction declined.

Respondents reported better than the median score for expectations about their financial future.

An ordinary least squares regression was used to model changes in financial satisfaction. A cumulative logistic regression was used to model changes in financial strain and expectations about one's future financial situation. The model results provided support for several key hypotheses formed from the theoretical framework. In particular, salivary cortisol, the proxy for chronic physiological stress, had a statistically significant negative relationship with expectations

about one's future financial situation. An increase in chronic physiological stress was associated with lower expectations about the financial future. There was not a statistically significant relationship between salivary cortisol and changes in financial satisfaction or changes in financial strain.

Given the sparse physiological stress research that exists in the financial planning field, this study provides researchers and practitioners with new information regarding the impact of chronic physiological stress on financial health perceptions. Measuring physiological stress in a non-experimental setting gives researchers a different approach to understanding the impacts of physiological stress. For practitioners, uncovering the relationship between chronic physiological stress and financial health perceptions might promote the use of stress reductions as part of holistic approach to financial planning.

*Keywords:* Physiological stress, chronic physiological stress, salivary cortisol, financial health perceptions, coping

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Approved by:

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Dr. Sonya Lutter

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## **Dedication**

When I was an undergrad, I did not take school seriously. In fact, I did not take anything seriously. At some point during my turbulent journey through undergrad, I met someone different. When I say different, I mean she was a good person, which was a rare breed for my circle of companions. For reasons I still do not quite understand today, she wanted to be around me as much as I wanted to be around her. The thing was – I did not just want to be around her – I wanted to be like her. She had a loving family, lots of friends, and was a great student. For the first time in my life, I had someone to emulate and even admire. Somehow she let me stick around long enough for her to say “Yes” and then blessed me with two beautiful children.

I have absolutely no idea where our lives will take us after this journey concludes, but I have no doubt we will get through wherever life takes us. Thank you for all of your support and sacrifices throughout this program and in life. I love you.

## **Chapter 1 - Introduction**

Psychophysiological economics is an emerging field of study within the personal financial planning field. The term psychophysiological economics refers to the assessment and evaluation of psychological and physiological events that affect the financial decision-making process, and ultimately, financial outcomes (Grable, 2013). A physiological event includes the concept of physiological stress, which is defined as the body's response to conditions or stressors produced by the environment (Lazarus & Folkman, 1984). When someone evaluates their environment and determines that something in the environment threatens their well-being, the body activates certain internal processes in response to that threat. These internal processes create biomarkers, which are biological "foot prints" that are left behind after stressful events (Vinkers et al., 2013). Biomarkers can be directly measured by researchers to observe how a person responds to stressors produced from the environment (Grable, 2013).

It is important to understand how people respond to stressors because physiological stress degrades the decision-making process, leads to poor physical health, creates social inadequacies, and is associated with poor financial behaviors and attitudes (Grable, 2013; Grable & Britt, 2012; Lazarus & Folkman, 1984). While there is a robust body of literature that covers the influence of physiological stress on the decision-making process, physical health, and social outcomes (Lazarus & Folkman, 1984), less is known about the influence of physiological stress on financial health perceptions. If non-financial factors, such as physiological stress, negatively influence financial health perceptions, there may be a gap in the current financial planning process. Establishing the relationship between physiological stress and financial health perceptions can give practitioners the awareness to promote the use of stress reductions and create plans to target the effects of physiological stress as part of holistic approach to financial

planning. The purpose of this study was to establish a relationship between chronic physiological stress and financial health perceptions.

## **Physiological Stress**

Physiological stress is categorized as either acute or chronic physiological stress. Acute physiological stress is defined as the body's response to conditions produced by the environment on a temporary basis (Lazarus & Folkman, 1984). Acute physiological stress can last anywhere from a few seconds up to a few minutes. During this short period, physiological stress can severely hinder the performance of the decision-making process. Acute physiological stress leads to myopic decisions, deteriorates memory retention, and creates an inefficient decision-making process due to the activation of a fight or flight response from the body (Grable & Britt, 2012; Masicampo & Baumeister, 2008; Porcelli & Delgado, 2009). Acute physiological stress also has a negative association with financial behaviors and financial attitudes (Britt-Lutter, Haselwood, & Koochel, 2018; Britt, Lawson, & Haselwood, 2016; Grable, Heo, & Rabbani, 2014).

Chronic physiological stress is defined as reoccurring episodes of acute physiological stress over time and can severely impact one's physical health (Schneiderman, Ironson, & Siegel, 2005). For example, chronic physiological stress is associated with accelerated aging, increased susceptibility to infectious diseases, microscopic changes in the brain, deterioration in the immune system, and even depression (Mariotti, 2015). While there is a robust body of literature that demonstrated the relationship between chronic physiological stress and physical health (Schneiderman et al., 2005), the relationship between chronic physiological stress and financial health perceptions received limited attention. The purpose of this study was to investigate the influence of chronic physiological stress, measured by cortisol levels in saliva, on three financial health perceptions. With Lazarus and Folkman's (1984) theory of cognitive appraisal serving as

the framework for this study, three multivariate regressions investigated how chronic physiological stress impacts financial health perceptions as measured by changes in financial satisfaction, changes in financial strain, and expectations about one's financial situation in the future.

### **Financial Health Perceptions**

From a personal financial planning perspective, financial health is traditionally measured with objective financial ratios such as net worth, debt to asset ratio, current ratio, emergency fund ratio, savings ratio, etc. (Dalton, Dalton, & Oakley, 2014; DeVaney, 1994). These objective ratios are meant to provide an indication of the health of one's financial situation. For example, a high net worth would presumably mean that someone was in a healthy financial situation. Conversely, a high debt to asset ratio would mean that someone is not in a healthy financial situation as they are carrying too much debt.

Although financial health is primarily measured with objective ratios, this paper measured financial health with perceptions as the theory of cognitive appraisal suggests that the effects of physiological stress on financial health would be stronger in perceptive context rather than objective context (Lazarus & Folkman, 1984). The cognitive appraisal process is predicated on whether an individual perceives a threat and that perception ultimately determines whether physiological stress creates a negative outcome. For example, suppose Person A and Person B were in a car accident. Person A, who lacks financial resources, does not experience physiological stress but Person B, who has sufficient financial resources, experiences a large amount of physiological stress. The framework would explain this phenomenon by positing that the occurrence of physiological stress depends on a person's reaction to an event, and not the objective event itself (Lazarus & Folkman, 1984). Additionally, a review of the prior literature

indicated that financial health perceptions can influence financial decisions that contribute to objective financial health outcomes (Furnham, 1984; Zepp & Heckman, 2018). Therefore, financial health perceptions, defined as the subjective assessment of one's overall financial situation, were the dependent variables of study for this research. Specifically, financial health perceptions were measured by changes in financial satisfaction, changes in financial strain, and expectations about one's financial situation in the future.

### **Brief Literature Review**

Although psychophysiological economics is similar to the fields of behavioral finance and neuro finance, psychophysiological economics is the only field to emphasize the role of the peripheral nervous system in the decision-making process (Grable, 2013). The peripheral nervous system is a set of communicative nerves that connects the spinal cord to the brain with the assistance of the autonomic nervous system (Mariotti, 2015). When people experience stressful situations, the brain and autonomic nervous system regulates body processes including blood pressure, heart rate, breathing rate, arousal, and the production of stress hormones such as the release of cortisol in saliva (Grable, 2013; Hellhammer, Wust, Kudielka, 2009). These biomarkers can be directly measured by researchers to measure the existence and severity of acute and chronic physiological stress. These measurements provide researchers with the opportunity to observe how a person responds to stressors produced from the environment and the associated outcomes.

While there is a limited body of literature with respect to the relationship between physiological stress and financial planning outcomes, the previous research that examined that relationship focused primarily on acute physiological stress and financial-decision making tasks. For example, one small experimental design found that participants under acute physiological

stress had trouble remembering key details of a financial task. When the same participants were not under acute physiological stress, their memory performed much better (Porcelli & Delgado, 2009). In another experimental design, participants under acute physiological stress were less likely to seek financial help when compared to those that were not under acute physiological stress (Grable et al., 2014). Another similar experimental design found that lower levels of acute physiological stress were associated with a greater readiness to change behavior to improve credit scores three months after an initial meeting (Britt et al., 2016).

With respect to chronic physiological stress, there is a robust body of literature that established the relationship between chronic physiological stress and physical health (Schneiderman et al., 2005). Chronic physiological stress is associated with accelerated aging, increased susceptibility to infectious diseases, microscopic changes in the brain, deterioration in the immune system, and even depression (Mariotti, 2015). Previous literature also established a relationship between physical health and financial health. For example, one study found that insufficient health and financial resources contributed to general life and financial stress (Tibbetts & Britt-Lutter, 2018). A similar study found a relationship between poor physical health, measured by body mass index, and poor financial status (Lee, 2018). Another study found that a poor health status increased the likelihood of having medical debt, which imposed a financial burden on households (Richard, Patel, Lu, & Alexandre, 2018).

The previous literature that was examined also demonstrated a relationship between physiological stress, financial health perceptions, and objective financial health outcomes. For example, one study found a negative association with physiological stress and an unhealthy attitude about one's financial situation (Grable et al., 2014). Another study found that financial attitudes shaped how people spend and save money. Specifically, people who treated saving as a

priority over spending had better overall objective financial health (Furnham, 1984). A study that used a national representative sample found that perceptions about the financial future predicted whether people were willing to delay gratification with their economic choices, including the decision to save money regularly (Zepp & Heckman, 2018). According to the economic literature, those who delay gratification with their economic choices are in a position to establish better financial health (Frederick, Loewenstein, & O'Donoghue, 2002).

While the existing literature was useful in identifying a broad relationship between physiological stress, financial decision-making, financial health perceptions, and objective financial health outcomes, a gap currently exists in the literature because the direct relationship between chronic physiological stress and financial health perceptions remains relatively unexamined. Theory rooted in the field of psychophysiological economics predicts that individuals that have experienced chronic physiological stress would carry a myopic perspective that places short-term financial needs over long-term financial needs (Grable, 2013). As a result, it was hypothesized that chronic physiological stress would have a negative relationship with financial health perceptions. This study attempted to fill the current gap in literature with Lazarus and Folkman's (1984) theory of cognitive appraisal and a large secondary dataset.

### **Theoretical Framework**

Prior to the introduction of the theory of cognitive appraisal framework, stress induced reactions were observed using a stimulus-response theory. According to the stimulus-response theory, people are presented with a stimulus and then respond to that stimulus, which produces behavior. Thus, the situation or event produced the stimulus that created stress (Spence, 1950). It was argued that the stimulus-response framework was limited given that it could not adequately explain the inconsistency in reactions from person to person (Roseman & Smith, 2001). The

theory of cognitive appraisal addressed this limitation with the introduction of the appraisal process (Lazarus & Folkman, 1984).

After the introduction of the theory of cognitive appraisal, stress was also conceptualized as a process that was determined by the maintenance of resources under the conservation of resources (COR) theory (Hobfoll, 1989). The COR theory was originally introduced as a way to study the effects of traumatic events, and therefore, focused mostly on how stress related outcomes were predicted by the preservation and loss of resources as a result of that one singular event (Hobfoll, 1989). The theory of cognitive appraisal focuses more on continuous idiographic appraisals that determine how stress affects well-being across a number of domains (Chen, Westman, & Hobfoll, 2015). Since the purpose of this study was to observe how continuous experiences of physiological stress influences financial health perceptions, the theory of cognitive appraisal was the preferred theoretical framework for this study.

The theory of cognitive appraisal posited that a person constantly evaluates their environment in order to appraise whether they feel threatened. People experience physiological stress when a situation or event in the environment produces demands that exceed their perceived ability to control the situation or event (Lazarus & Folkman, 1984). When physiological stress occurs, people shift their appraisal to evaluate available resources and coping strategies to deal with the stress. Conceptually, physiological stress negatively influences financial health perceptions, but the effects of stress can ultimately be mitigated or reduced to a minimum if people have the proper resources and coping abilities to address the situation or event (Lazarus & Folkman, 1984). Thus, the theory of cognitive appraisal incorporates both physiological and psychological constructs, which are the underpinnings of psychophysiological economic research (Grable, 2013). The theory of cognitive appraisal served as the framework for this research to

help explain the relationship between chronic physiological stress and financial health perceptions while controlling for resources and coping abilities.

## **Research Purpose and Question**

The primary objective of this paper was to examine the relationship between chronic physiological stress and financial health perceptions, as measured by changes in financial satisfaction, changes in financial strain, and expectations about one's financial situation in the future. With Lazarus and Folkman's (1984) theory of cognitive appraisal serving as the guiding framework for this study, this paper addressed the following hypotheses:

### **Hypotheses for Changes in Financial Satisfaction**

**H<sub>1</sub>:** Chronic physiological stress is associated with a decline in financial satisfaction.

**H<sub>2</sub>:** Financial stressors (e.g., bankruptcy and financial loss) are associated with a decline in financial satisfaction.

**H<sub>3</sub>:** Access to financial resources (e.g., perceived income adequacy, income, objective net worth, subjective net worth, lack of debt changes, and financial effort) are associated with an increase in financial satisfaction.

**H<sub>4</sub>:** Access to social resources (e.g., rely on family and open up to family about problems) are associated with an increase in financial satisfaction.

**H<sub>5</sub>:** Financial mastery is associated with an increase in financial satisfaction.

**H<sub>6</sub>:** Stronger preference for using problem-focused coping strategies is associated with an increase in financial satisfaction.

**H<sub>7</sub>:** Stronger preference for using emotion-focused coping strategies is associated with an increase in financial satisfaction.

## **Hypotheses for Changes in Financial Strain**

**H<sub>1</sub>:** Chronic physiological stress is associated with higher odds of reporting a higher financial strain level.

**H<sub>2</sub>:** Financial stressors (e.g., bankruptcy and financial loss) are associated with higher odds of reporting a higher financial strain level.

**H<sub>3</sub>:** Access to financial resources (e.g., perceived income adequacy, income, objective net worth, subjective net worth, lack of debt changes, and financial effort) are associated with lower odds of reporting a higher financial strain level.

**H<sub>4</sub>:** Access to social resources (e.g., rely on family and open up to family about problems) are associated with lower odds of reporting a higher financial strain level.

**H<sub>5</sub>:** Financial mastery is associated with lower odds of reporting a higher financial strain level.

**H<sub>6</sub>:** Stronger preference for using problem-focused coping strategies is associated with lower odds of reporting a higher financial strain level.

**H<sub>7</sub>:** Stronger preference for using emotion-focused coping strategies is associated with lower odds of reporting a higher financial strain level.

## **Hypotheses for Expectations about the Financial Future**

**H<sub>1</sub>:** Chronic physiological stress is associated with lower odds of reporting a higher expectation for the financial future.

**H<sub>2</sub>:** Financial stressors (e.g., bankruptcy and financial loss) are associated with lower odds of reporting a higher expectation for the financial future.

**H3:** Access to financial resources (e.g., perceived income adequacy, income, objective net worth, subjective net worth, lack of debt changes, and financial effort) are associated with higher odds of reporting a higher expectation for the financial future.

**H4:** Access to social resources (e.g., rely on family and open up to family about problems) are associated with higher odds of reporting a higher expectation for the financial future.

**H5:** Financial mastery is associated with higher odds of reporting a higher expectation.

**H6:** Stronger preference for using problem-focused coping strategies is associated with higher odds of reporting a higher expectation for the financial future.

**H7:** Stronger preference for using emotion-focused coping strategies is associated with higher odds of reporting a higher expectation for the financial future.

### **Population of Interest**

Given that physiological stress affects people of all ages, races, genders, and ethnicities (Lazarus & Folkman, 1984), the population of interest for this study was the U.S. general population. The Midlife in the United States 2011-2014 Refresher study was used for this research given that the MIDUS Refresher study recruited a U.S. national probability sample of 3,577 adults aged 25 to 76. After completing the Refresher study, respondents were given the opportunity to participate in additional assessments, including the biomarker assessment. A total of 703 (20%) respondents from the MIDUS Refresher Survey completed the Biomarker Assessment with valid salivary cortisol data.

### **Implications**

The measurement of biomarkers is an under-studied, but critical component to understanding the effects of physiological stress. For researchers involved in the field of

psychophysiological economics, this study may provide valuable insight into another way to measure physiological stress. Currently, most studies within the financial planning field have relied on acute physiological stress measurements that required small experimental designs. This study may provide opportunities for researchers to build upon the current base of the physiological stress literature by conducting additional studies using physiological stress measurements found in secondary datasets. The increase in sample size allows for stronger statistical tools that may strengthen the physiological stress literature.

While there is some literature that established the relationship between physiological stress and financial outcomes, most of the literature focused on measuring acute physiological stress while performing a financial task. There is a gap in the research that does not sufficiently target the relationship between chronic physiological stress and financial health perceptions. If the gap in literature can be filled, practitioners may consider offering stress reductions and other methods to address physiological stress in their practice as a more holistic approach to personal financial planning.

## **Summary**

The primary objective of this paper was to examine the relationship between chronic physiological stress and financial health perceptions, as measured by changes in financial satisfaction, changes in financial strain, and expectations about one's financial situation in the future. Given that the current literature does not sufficiently examine the relationship between chronic physiological stress and financial health perceptions, this study attempted to fill that gap and add to the existing physiological stress literature. With Lazarus and Folkman's (1984) theory of cognitive appraisal serving as the framework for this study, and utilizing the 2011-2014 MIDUS Refresher Survey and Biomarker Assessment datasets, three multivariate regressions

investigated the relationship between chronic physiological stress and financial health perceptions as measured by changes in financial satisfaction, changes in financial strain, and expectations about one's financial situation in the future. The results from this research are impactful for both researchers and practitioners.

## **Chapter 2 - Theoretical Framework and Literature Review**

### **Introduction**

Historically, most of the physiological stress research was performed by researchers in the medical field (Lazarus & Folkman, 1984). Specifically, a review of the current literature revealed an exceptionally robust body of literature that established the relationship between chronic physiological stress and physical and mental health outcomes (Juster, McEwen, & Lupien, 2010). In the financial planning field, there is a small, but growing body of physiological stress research. Most of the studies that were reviewed focused on the associations between acute physiological stress and some specific financial decision-making task, such as risk taking choices involving money or seeking financial help (Grable et al., 2014; Porcelli & Delgado, 2009). While this literature was useful in establishing a connection between physiological stress and the financial planning field, more research is needed to build a robust body of literature that explores a variety of financial outcomes.

The prior literature also established a relationship between general stress, health, and financial resources (Tibbetts & Britt-Lutter, 2018). There is also a growing body of literature that established a relationship between poor physical health outcomes and poor objective financial health outcomes (Lee, 2018; Richard et al., 2018). While the prior literature was extremely useful in establishing an indirect connection between physiological stress, physical health, financial health perceptions, and ultimately, objective financial health outcomes, there is a current need for research that establishes a direct relationship between chronic physiological stress and financial health perceptions. This study adds to the body of physiological stress literature within the financial planning field and attempts to fill the gap in the literature by establishing a relationship between chronic physiological stress and financial health perceptions.

## **Theoretical Framework**

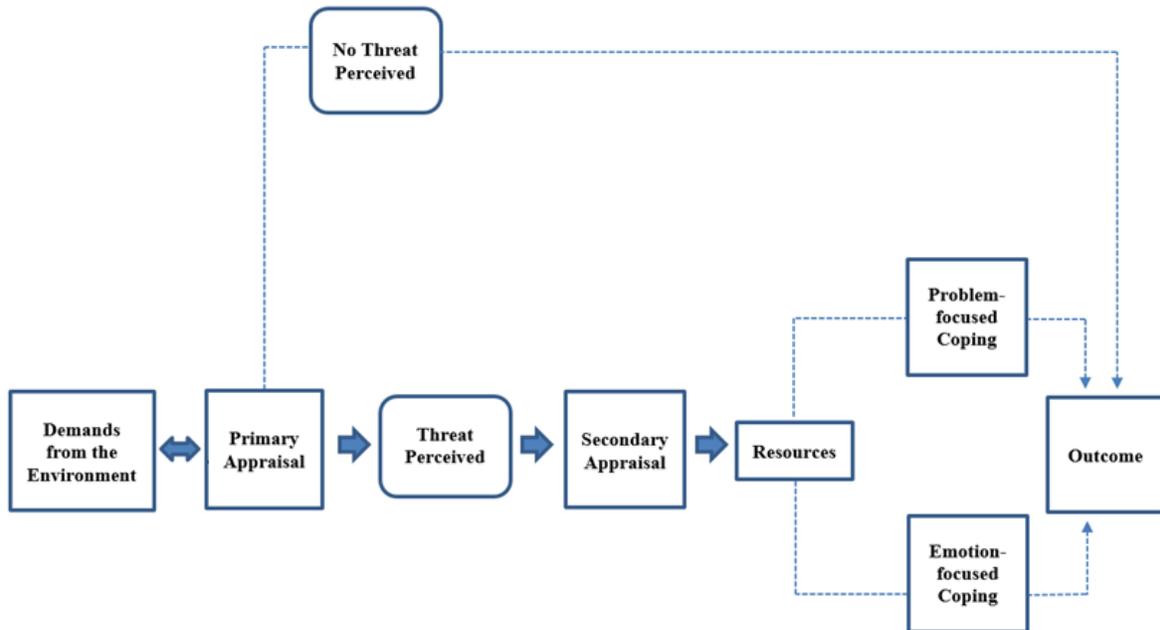
Physiological and psychological constructs are the underpinnings of psychophysiological economic research, and thus, physiological stress research (Grable, 2013). The objective of the theoretical framework for this study, the theory of cognitive appraisal, is to incorporate physiological and psychological constructs into a conceptual model that explains and predicts the impact of chronic physiological stress on financial health perceptions (Lazarus & Folkman, 1984). The theory of cognitive appraisal is a framework traditionally used in the medical and social health field to explain and predict the impact of stress on physical and mental health, morale, and social functioning outcomes (Lazarus & Folkman, 1984). Given that prior literature established a relationship between physical health and financial health, the theory of cognitive appraisal was utilized in this study to explain and predict the impact of chronic physiological stress on financial health perceptions.

The theory of cognitive appraisal posited that a person experiences stress when the demands of a situation or event exceed the perceived ability to control the situation or event (Lazarus & Folkman, 1984). Stress originates from the relationship between the environment and the person. When a situation or event in the environment produces characteristics, people appraise those characteristics to determine whether their well-being is at stake (Lazarus, 1990). The environment does not produce stressors, but rather, stress is the result of an individual's perception and appraisal of the characteristics produced by the environment (Lazarus, 1990). This phenomenon is referred to as the appraisal process.

As Figure 2.1 illustrates, there are two stages of appraisal in the framework. After a situation or event triggers characteristics in the environment, a person enters primary appraisal. After making a primary appraisal of the environment, a person may then enter into secondary

appraisal. Although these stages generally occur in a linear fashion, the appraisal processes are parallel and dynamic functions that interact with the environment on a continuous basis (Lazarus & Folkman, 1984).

**Figure 2.1. The Transactional Model of Stress and Coping**



**Primary Appraisal**

After a situation or event establishes a relationship between the person and environment, the individual enters into the primary appraisal stage. In this stage, the individual appraises the characteristics produced by the environment to determine whether there is an initial perceived danger to their well-being. There are two possible outcomes during the primary appraisal stage. One possible outcome is the individual does not perceive a threat from the environment, and therefore, stress does not occur and the individual’s subsequent behavior is not affected by stress. A second possible outcome is the individual perceives a threat and believes their well-being is at stake. If a threat is perceived, harm/loss, threat, and/or challenge appraisals are considered (Lazarus & Folkman, 1984).

Harm/loss is a retrospective appraisal of losses that already occurred (Fugate, Harrison, & Kinicki, 2011). Harm is an irrevocable loss that causes psychological damage (Lazarus, 1993b). Threat is as an anticipatory appraisal of potential losses that may occur in the future (Lazarus & Folkman, 1984). Individuals in threat appraisal perceive the potential for loss with little to be gained from the situation or event that triggered the primary appraisal (Tomaka, Blascovich, Kelsey, & Leitten, 1993). Contrary to the harm/loss and threat appraisals, individuals faced with challenge appraisals believe their well-being could be improved by engaging in the situation or event that causes their stress (Lazarus, 1993b). For example, public speaking is viewed as a challenge appraisal (Feldman, Cohen, Hamrick, & Lepore, 2004).

### **Secondary Appraisal**

When there is a primary appraisal of a harm, threat, and/or challenge, individuals move from the primary appraisal stage and into the secondary appraisal stage (Lazarus, 1999). The stages of appraisal are not indicative of timing, but rather indicative of a shift in the appraisal process (Lazarus, 1999). The appraisal process shifts from “does this affect me” to “what can I do about it” (Folkman, Lazarus, Dunkel-Schetter, DeLongis, & Gruen, 1986). Secondary appraisal is strictly a cognitive evaluation of potential resources and available coping options (Tomaka et al., 1993). A perceived lack of resources will trigger the process of seeking available coping options to deal with perception of stress (Lazarus & Folkman, 1984).

### **Resource Management**

When an individual engages in an appraisal of available resources, the purpose is to identify and utilize specific resources to meet the demands from the environment that caused stress or alter a desired outcome (Lazarus & Folkman, 1984). The available resources managed during the secondary appraisal process were generally categorized as either internal or external

resources (Lazarus & Folkman, 1984). Internal resources are considered individual or psychological competencies such as confidence, knowledge, and skills. External resources are material items such as money, time, and the assistance of other people. Although there are general categories of resources, there is no pre-defined list of available resources per person or situation as the resource appraisal process is based upon individual perceptions. The individual's perceptions about the resources that are available to meet the demands from the environment or alter a desired outcome ultimately determine the coping processes that follow (Lazarus & Folkman, 1984). In other words, how a person copes depends mostly on whether that person believes they have sufficient resources to handle their stress.

### **Coping Process**

The coping process is a fluid process of cognitive and behavioral efforts to manage stress (Lazarus & Folkman, 1984). Although resource evaluations and coping processes are dynamic, the coping process usually occurs after there is an appraisal that the demands from the environment exceeded the available resources. The way people cope depends mostly on the resources that are available to meet the demands from the environment (Lazarus & Folkman, 1984). The coping process is primarily used to regulate stressful emotions and alter the troubled person-environment relationship that is causing stress (Folkman et al., 1986). Problem-focused coping is used to alter the troubled person-environment relationship and emotion-focused coping is used to regulate stressful emotions (Lazarus, 1993b).

Problem-focused coping strategies alter the environment by focusing on the problem or issue at hand. Emotion-focused coping alters the perceptions of the demands from the environment (Lazarus, 1993b). Neither coping strategy type should be considered "better," but rather, coping should be strictly thought of as an effort to manage stress (Folkman et al., 1986).

However, some coping strategies are more effective than others at stress (Lazarus, 1999). The type of coping strategy used to manage the demands from the environment affects subsequent stress reactions (Lazarus, 1993b). If a person's relationship with the environment is altered because of the use of coping strategies, the physiological stress from the environment may also change (Lazarus, 1993b).

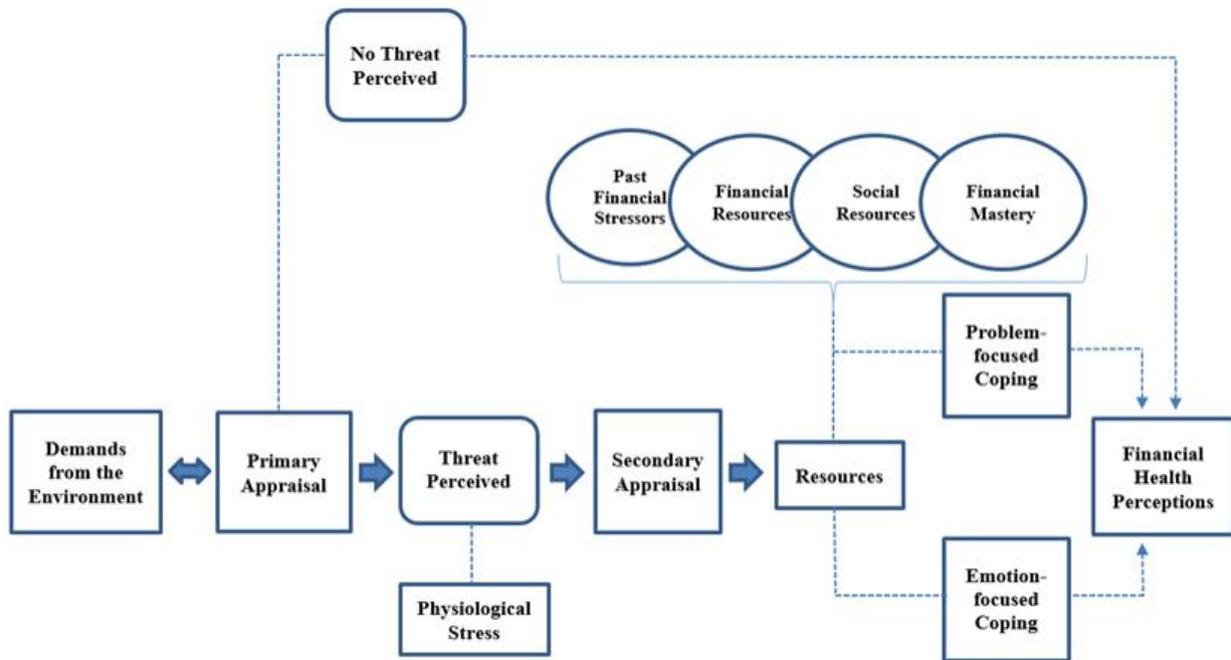
### **Conceptual Framework**

As illustrated in Figure 2.2 with the two-way arrow, the primary appraisal process involves a constant state of evaluation with the environment. Individuals interact and assess their environment on a continuous basis to determine whether there is a potential threat to their well-being (Lazarus, 1990). If a potential threat is perceived, acute physiological stress occurs (Lazarus & Folkman, 1984). Since the primary appraisal process involves constant evaluation, repeated episodes of physiological stress are possible. This concept allows for the measurement of chronic physiological stress, which is defined as reoccurring episodes of acute physiological stress over time (Schneiderman et al., 2005). Theoretically, individuals who experience higher levels of chronic physiological stress will focus on choices that meet short-term financial needs at the cost of better long-term objective financial health outcomes (Grable, 2013). Thus, individuals who experience higher levels of chronic physiological stress are more likely to have myopic financial health perspectives that hinder the type of financial decisions needed to achieve good long-term objective financial health (Grable, 2013).

If a threat is perceived and physiological stress occurs, individuals will then move into the secondary appraisal stage (Lazarus & Folkman, 1984). In the secondary appraisal stage, individuals evaluate whether they have sufficient resources to address stress (Lazarus & Folkman, 1984). If there is a perceived lack of resources and inadequate coping options,

physiological stress levels will heighten. Conceptually, higher physiological stress levels will contribute to worse financial health perceptions.

**Figure 2.2. Conceptual Model**



If individuals believe they have sufficient resources to handle stress, negative financial health perceptions should be limited (Lazarus, 1993b). If individuals do not have sufficient resources to handle stress, financial health perceptions may worsen (Lazarus, 1993b). In other words, the resources available to the individual moderate the appraisal and coping process, and thus, stress-related outcomes. These resources should theoretically relate to financial health, but they can be anything that an individual finds useful in dealing with their stress (Lazarus, 1993b).

For instance, having control over one’s finances is associated with improved financial health perceptions (Vlaev & Elliott, 2014). If an individual experiences physiological stress, having control over one’s finances is a resource that could mitigate the effects of stress. If individuals feel like they have control over their finances, their financial health perceptions are unlikely to be affected even though they experienced physiological stress. Conceptually, an

individual who perceives that they have control over their finances can rely on those resources to deal with stress. Individuals with the right types of resources to handle their stress are likely to maintain a long-term oriented financial planning perspective, which should result in long-term oriented choices that positively contribute to one's financial health. If individuals feel like they do not have control over their finances, the effects of physiological stress could actually worsen financial health perceptions. Conceptually, an individual who does not have the right resources to manage stress is likely to maintain a myopic personal financial planning perspective that leads to poor financial decisions that are short-term oriented. These types of short-sighted decisions may lead to poor financial health perceptions, which the prior literature associated with poor objective financial health outcomes (Furnham, 1984; Zepp & Heckman, 2018).

Coping strategies also moderate the appraisal process and physiological stress outcomes (Lazarus & Folkman, 1984). Individuals cope with threats to their well-being by either addressing the problem that triggered the appraisal processes or avoiding the problem and altering the perceptions of their stress (Lazarus, 1999). In the event that an individual experiences high levels of chronic physiological stress, coping processes should theoretically help mitigate the influence of physiological stress on financial health perceptions. Even if individuals lack the perceived resources needed to address their stress, the consistent use of either problem-focused or emotion-focused coping strategies can alter the myopic financial health perspective brought about by chronic physiological stress (Grable, 2013; Lazarus, 1993b). Therefore, coping is an integral construct that is likely to have a direct influence on an individual's financial health perceptions.

## **Financial Health Perceptions**

### **Definition**

A review of the prior literature revealed the existence of overlapping terms and definitions used to define or categorize the subjective assessment of one's financial situation. For example, "financial wellness" was used to describe the level of a person's financial health (Joo, 2008). According to Joo (2008), financial wellness comprises both objective and subjective financial assessments. The term "financial well-being" is another popular term used to describe the state of being financially healthy, happy, and free from worry (Joo, 2008; Vlaev & Elliott, 2013). Thus, some might consider the term "financial well-being" to be similar to financial satisfaction, which was defined as the subjective evaluation of one's financial status (Xiao, Chen, & Chen, 2014). Other researches have used the term financial well-being as an indicator of income adequacy (Piumatti, 2017). Indeed, a recent study that attempted to conceptualize financial well-being with an extensive literature review opined that there is no universally accepted definition or use of "financial well-being" (Bruggen, Hogreve, Holmlund, Kabadayi, & Lofgren, 2017). The authors pointed out that the terms "financial well-being" and "financial wellness" are used interchangeably in a way that muddies the meaning of both terms.

This study avoids using either term of financial well-being or financial wellness given the inconsistencies in how those terms were used in the prior literature. The term "financial health" seems more appropriate given that the word "health" is consistent with the terminology used by the theory of cognitive appraisal framework (Lazarus & Folkman, 1984). This paper borrows from Joo's (2008) definition of financial wellness and defines "financial health" as a broad term that includes objective and subjective financial assessments that indicate the level of a person's financial health. Thus, the term "financial health perceptions" for this paper was broadly defined

as a subjective financial assessment of one's personal financial situation. A prior study used a similar approach in using the term "financial health" in place of "financial well-being" or "financial wellness" (Britt, Klontz, Tibbetts, & Leitz, 2015).

### **Financial Health Perceptions and Objective Financial Health**

One the primary reasons why financial health perceptions were investigated as dependent variables in this study was because the prior literature that was reviewed found a strong relationship between financial health perceptions and objective financial health outcomes. For example, a nationally representative study using the U.S. Survey of Consumer Finances found that those who had positive perceptions about the future performance of the U.S. economy and their future income made more financial choices that were long-term oriented than those who did not have such perceptions (Zepp & Heckman, 2018). These long-term financial choices included buying a house, obtaining a college education, and maintaining a regular savings plan. Additionally, individuals who had vivid perceptions about their financial future made more financial choices that were long-term oriented than those who did not have vivid perceptions of their financial future (Zepp & Heckman, 2018). According to the economic literature, long-term financial choices are necessary to achieve utility maximization (Frederick et al., 2002).

A study that used a nationally representative dataset found that an individual's perception of their financial abilities predicted how much they saved, invested in risky assets, and whether they participated in retirement savings (Tang & Baker, 2016). Specifically, the authors found that subjective financial knowledge was associated with an increase in the log odds of having a savings account and saving for retirement. Additionally, the authors found that confidence increased the odds of investing in risky assets, which the authors argued would be a positive financial behavior in the context of saving for one's retirement (Tang & Baker, 2016). The

results from this study suggest that perceptions about financial knowledge and general self-confidence predict whether people save money. Saving is a core component of achieving proper financial health.

A study that surveyed the college student population at a private university, and used a causal modeling approach, found that negative money attitudes were associated with compulsive buying and credit card use (Roberts & Jones, 2011). Specifically, perceptions that money is a tool to influence and impress others was associated with an increase in compulsive buying habits, such as chronically buying items to cope with feeling sad. Additionally, feeling anxious and stressed was also associated with an increase in compulsive buying habits. Compulsive buying habits were found to be mediated by the level of credit card usage (Roberts & Jones, 2011). A similar study that focused on the mental health profession population reported similar results in the context of compulsive buying habits (Britt et al., 2015). The authors also found that unhealthy attitudes towards money status predicted negative financial health behaviors, such as people letting others taking advantage of them financially and spending money impulsively. These findings suggest that perceptions regarding the use of money and perceptions of anxiety and stress predicted whether people spent their money responsibly. Spending money responsibly is a key tenant to building and maintaining good overall objective financial health.

A study using the 1998 U.S. Survey of Consumer Finances found that perceptions about the health of one's credit card use was negatively associated with credit card use (Chien & Devaney, 2001). Specifically, respondents in the study who reported a favorable attitude toward credit use were more likely to have higher installment loans and higher credit card balances. Although the findings from this study are directionally inconsistent with the literature that was previously reviewed, the findings still suggest that perceptions related to one's financial health

are still important in determining actual financial behavior that contributes to the overall financial health of an individual.

Researchers who examined the relationship between perceptions of financial control and saving for retirement found that the perception of having control over one's finances was the most important variable in predicting positive savings behaviors, such as saving regularly and saving for retirement (Davis & Hustvedt, 2012). The researchers suggested that saving regularly and saving for retirement were strong strategies to build wealth. The results from the study also suggest that the perception of being in control of one's financial situation is positively associated with building good financial health.

A small experimental design found that individuals who perceived their net worth to be negative showed a greater willingness to incur more debt than they already had collected (Sussman & Shafir, 2012). The authors also found that 75% of the sample favored giving loans to people who perceived their net worth to be superior to others, even though their objective net worth was comparable to others (Sussman & Shafir, 2012). The results suggest that perceptions of one's subjective net worth influences whether people exhibit positive borrowing habits. Positive borrowing habits should positively contribute to one's overall financial health.

Another small experimental design that used the mental health profession population found that subjective net worth predicted financial health perceptions, money disorders, and risk planning (Britt et al., 2015). Specifically, the authors measured subjective net worth on a scale of 1 to 5 where 1 = be in serious debt and 5 = have money left over and found that higher levels of subjective net worth predicted positive financial health perceptions such as whether the respondents were saving for education needs. Additionally, the authors found that higher levels of subjective net worth predicted fewer money disorders such as spending more money than can

be afforded. Finally, the authors found that respondents who reported higher levels of subjective net worth also reported having plans in place to meet financial goals and address financial emergencies (Britt et al., 2015). The results from this study suggest that subjective net worth plays an important role in establishing financial health perceptions as well as financial behaviors associated with positive financial health outcomes.

A longitudinal study using the 1979-1994 National Longitudinal Survey of Youth found that the perception of having a negative net worth was associated with worsening depressive symptoms (Mossakowski, 2009). The perception of having a positive net worth was not statistically significant in the model. Although the dependent variable in this study was a measure of physical and mental health, the results are still consistent with the previous literature reviewed given that the existing literature established a relationship between physical health and financial health (Lee, 2018; Richard et al., 2018; Tibbetts & Britt-Lutter, 2018). Therefore, the results from this study suggest that negative financial health perceptions can worsen physical and mental health, and ultimately, negatively influence objective financial health outcomes.

Another study involving the college student population did not find a relationship between subjective net worth and several financial behaviors including paying a credit card balance in full and spending more money than earned (Sages, Britt, & Cumbie, 2013). A different study involving another college student population found that students with lower subjective net worth were more likely to seek financial counseling, which should theoretically contribute to better financial health outcomes (Britt et al., 2011). These findings contrast the findings from the previously reviewed literature that found that negative perceptions of net worth had a negative association with financial health outcomes (Sussman & Shafir, 2012). Possible explanations for the inconsistency in findings include the possibility that college students do not

have a meaningful net worth yet or they may not fully understand the implications of having a positive or negative net worth. Additionally, the college student samples used in these studies were not nationally representative, which limits comparative analyses.

The previously reviewed literature established a strong relationship between perceptions about one's financial health and objective financial health outcomes. The results from the studies reviewed suggests that financial health perceptions play an important role in shaping the financial behaviors that people perform, such as saving, which are necessary to achieve good financial health. This relationship illustrates the importance of investigating the relationship between chronic physiological stress and financial health perceptions. Additionally, the results from the prior literature revealed that there are a plethora of perceptions that an individual can maintain with respect to their overall financial health. To establish the importance of financial satisfaction, financial strain, and expectations about one's future financial situation as integral financial health perceptions in the context of objective financial health, the literature regarding these three perceptions was reviewed further.

### **Financial Satisfaction and Objective Financial Health**

Although the prior literature established a clear relationship between financial health perceptions and financial health outcomes, the literature that established financial satisfaction as an important financial health perception in that relationship was rather limited. However, the previous literature that was reviewed established a broad positive relationship between financial satisfaction and objective financial health outcomes. The findings indicate that financial satisfaction is an important predictor of positive financial health outcomes and underscores the importance of establishing and adding to the financial satisfaction literature.

For example, a study using the college student population across 15 campuses throughout the U.S. found a strong association between perceptions of financial health and financial behavior (Gutter & Copur, 2011). Specifically, the authors found a positive relationship between positive perceptions of one's financial health and a number of positive financial behaviors including budgeting, saving, not maxing out credit cards, not making late payments on credit cards, paying off credit cards at the end of each month, and avoiding compulsive purchases. Positive perceptions of one's financial health included high levels of satisfaction with one's finances and low levels of financial stress (Gutter & Copur, 2011). Another study that used a nationally representative sample found a strong association between managing finances, saving, and financial satisfaction (Xiao et al., 2014). These findings suggest that financial satisfaction is a predictor of positive financial behaviors that should theoretically result in better objective financial health outcomes.

A different study using a nationally representative sample found that financial satisfaction was positively related to the use of any financial advice, but specifically associated with seeking advice related to investing, saving, and tax planning (Robb, Babiarz, & Woodyard, 2012). A similar study focused on the determinants of financial help-seeking behavior found that financial satisfaction was positively associated with seeking financial help (Grable & Joo, 2001). Practically, seeking advice related to investing, saving, and tax planning should positively contribute to one's overall objective financial health. Conversely, low financial satisfaction or declines in financial satisfaction could have a negative influence on one's objective financial health.

## **Changes in Financial Satisfaction as a Dependent Variable**

The literature review established a broad relationship between financial satisfaction and objective financial health outcomes. However, the majority of research that involved financial satisfaction appeared to focus on financial satisfaction as the dependent variable. Indeed, there appears to be a strong framework of literature that examined the predictors of financial satisfaction across several domains (Aboagye & Jung, 2018; Joo & Grable, 2004; Loibl & Hira, 2005; Xiao & O'Neill, 2018). However, changes in financial satisfaction over time appeared relatively understudied in the financial planning literature. For example, the one study that was identified examined changes in financial satisfaction over time and found that changes in the investment asset ratio, and not just debt, were strongly associated with changes in financial satisfaction (Garrett & James, 2013). Given the evidence that changes in financial satisfaction may be associated with changes in objective financial health, using changes in financial satisfaction as a dependent variable may do a better job of isolating the economic and non-economic predictors associated with financial satisfaction as an outcome variable. This gap in literature demonstrates the importance of establishing and adding to the financial satisfaction literature, and in particular, examining the relationship between chronic physiological stress and changes in financial satisfaction.

## **Financial Strain and Objective Financial Health**

Similar to financial satisfaction, financial strain received scant attention in the financial perceptions literature. A review of the previous literature did identify studies that examined the influence of financial strain on an outcome, but most of those studies focused on mental and physical health outcomes (Price, Choi, & Vinokur, 2002; Tucker-Seeley, Li, Subramanian, & Sorensen, 2009). Additionally, the literature also identified inconsistent definitions of financial

strain. A popular definition of financial strain comes from a study that defined the term as the cognitive, emotional, and behavioral response to the experience of a financial hardship that impedes the ability of people to meet their financial obligations (Aldana & Liljenquist, 1998). The authors made the distinction between financial stress and financial strain by explicitly describing financial strain as a hardship that disrupts the capacity to meet basic financial obligations. Therefore, the literature review focused on studies that conceptualized financial strain under that definition.

A review of the literature did identify a few studies that established a relationship between financial strain and objective financial health. For example, a small study of recent mothers found that financial strain was associated with poor financial management strategies (Walker, 1996). Specifically, the authors found that mothers who were unable to meet certain financial obligations did not properly use a budget as a strategy to deal with the financial strain. Another study found that perceptions of financial strain were highly correlated with savings habits and positive savings habits predicted a decline in financial strain (Loibl, Kraybill, & DeMay, 2011). This was also the case in a study of a college student population that found a negative relationship between financial strain and saving (Hayhoe, Leach, Turner, Bruin, & Lawrence, 2000). The results from these studies suggest that financial strain impedes the use of proper saving mechanisms that are likely to positively influence objective financial health outcomes.

A study that examined the influence of family financial socialization on retirement preparedness pointed out that financial strain was almost exclusively used as a mediating factor between objective financial predictors and various mental and physical health outcomes (Payne, Yorgason, & Dew, 2014). For example, one study found that financial strain mediated the effects

between income and depression (Schultz et al., 2006). Another study found that financial strain mediated the effects of income and employment on a mother's marital happiness (Lempers & Clark-Lempers, 1997). A similar study found that financial strain mediated the relationship between financial materialism and marital satisfaction (Dean, Carroll, & Yang, 2007). These studies suggest that there is a relationship between financial strain and objective financial health outcomes, but the literature on the importance of financial strain as a predictor of financial health outcomes appeared limited.

### **Changes in Financial Strain as a Dependent Variable**

There were a number of studies that examined the influence of financial strain on mental and physical health outcomes (Price et al., 2002; Tucker-Seeley et al., 2009), but very few studies examined the causes of financial strain. Indeed, there appeared to be an implicit assumption in the literature that financial strain was purely the result of economic changes. On the surface, the implicit assumption makes sense, but given the lack of studies that examined financial strain as a dependent variable, this remains an assumption in the literature. Further, a review of the literature did not find any studies that specifically examined changes in financial strain as a dependent variable. The examination of changes in financial strain may do a better job of isolating the economic and non-economic predictors associated with financial strain as an outcome variable. This gap in literature demonstrates the importance of establishing and adding to the financial strain literature, and in particular, examining the relationship between chronic physiological stress and changes in financial strain.

### **Expectations about the Financial Future and Objective Financial Health**

Similar to financial satisfaction and financial strain, expectations about the financial future received little attention in the financial perceptions literature. A review of the previous

literature revealed several interpretations of what the construct, expectations about the financial future, measured. One study used expectations about the future performance of the economy and inflation as measures of positivity about the financial future (Zepp & Heckman, 2018). Another study similarly defined expectations about one's future financial situation as a measure of optimism about the financial future (Furnham, 1984). A different study used expectations about one's future financial situation as a measure of financial stress (Montpetit, Kapp, & Bergeman, 2015). A study using a sample of twins from the 2004-2006 MIDUS dataset used expectations about one's future financial situation as a measure of subjective financial well-being (Zyphur, Li, Zhang, Arvey, & Barsky, 2015). Even though there was some inconsistency in what expectations about the financial future measured, the literature that was reviewed consistently identified high expectations about the financial future as a positive financial health perception.

Although limited, the literature that was reviewed identified an important relationship between expectations about the financial future and objective financial health outcomes. For example, an experimental study that looked at the relationship between demographic variables, social beliefs, financial attitudes, and financial behaviors found that financial attitudes were correlated with financial behaviors (Furnham, 1984). Specifically, the author asked respondents to indicate how they expected their economic situation to change in the next five years and found that people who had high expectations about their future economic situation saved more for their future than those with low expectations. This suggests that optimism for the financial future may lead to the type of financial behaviors that ultimately improve one's overall objective financial health.

A similar study that used a nationally representative sample from the 2013 U.S. Survey of Consumer Finances yielded similar results. The authors found that positivity of the financial

future, similarity to the financial future, and vividness of the financial future all predicted low discount intertemporal choices (Zepp & Heckman, 2018). Specifically, respondents who reported that they believed the U.S. economy would perform well in the next five years were more likely to buy a home, obtain a college degree, have good health, not smoke, and save regularly. Additionally, respondents who reported that they considered the longest planning horizon to be most important horizon when thinking about planning and saving were also more likely to buy a home, obtain a college degree, have good health, not smoke, and save regularly. These decisions are generally considered low discount intertemporal decisions associated with maximizing utility. According to the economic literature, the maximization of utility is necessary to obtain good overall objective financial health (Frederick et al., 2002). The findings from this study suggest that those who are mindful and have positive expectations for their financial future are more likely to make financial decisions that benefit their overall objective financial health.

Research that examined the relationship between expectations about one's future financial situation and socio-economic status found that people in the bottom of the socio-economic status distribution (< 20%) were more likely to experience worsening expectations about their financial future than those who were at the top of the socio-economic distribution (> 80%; Gleib, Goldman, & Weinstein, 2018). The authors measured socio-economic status with several objective financial health outcomes including educational attainment, income, net worth, and unemployment. While the results from this study suggest that there is an important relationship between expectations about one's future financial situation and objective financial health outcomes, the authors did point out that directionality between the two constructs needed further examination (Gleib et al., 2018).

Another study using nationally representative data from the British Household Panel Survey found an inverse relationship between expectations about the financial future and saving (Brown, Garino, Taylor, & Price, 2005). Specifically, the authors reported that the more financially optimistic individuals were about their financial future, the less they saved. The authors suggested that the results may be consistent with a precautionary savings motive, such as saving for a rainy day (Brown et al., 2005). The results from this study contrast the majority of the findings from the previously reviewed literature, which found that higher expectations about the financial future had a positive relationship with objective financial health outcomes. Though, the varying results could be explained by the heterogeneous economic conditions of the samples that were used. Regardless, the inconsistent findings illustrate the value of adding to the literature base that examined expectations about the financial future.

### **Expectations about the Financial Future as a Dependent Variable**

The previous literature that was reviewed established a relationship between expectations about the financial future and various objective financial health outcomes. Although the literature was rather limited, the directional results from the studies reviewed were largely consistent as high expectations about the financial future were associated with positive financial behaviors, and ultimately, objective financial health outcomes. However, similar to the literature review on changes in financial satisfaction and financial strain, no studies were identified that used expectations about the financial future as a dependent variable. Given the results that connected expectations about the financial future to objective financial health outcomes, additional research on the predictors of expectations about the financial future is needed. In particular, one of the purposes of this study was to examine the relationship between chronic physiological stress and expectations about the financial future.

## **Stress and Financial Health Perceptions**

Another area that received some attention in the financial health perceptions literature is the relationship between stress and financial health perceptions. A review of the literature established a relationship between two general approaches to measuring stress and financial health perceptions. One approach that researchers used to measure stress was through a proxy of subjective financial stress where respondents self-reported how much stress they experienced as a result of their financial situation (Gasiorowska, 2014; Joo & Grable, 2004; O'Neill, Sorhaindo, Xiao, & Garman, 2005; Montpetit et al., 2015). A second approach that researchers used to measure stress was through a proxy of physiological stress (Britt-Lutter et al., 2018). Overall, the subjective measure of stress was used significantly more than the physiological stress measurement, which was limited to one small quasi-experimental study design.

The literature that was reviewed established a clear relationship between stress and financial health perceptions. For example, a study using the Notre Dame Study of Health and Well-Being dataset found that subjective financial stress was negatively associated with psychological well-being (Montpetit et al., 2015). The authors used five self-report questions with scales from one to five for each question to measure subjective financial stress. The authors found that an increase in the subjective financial stress scale was associated with worsened psychological well-being. Previous research indicated that financial health perceptions were strongly associated with overall psychological well-being (Joo, 2008). Therefore, the results from the study suggest that subjective financial stress is negatively associated with financial health perceptions.

A study using primary data collected from a mail survey of white-collar workers from a community in west Texas found that subjective financial stress was directly and negatively

associated with financial satisfaction (Joo & Grable, 2004). The authors used a single item scale from 1 to 10 to measure subjective financial stress and found that an increase in the subjective financial stress scale was associated with a decline in a similar financial satisfaction scale. Previous research indicated that financial satisfaction was positively associated with other financial health perceptions and objective financial health outcomes (Joo, 2008). Therefore, the results from this study suggest that subjective financial stress is negatively associated with financial health perceptions.

Another study that used primary data collected from a representative sample of Polish adults measured subjective financial stress with a 10-point Likert-type scale (Gasiorowska, 2014). The study examined the relationship between financial stress and subjective wealth, which was measured with three questions related to financial satisfaction, ability to make ends meet financially, and whether respondents felt their income adequately fulfilled their needs and wants. The researchers found that financial stress mediated the relationship between income and subjective wealth (Gasiorowska, 2014). Specifically, if people had higher income, they were less stressed about their finances. Additionally, the researchers found that financial stress directly influenced subjective wealth. These results suggest that subjective financial stress mediates the relationship between financial health perceptions and objective financial health outcomes. The results also suggest that subjective financial stress has a direct relationship with financial health perceptions.

Only one study was identified that included both physiological stress and financial health perceptions in its research design. Researchers examined whether couples participating in a love and money curriculum experienced reductions in physiological stress and an increase in financial satisfaction after meeting five times (Britt-Lutter et al., 2018). The researchers used declines in

skin temperature as a measure of physiological stress given that the body pulls blood away from the peripheral parts of the body when under physiological stress. This reduction in blood leads to a decrease in skin temperature on and around the hands, which can be used to proxy physiological stress. To measure declines in skin temperature, the researchers used a wristband that reported the temperature of the wrist. Although the researchers did not find a statistical change in physiological stress levels pre to post meetings, there were significant increases in financial satisfaction from pre to post meetings. Although the results from this study were useful in framing the current research design, the relationship between physiological stress and financial health perceptions were not directly examined. The lack of literature in this space emphasizes the importance of adding to the literature base that examines the relationship between physiological stress and financial health perceptions.

The previous literature that was reviewed established a relationship between subjective financial stress, physiological stress, and financial health perceptions. While the literature involving subjective financial stress was rather robust, the literature covering the relationship between physiological stress and financial health perceptions was limited to just one study. Additionally, the literature that investigated changes in financial satisfaction, changes in financial strain, and expectations about the financial future as dependent variables was also limited. The lack of literature in these spaces is one of the reasons why this study investigated the relationship between chronic physiological stress and financial health perceptions, as measured by changes in financial satisfaction, changes in financial strain, and expectations about one's financial situation in the future.

## **Conclusion**

The literature summarized above suggests that financial health perceptions can ultimately predict whether individuals make financial decisions and exhibit certain financial behaviors, such as saving, that positively contribute to their objective financial health. The positive relationship between financial health perceptions and objective financial health outcomes emphasizes the importance of identifying and understanding how financial health perceptions are influenced. In particular, the literature review revealed that changes in financial satisfaction, changes in financial strain, and expectations about one's financial situation in the future were understudied, but important predictors of objective financial health outcomes. Given the limited literature, all three of these financial health perceptions were used as dependent variables in this study.

If financial health perceptions can be altered as the literature suggests (Ramsey, 2003), then financial planners, clients, researchers, and other stakeholders can target the predictors of financial health perceptions with the intention of positively influencing objective financial health outcomes. For example, if chronic physiological stress and the resulting cognitive appraisal process described by Lazarus and Folkman (1984) negatively influences financial health perceptions, stress reductions and other targeted processes can be used to improve overall objective financial health. Given the limited scope of the relationship between chronic physiological stress and financial health perceptions, the purpose of this study was to investigate how chronic physiological stress impacts financial health perceptions as measured by changes in financial satisfaction, changes in financial strain, and expectations about one's financial situation in the future.

## **Empirical Evidence of Primary Appraisal**

From an empirical perspective, the appraisal process was mostly examined in the behavioral science fields such as health and psychology (Lazarus, 1993a). More recently, the appraisal process was used to explain the influences of emotion and coping in consumer behavior in a number of different environments (Watson & Spence, 2007). Despite the growing use of the appraisal process in consumer oriented studies, the appraisal process was not used consistently across studies (Watson & Spence, 2007). Specifically, there were inconsistencies in the terminology, the number of relevant concepts, construct measurements, and theoretical linkages between the constructs. It was also pointed out that the use of appraisal theory in consumer oriented studies is in an infancy stage and work remains to move towards a consistent framework (Watson & Spence, 2007). Therefore, past literature in the behavioral and social sciences field were used to guide the theoretical measurements of primary and secondary appraisal for this study.

### **Stress Measurements**

During the primary appraisal stage, individuals continuously interact with their environment to appraise whether a potential threat exists. If a potential threat is perceived, stress occurs (Lazarus & Folkman, 1984). Traditionally, there are two primary methods to measure stress (Grable & Britt, 2012a). Stress can be measured subjectively by asking participants to self-report how much stress they believe they are under in a specific context. Stress can also be measured objectively by measuring the body's response to conditions produced by the environment, which is referred to as physiological stress (Lazarus & Folkman, 1984). Physiological stress is a response by the body that triggers the autonomic nervous system, which

causes an increase in heart rate, increase in breathing, overproduction of sweat, and a decrease in skin temperature (Grable, 2013).

A review of the literature suggests that physiological stress measurements may be a more accurate measurement of primary appraisal. For example, in an experimental design involving 62 male college students, researchers measured the primary appraisal stage of each participant both subjectively and objectively (Tomaka et al., 1993). For the subjective measurement, participants were asked to report how stressed they felt after performing a task by indicating their stress level on a 7-point Likert-type scale. For the objective measurements, participants had their skin conductance, pulse transit time, and heart rate continuously measured throughout the experiment (Tomaka et al., 1993). To measure the appraisal process with physiological measurements, the authors used differences in baseline measurements by subtracting the data of each measure for the last minute of the pre-task rest period from the data for each minute of the corresponding task period (Tomaka et al., 1993). The authors found that changes in physiological stress measurements were more useful than subjective stress measurements for predicting stress reactions when the participants were involved in an active task, such as performing a mental arithmetic task (Tomaka et al., 1993). These results suggest that physiological stress measurements may be the preferred proxy for the primary appraisal stage.

The use of physiological stress measurements is further supported by another study that found that participants did a poor job of evaluating their own stress levels (Grable & Britt, 2012a). A quasi-experimental design was used to evaluate the ability of clients to report their stress levels accurately after a meeting with a financial adviser. Client stress levels were measured subjectively at the beginning of the meeting using a seven-question survey and objectively at the end of the meeting using a skin temperature sensor. The subjective stress

measurements were then regressed on the objective measurements to produce a differential prediction. The results showed that only 18% of participants were able to accurately evaluate their stress levels, as measured by a residual score of less than 1.0 or greater than -1.0 (Grable & Britt, 2012a). In other words, the subjective stress results did not match the objective stress results for the majority of the clients. This suggests that clients may be more or less stressed than they indicate using self-reported methods. Thus, physiological stress measurements appear to be a stronger proxy of the primary appraisal stage than subjective measurements.

### **Physiological Stress Process**

When an individual perceives a stressor produced from the environment as a potential threat, the brain and body engage in processes that cause internal organs and glands to take action as a way to defend itself from the perceived threat. The mechanism responsible for these processes is called the autonomic nervous system (ANS) (Grable, 2013). The ANS is an involuntary control system comprising a nerve pathway that is connected by two nerve cells in the spinal cord and brain. When the ANS receives information from the external environment, it responds by activating the sympathetic or parasympathetic division of the nerve pathway (Ekman, Levenson, & Friesen, 1983). The sympathetic division is responsible for the “fight or flight” response, which is best characterized as a system that quickly mobilizes the body to act against a potential threat (Ekman et al., 1983; Grable, 2013). The parasympathetic division is the antitheses of the “fight or flight” response and generally slows the body’s response to the threat. Generally speaking, the sympathetic division of the ANS is responsible for preparing the body for unusual and stressful situations while the parasympathetic division is responsible for preparing the body for more familiar situations that create arousal, such as sexual activity (Ekman et al., 1983).

When a threat from the environment is perceived, the sympathetic division of the ANS is involuntarily activated as a “fight or flight” response to the perceived threat. The activation is referred to as an involuntary activation because people generally cannot control the “fight or flight” response. Rather, people instinctively respond to the threat without rational thought, which is why physiological stress is associated with myopic and irrational decisions (Ekman et al., 1983; Grable & Britt, 2012a). As part of the activation of the sympathetic division of the ANS, the brain involuntarily instructs the heart to pump more blood throughout the body to provide additional oxygen to the brain to help its performance in dealing with the perceived threat (Jaffe-Gill, Smith, Larson, & Segal, 2008). At the same time, the sympathetic division of the ANS involuntarily floods the body with stress hormones, such as adrenaline and cortisol. These stress hormones physically prepare the body to deal with emergency action and results in an increase in overall strength, stamina, and reaction time (Jaffe-Gill et al., 2008).

As a result of the involuntary work performed by the brain and sympathetic division of the ANS, biomarkers are created. A biomarker is a biological “foot print” that is left behind after a stressful event, which allows researchers to measure the existence of both acute and chronic physiological stress (Hellhammer et al., 2009). Since the sympathetic division of the ANS is an involuntary process, biomarkers are reliably left behind after an event is perceived as stressful. For example, suppose two separate individuals are in two separate car accidents and both perceive the accident as a threat to their well-being. The sympathetic division of the ANS in both people will involuntarily activate due to the perception of a threat. However, suppose one person gets out of their car and begins taking pictures of the damage while the other person remains in the car screaming and banging on their steering wheel. Despite the polar reactions to the stressful event, both individuals experienced physiological stress because they perceived a threat to their

well-being. Therefore, both individuals will leave behind biomarkers as the result of the involuntary activation of the sympathetic division of the ANS. These biomarkers can then be measured as proxy for acute physiological stress.

When the brain instructs the heart to pump more blood, blood moves from the peripherals of the body and closer to the heart. As a result, skin temperature on the fingers and toes declines. Thus, a decline in the skin temperature of the finger is a biomarker that can be measured to identify the existence of acute physiological stress (Vinkers et al., 2013). When the heart increases in activity to pump more blood, heart rate, blood pressure, and respiration rates also increase. When blood pressure and respiration rates rise, the core body temperature also rises. When the core body temperature rises, the eccrine sweat glands are activated to cool off the body. This process generates sweat throughout the body, and in particular, the peripheral parts of the body, such as the hands and feet. When the hands and feet sweat due to the activation of the eccrine sweat glands, the skin on the hands and feet become better conductors of electricity. Therefore, increases in heart rate, blood pressure, respiration rate, and skin conductance are biomarkers that can be measured to proxy acute physiological stress (Grable & Britt, 2012b; Vinkers et al., 2013).

**Acute physiological stress measurements and outcomes.** Acute physiological stress, which can last up to a few minutes, is defined as the body's response to conditions produced by the environment on a temporary basis (Lazarus & Folkman, 1984). During this temporary basis, physiological stress can severely hinder the performance of the cognitive and emotional processes (Coates & Herbert, 2008; Lazarus & Folkman, 1984). Historically, acute physiological stress measurements were used in the medical literature to establish the relationship between physiological stress and physical and mental health outcomes (Lazarus & Folkman, 1984;

Schneiderman et al., 2005). However, there is a growing, but still limited, body of literature in the financial planning field that used biomarkers to measure physiological stress. For example, a small quasi-experimental study measured physiological stress by using a physiological assessment device about the size of a small laptop. The assessment device had skin temperature sensors that were hooked up to the participants' right forefingers during a financial meeting in an office (Grable & Britt, 2012a). Declines in the skin temperature of the participant's fingers were used as a biomarker to proxy whether the participant experienced physiological stress during the meeting. The researchers found that acute physiological stress led to myopic decision-making and "fight or flight" responses (Grable & Britt, 2012a).

A small counseling study used a similar physiological assessment device to measure skin temperature on the finger tips as a biomarker proxy for physiological stress (Britt et al., 2016). The authors found that lower levels of physiological stress were associated with a greater readiness to change behavior to improve credit scores three months after an initial meeting (Britt et al., 2016). A similar quasi-experimental study used a similar physiological assessment device to measure declines in skin temperature on the finger as a biomarker proxy for physiological stress (Grable et al., 2014). The authors reported that declines in skin temperature were associated with a decline in the likelihood to seek financial planning assistance from professionals.

With recent technological advances, researchers upgraded their bulky physiological assessment devices to sleeker devices. One key advantage to using a sleeker and nondescript assessment device to proxy physiological stress is that participants may forget they are being measured, which could help reduce the bias that comes from laboratory-type studies. For example, a small counseling study used a wristband similar in size to a Fitbit to measure skin

temperature changes on the wrist during a five-week study (Britt-Lutter et al., 2018). The researchers used the wristband during a series of meetings in which participants received education through a formal program. The authors reported that the average skin temperatures rose from the first meeting to the fifth meeting, which suggested that there was a decline in physiological stress when the participants received more education through the program (Britt-Lutter et al., 2018). However, physiological stress was not statistically significant in any of the models that predicted financial or relationship stress at the last meeting.

Another small quasi-experimental study used a different approach to proxy physiological stress by measuring physiological stress with the skin conductance biomarker (Grable & Britt, 2012b). The researchers attached skin conductance activity sensors to participants' middle fingers during a financial meeting. The sensor contained electrodes that passed tiny electric charges back and forth on the skin of the finger. As participants became more physiologically stressed, the conductance of their skin increased and the sensor reported the increase in activity. Therefore, the researchers used increases in skin conductance activity as a biomarker proxy for physiological stress. The study found that men and women experienced physiological stress after viewing financial news (Grable & Britt, 2012b). A similar study that focused on behavior by couples during a financial planning meeting also used skin conductance activity as a biomarker proxy for physiological stress and found that couples who experienced higher levels of physiological stress were more likely to report intention to seek future financial planner services. Couples who experienced less physiological stress during the meeting reported less intention to seek future financial planner services (Ford, Grable, Kruger, & DeGraff, 2017).

Another small experiment used ice water to emulate physiological stress during financial decision-making tasks involving memory (Porcelli & Delgado, 2009). Specifically, participants

had their dominant hand immersed in ice-cold water (4 °C) to simulate acute physiological stress. The researchers cited previous literature that found that ice water can stimulate the physiological stress process by increasing the heart rate and decreasing the skin temperature of the hand. Both of these biomarkers were used to proxy whether participants were experiencing physiological stress. Participants who were under physiological stress performed the recognition memory task worse than those who were not under stress (Porcelli & Delgado, 2009). Therefore, the results of this study suggest that acute physiological stress can impact the decision-making process necessary to make sound and long-term oriented financial decisions to obtain adequate financial health.

A unique experimental study of 10 professional stock traders measured five different physiological stress biomarkers to assess whether physiological stress influenced the decision-making process during the course of trading securities (Lo & Repin, 2002). The researchers attached a bio-assessment device to 10 professional stock traders and measured skin temperature, skin conductance, blood pressure, heart rate, and respiration rate while the stock traders traded stocks. The researchers found that when there was a market event, defined as either a deviation in the general movement of the stock prices or a reversal in stock price trends, the traders experienced a statistically significant increase in skin conductance and blood pressure. At least one point throughout the trading day, each trader experienced a statistically significant increase in all of the biomarkers except for respiration rate (Lo & Repin, 2002). The results from the study suggest that certain acute biomarkers may be more spurious in measurement.

A similar study of professional stock traders on the London trading floor followed 17 traders for eight consecutive business days to observe whether professional traders experienced physiological stress when taking financial risks during certain market events (Coates & Herbert,

2008). The researchers took saliva samples from traders twice a day to measure cortisol levels as a proxy for physiological stress. The study found that the traders' cortisol levels increased when faced with variances in trading results and volatility in the market. The researchers explained that the rise in cortisol levels indicated that the traders experienced physiological stress when faced with financial decisions involving risk. When traders experienced physiological stress, they made irrational decisions with their trading strategies that they normally did not make when not under stress (Coates & Herbert, 2008). The results from this study were consistent with other physiological stress studies in other fields that found that physiological stress negatively impacted the efficacy of the decision-making process (Masicampo & Baumeister, 2008; Shapiro & Burchell, 2012; Starcke & Brand, 2012).

The literature summarized above established a strong relationship between physiological stress and negative financial outcomes. In particular, the literature indicated that physiological stress was associated with myopic decisions, poor memory, help avoidance, barriers to change financial behaviors, and an overall decline in the performance of the decision-making process. While the reviewed literature was critical in establishing a baseline foundation for studying the relationship between physiological stress and financial outcomes, there were some limitations in the literature that are worth noting. Most of the studies that were reviewed were small quasi-experimental studies that lacked a proper control group. Therefore, the analyses may not be as strong due to lack of randomization and threats to internal validity (Babbie, 2016).

Another limitation in the literature was the use of acute physiological stress measurements during laboratory-type settings. Laboratory-type settings can cause misleading spikes in physiological stress data that can confine genuine signals in the acute physiological stress data (Lo & Repin, 2002). Additionally, the acute physiological stress experienced by

participants during the study may have been caused by something other than the independent and dependent variables of interest. For example, a participant may have had elevated blood pressure due to a family problem that had nothing to do with the study. When the researchers measured the participant's blood pressure, it is possible that incorrect inferences related to the study may have been drawn by the researcher.

In conclusion, the literature that was reviewed was vital in identifying a broad relationship between acute physiological stress and financial outcomes. However, a gap currently exists as chronic physiological stress received little to no attention in the financial planning literature. Given that the purpose of this study was to establish a relationship between chronic physiological stress and financial health perceptions, the literature on chronic physiological stress was reviewed. Since there is little to no literature on chronic physiological stress in the financial planning field, a brief review of the literature in the health and related behavioral sciences fields was performed.

### **Chronic Physiological Stress Process**

When an individual perceives something in the environment as a potential threat, the sympathetic division of the ANS is involuntarily activated (Ekman et al., 1983). When the sympathetic division of the ANS is activated, the brain and body engage in processes that cause internal organs and glands to take action to prepare the body for response (Grable, 2013). As part of this process, the hypothalamic-pituitary-adrenal axis (HPA axis) floods the body with stress hormones, such as adrenaline and cortisol, to “numb” the body and brain (Bozovic, Racic, & Ivkovic, 2013). From the brain's perspective, stressful events are threats to survival and can cause serious long-term damage to the psyche so the HPA axis floods the body and brain with stress hormones as a survival mechanism (Jaffe-Gill et al., 2008; Klontz & Klontz, 2009). As

collateral damage, the release of stress hormones prevents the decision-making process from accessing the highest levels of the brain. As a result, people make myopic and irrational decisions and have trouble remembering the finer details of stressful events (Gunlicks-Stoessel & Powers, 2009; Klontz & Klontz, 2009).

These stress hormones released by the body are additional biomarkers that can be measured as a proxy for acute physiological stress. Additionally, some stress hormones persist in certain parts of the body even after a stressful event concludes, which allows researchers to proxy for chronic physiological stress, defined as reoccurring episodes of acute physiological stress over time (Schneiderman et al, 2008). For example, when the HPA axis floods the body and brain with stress hormones, cortisol, a neurohormone, is released from the hypothalamus, which is a small region of the brain located near the pituitary gland (Sharpley et al., 2016). Cortisol then moves into the pituitary gland before making its way into the blood stream. When someone experiences acute physiological stress, cortisol levels will elevate temporarily throughout the body until the stressful event concludes (Sharpley et al., 2016).

Cortisol is a popular biomarker to proxy for physiological stress because “free cortisol” is released throughout the body (Hellhammer et al., 2009). When cortisol is released by the body, 95% of the hormones bind to carriers in the body, making it difficult to measure. However, 5% of the cortisol “freely” travels the body without binding to carriers and ends up in certain bodily fluids, such as blood, urine, and saliva. Researchers are then able to take blood, urine, and saliva samples to measure the level of “free cortisol” found in the fluids. Higher levels of free cortisol indicate a higher severity of physiological stress (Clemens & Hellhammer, 1999).

**Chronic physiological stress measurement.** The most popular methods for measuring free cortisol are through blood, urine, and saliva due to the simplistic nature of collecting these

types of samples from people (Hellhammer et al., 2009). While free cortisol levels in blood and urine are valid methods for measuring free cortisol, and thus, physiological stress, salivary biomarkers have a unique advantage over the aforementioned biomarkers (Hellhammer et al., 2009). When free cortisol ends up in saliva, there are unique molecular properties in both cortisol and saliva that create molecular compatibility. When molecular compatibility is achieved, the molecular properties persist indefinitely. Thus, when free cortisol ends up in saliva, the cortisol properties permanently persist in the saliva, which creates a unique biomarker defined as salivary cortisol (Kirschbaum & Hellhammer, 1994; Sharpley et al., 2016). This biomarker provides researchers with the ability to measure the existence and severity of reoccurring episodes of acute physiological stress over time, otherwise defined as chronic physiological stress (Kirschbaum & Hellhammer, 1994; Sharpley et al., 2016). Higher levels of salivary cortisol indicate a higher severity and exposure to chronic physiological stress.

Another advantage that salivary cortisol has over other cortisol biomarkers is that the molecular compatibility between cortisol and saliva provides a stable reading that limits false positives (Liu, Clarke, Funder, & Engler, 1994). For example, salivary cortisol levels are unaffected by saliva flow rate whereas urinary cortisol is affected by urinary rate and other bodily processes (Kirschbaum & Hellhammer, 1994). According to the literature, only a few events were noted as potential issues that can cause false positives when reporting salivary cortisol levels. One notable example is Cushing Syndrome, which is a medical condition that can cause a person to have elevated salivary cortisol levels unrelated to physiological stress (Liu et al., 1994). Additionally, salivary cortisol levels tend to be relatively consistent throughout the day except after waking up and eating. Therefore, researchers recommend taking multiple

salivary cortisol levels throughout the day to ensure that the readings are not elevated for those reasons (Hellhammer et al., 2009; Liu et al., 1994)

From the perspective of the theory of cognitive appraisal, chronic physiological stress is the optimal proxy of the primary appraisal stage when compared to subjective and acute stress measurements (Lazarus & Folkman, 1984). When comparing chronic physiological stress measurements to subjective measurements, previous research indicated that objective measurements of physiological stress were more accurate than subjective measurements (Grable & Britt, 2012a; Tomaka et al., 1993). When comparing chronic measurements to acute measurements, chronic measurements may be stronger due to the nature of the primary appraisal process. According to the theory of cognitive appraisal, the primary appraisal process is a constant and reoccurring evaluation between the person and environment to determine if the person's well-being is at stake (Lazarus & Folkman, 1984). While an acute measure of physiological stress is an acceptable proxy, acute physiological stress is an isolated event and may not do an adequate job of capturing the reoccurring evaluation between the person and environment.

Since chronic physiological stress measures reoccurring episodes of acute physiological stress, chronic measures may do a better job of measuring the reoccurring nature of the primary appraisal process. Additionally, without a robust experimental design, acute physiological stress measurements can be misleading because someone can experience acute physiological stress during the assay period for a reason unrelated to the observation of the dependent variable. Since chronic physiological stress measurements proxy events that occurred before the assay, there is stronger evidence of causality between chronic physiological stress and the dependent variable. However, the measurement of chronic physiological stress with salivary cortisol levels is limited

to time of measurement. Individuals may have higher or lower salivary cortisol levels based on events that occurred much earlier in life. Given the preponderance of evidence, this study used salivary cortisol as the proxy for chronic physiological stress.

**Chronic physiological stress outcomes.** A review of multiple search engines for peer-reviewed articles did not identify any traditional financial planning studies that examined chronic physiological stress as a primary variable of interest. Based on the literature review, chronic physiological stress was mostly studied in the medical and social health literature. For example, researchers that conducted a robust literature review on salivary cortisol as a biomarker for chronic physiological stress found six studies in the medical field that supported the use of salivary cortisol as a biomarker for chronic physiological stress (Bozovic et al., 2013). In particular, the review found that work place stress, unemployment, detention, living in the vicinity of a nuclear plant, and breast cancer increased basal salivary cortisol levels. The researchers also conducted a meta-analysis and determined that average salivary cortisol levels in healthy subjects ranged from 5.52 Nanomoles per litre (nmol/L) to 28.92 nmol/L in the morning and 1.10 nmol/L to 11.32 nmol/L in the afternoon (Bozovic et al., 2013).

Another meta-analysis reviewed 107 studies from a total of 119 published manuscripts and concluded that the 107 studies focused on combat/war experience, physical or mental abuse, death or loss of a major relationship, caregiving experiences, natural disasters, and job loss outcomes (Miller, Chen, & Zhou, 2007). The authors found that that the type of stressor, the emotions that were elicited by the stressors, and the controllability of the stressor played an important role in the severity of the influence that chronic physiological stress had on the respective outcome variable (Miller et al., 2007). The results from the meta-analysis were consistent with the main tenants of the theory of cognitive appraisal, which suggested that the

type of stressor, coping ability, and resources available to handle stress ultimately influences the severity of the outcome caused by physiological stress (Lazarus & Folkman, 1984).

A longitudinal study of 195 young adults measured chronic physiological stress using an allostatic load, which is an index of biomarkers combined into one variable (Evans & Schamberg, 2009). The allostatic load consisted of blood pressure, body mass index, epinephrine, and urinary cortisol measurements. The researchers found that chronic physiological stress experienced during childhood mediated the negative relationship between childhood poverty and working memory in young adults. Specifically, chronic physiological stress was associated with a decline in the performance of working memory in low-income adults (Evans & Schamberg, 2009). The authors argued that chronic physiological stress influenced working memory, which contributed to the income gap in their sample.

A small study of 107 patients in the medical literature used salivary cortisol as a proxy for chronic physiological stress and found that chronic physiological stress was highly correlated with depression in prostate cancer patients (Sharpley et al., 2016). Specifically, patients who had prostate cancer but did not feel depressed had salivary cortisol levels that were consistent with healthy patients. Patients who had prostate cancer and reported depressive symptoms had statistically significantly higher salivary cortisol levels. Consistent with the previously reviewed meta-analysis, the researchers reported that a healthy salivary cortisol level was approximately 17 nmol/L (Sharpley et al., 2016). Two similar studies of patients with anxiety disorders found that chronic physiological stress was a significant contributor to social phobia and depression (Condren, O'Neill, Ryan, Barrett, & Thakore, 2002; Young, Abelson, & Cameron, 2004).

A study of 187 opposite-sex couples who had been involved in a relationship for at least two months examined the influence of chronic physiological stress and coping strategies on

relationship conflict (Gunlicks-Stoessel & Powers, 2009). The researchers used salivary cortisol to proxy for chronic physiological stress and used several collection periods to reduce spurious readings from the samples. The study found that social support and emotional coping limited the amount of chronic physiological stress experienced as the result of relationship conflict (Gunlicks-Stoessel & Powers, 2009). A similar study of married couples found that chronic physiological stress was associated with negative and hostile behaviors during marital conflict (Robles & Kiecolt-Glaser, 2003). The authors suggested that chronic physiological stress reduced cognitive and emotional functioning in the brain, which led to a severe decline in the cognitive and emotional ability to approach marital problems rationally (Robles & Kiecolt-Glaser, 2003). These findings were consistent with the chronic physiological stress literature that found that repeated activation of the HPA axis was associated with cognitive and emotional performance deficiencies (Bozovic et al., 2013).

**The complexity of cortisol as a biomarker.** The majority of literature that was reviewed revealed a negative relationship between chronic physiological stress and physical, mental, and social health outcomes. In particular, it is clear from the literature that chronic physiological stress, measured with cortisol levels, causes an array of negative physical, mental, and social problems. However, some of the literature that focused specifically on cortisol as a biomarker for physiological stress revealed some inconsistent findings that added to the complexity of cortisol as a biomarker for stress. Some research questioned whether cortisol was strictly an unhealthy hormone and whether the presumed directional relationship between cortisol reactivity and stress was reliable (Shirtcliff, Peres, Dismukes, Lee, & Phan, 2014).

Specifically, prior research indicated that cortisol can be used in a beneficial context to help the body recover from an array of illnesses. For example, cortisol is commonly found in

certain medications used to treat skin conditions, inflammation, and other serious medical issues such as Crohn's disease (Irving, Gearry, Sparrow, & Gibson, 2007; Schöfer & Simonsen, 2010; Verbov, 1976). Synthetic cortisol is used in inhalers to help children overcome asthma problems and administered to infants suffering from life-threatening physical developmental issues (Derendorf, Nave, Drollmann, Cerasoli, & Wurst, 2006; Subhedar, Duffy, & Ibrahim, 2007). These applications suggest that cortisol may not always be an unhealthy stress hormone and may have positive health benefits. However, it is important to note that the release of cortisol in these applications were systematically controlled to limit the amount of cortisol intake. When the body releases cortisol as part of the HPA-axis response, there is no bodily process that limits the release of cortisol so that only a "healthy" or controlled amount of cortisol is released (Hellhammer et al., 2009). Therefore, the presence of salivary cortisol could still be indicative of an unhealthy level of cortisol due to physiological stress.

Traditionally, it was expected that an increase in cortisol would be associated with a negative event (Hellhammer et al., 2009). However, some of the research that was reviewed in the psychology literature found some inconsistent findings related to that directional relationship. For example, one experimental study found that acute cortisol levels actually declined during parent-child conflict (Shirtcliff, Zahn-Waxler, & Klimes-Dougan, 2005). Other studies also reported similar findings when observing participants engaged in marital conflicts (Kiecolt-Glaser, Bane, Glaser, & Malarkey, 2003). Another set of studies found that cortisol acutely rose in participants when they were engaged in fun and exciting activities such as sports and social gatherings (Bateup, Booth, Shirtcliff, & Granger, 2002; Lovallo, 2006). From a medical context, these findings contradict the working theory that cortisol is released and increases when negative stressors occur. However, a majority of these studies used acute cortisol levels in their research

designs. Salivary cortisol, the preferred biomarker for this study, is not a measure of acute cortisol, but rather, a measure of basal cortisol levels accumulated over the life span.

Some of the literature that focused on basal (i.e., chronic) levels of cortisol also reported some inconsistent findings that deviated from the assumed cortisol reactivity relationship from the medical literature. For example, several studies found high basal cortisol levels in females who had a high number of social relationships, attentive mothers, and people who had strong emotional connections with others (Booth, Granger, & Shirtcliff, 2006; Buchanan, Bagley, Stansfield, & Preston, 2012; Taylor, 2002). Conversely, some studies found that participants with extreme mental and emotional problems reported unusually low basal cortisol levels compared to healthy participants (Shirtcliff & Essex, 2008; Shirtcliff, Granger, Booth, & Johnson, 2005). These findings contradict the working theory that people with low levels of basal cortisol had relatively stress-free life experiences when compared to those with higher levels of basal cortisol.

One study in particular offered a potential explanation for the inconsistent findings related to basal cortisol levels. The traditional assumption in the medical literature suggested that low basal cortisol levels indicated that people experienced less physiological stress because they were able to recover from the activation of the HPA-axis better than those with high basal cortisol levels (Tackett et al., 2014). However, the authors suggested that low basal cortisol levels in participants who should theoretically have higher basal cortisol levels could be caused by a superficial early HPA-axis termination. The authors explained that people under extreme stress may experience a physiological disengagement with their environment, which allows them to avoid pro-longed exposure to the HPA-axis process responsible for releasing cortisol. Therefore, basal cortisol levels would not accurately capture these individuals who clearly

experienced stressful and traumatic events (Tackett et al., 2014). This potential explanation was supported by a separate study that found that girls who were sexually abused as children reported unusually low levels of basal cortisol when compared to girls who did not experience the same trauma (Trickett, Noll, Susman, Shenk, & Putnam, 2010).

Based on the literature described above, it appeared that the interpretation of basal cortisol levels required knowledge one's life history and the timing, context, and presence of prior stressors (Shirtcliff et al., 2014). However, in the absence of these known parameters, one study argued that basal cortisol levels could still be interpreted with reliability and accuracy regardless of context (Kirschbaum, Pirke, & Hellhammer, 1993). The study used a popular stress reactivity test of the autonomic nervous system and found proper cortisol reactivity in 70% of participants on average. Put another way, the research indicated that, on average, low basal cortisol levels were associated with the absence of repeated instances of physiological stress, and high basal cortisol levels were associated with the experience of repeated instances of physiological stress (Kirschbaum et al., 1993). In further support of the salivary cortisol variable, the prior studies that found an inconsistent relationship between stress and basal cortisol levels used samples with unusual demographic characteristics, such as personality disorders or samples that had experienced atypical trauma. Given that the sample for this research project was drawn from a national probability sample, it was expected that this sample would produce similar results as the study that found that 70% of people, on average, reliably produce basal cortisol levels in a manner consistent with the traditional cortisol reactivity process.

### **The Reciprocal Relationship of Stress**

In addition to the complexity of the cortisol biomarker, a review of the stress literature found a consistent critique of cross-sectional research designs aimed to study the effects of stress

on an outcome. Specifically, it was argued that cross-sectional research designs limit insight into the causal direction of stress effects on an outcome because of the reciprocal nature of stress (Meier & Spector, 2013; Zapf, Dormann, & Frese, 1996). A summary of the research that was reviewed indicated that stress is a phenomenon that impacts a number of life domains, and those domains most likely have a two-way causal relationship with stress. For example, one study found that economic strain in childhood influenced the basal levels of salivary cortisol in children (Blair et al., 2011). Another study found that chronic physiological stress, measured with salivary cortisol levels, influenced financial strain brought about by job loss (Miller et al., 2007). According to the stress literature, these two findings would raise a number of questions related to the interpretation of the causal relationship between economic strain and stress.

One possible interpretation of the two studies is that economic strain in childhood led to physiological stress, which caused a myopic viewpoint. This viewpoint led to poor choices that eventually led to job loss and economic strain. Another potential interpretation is that economic strain from childhood led to economic strain in adulthood, which then caused physiological stress. Physiological stress then caused poor choices that led to additional economic strain. It could even be argued, given the findings related to children, that salivary cortisol is a proxy for economic strain and using salivary cortisol as a variable to study the effects on economic strain is circular in nature. Without discrete timing effects, one could argue that stress and economic strain may have a reciprocal or circular relationship. Thus, establishing a clear causal relationship with stress in a cross-sectional research design requires a careful methodological approach (Meier & Spector, 2013; Zapf et al., 1996).

The present study attempted to address this reciprocal and circular relationship by using dependent variables with discrete timing effects. For example, the variables used to measure

changes in financial satisfaction and changes in financial strain occurred between 2008 and 2014. Since salivary cortisol, the proxy for chronic physiological stress, is a measurement of physiological stress in the past and over the life span, there is stronger evidence to suggest that chronic physiological stress occurred first and then the change in financial satisfaction and financial strain occurred second. Similarly, the variable used to measure expectations about the financial future represented a present day perception about something that might happen in the future. Given that salivary cortisol is a measurement of physiological stress from the past and all three dependent variables had discrete time effects near the present, there is some evidence of a causal relationship between chronic physiological stress and the financial health perceptions of study.

Although longitudinal data would be the preferred mechanism for strengthening the directional relationship between chronic physiological stress and financial health perceptions, no such secondary dataset exists. If salivary cortisol levels during childhood or other parts of the life cycle were available, it would be possible to isolate spurious and genuine salivary cortisol level changes to strengthen the relationship between chronic physiological stress and financial health perceptions. In the absence of longitudinal data, the present study used dependent variables that had discrete timing effects to help address the common critique of reciprocation involved in cross-sectional research designs and stress outcomes. Although chronic physiological stress and financial health perceptions may still have a reciprocal relationship, isolating the timing of the variables associated with the measurement of chronic physiological stress and financial health perceptions should help reduce that critique.

## **Conclusion**

The literature review summarized above highlights the importance of establishing proper measurement of the primary appraisal stage of the theory of cognitive appraisal. Historically, the primary appraisal stage was measured with subjective measures of stress and acute measures of physiological stress. Although both types of measurements were important in establishing the literature on the role of the primary appraisal stage in predicting stress outcomes, both measurements have limitations. Chronic physiological stress measurements with salivary cortisol appear to be a stronger method for measuring the primary appraisal stage given that chronic physiological stress and the primary appraisal stage are both reoccurring in process.

The literature review also highlighted the importance of studying chronic physiological stress given its association with an array of negative physical, social, and mental health outcomes. However, the literature on chronic physiological stress was critically limited in the financial planning field. This study attempted to fill that gap by building on the existing, but limited, acute physiological stress literature in the financial planning field. The purpose of this study was to establish a relationship between chronic physiological stress and financial health perceptions.

## **Empirical Evidence of Secondary Appraisal**

After there is a primary appraisal of a harm, threat, and/or challenge and stress occurs, individuals move from the primary appraisal stage and into the secondary appraisal stage (Lazarus, 1999). The appraisal process shifts the appraisal from “does this affect me” to “what can I do about it” (Folkman et al., 1986). During this shift in appraisal, a cognitive evaluation of potential resources and available coping strategies occurs to deal with the stress (Tomaka et al., 1993). A key tenant to this process is that the evaluation of resources does not necessarily relate

to the stressor produced by the environment, but rather, the outcome of interest (Lazarus & Folkman, 1984). A review of the literature identified very few peer-reviewed studies that used changes in financial satisfaction, changes in financial strain, and expectations about one's financial situation in the future as dependent variables. Therefore, a broader literature review was performed to identify potential resources that were associated with general financial health perceptions. The literature review identified five broad categories of resources associated with financial health perceptions: (a) financial stressors, (b) financial resources, (c), social resources, (d) financial mastery, and (e) demographic variables.

### **Financial Stressors**

The literature that was reviewed found that financial stressors were negatively associated with financial health perceptions. For example, a study of 220 clerical workers from west Texas found that financial stressors were negatively associated with financial satisfaction (Joo & Grable, 2004). Specifically, the financial stressor measurement consisted of 24 consumer choice situations, such as bankruptcy and severe financial loss. A path analysis revealed that financial stressors were negatively and indirectly associated with financial satisfaction, which indicated that more financially stressful events predicted a lower financial satisfaction (Joo & Grable, 2004).

### **Financial Resources**

The literature that was reviewed found that an array of objective financial resources were positively associated with financial health perceptions. For example, the Joo and Grable (2004) study found that income adequacy, measured by whether respondents had enough income to meet needs, positively predicted financial satisfaction. A thorough literature review of the financial health perceptions literature found that motivation and effort to manage and develop

one's finances was positively associated with financial health perceptions (Bruggen et al., 2007). Not surprisingly, income and objective net worth positively predicted subjective net worth (Gasiorowska, 2014). Adjacently, another study found that a \$1 increase in objective wealth raised net worth perceptions by only \$0.27 (Zagorsky, 2000). Several other studies found that income, objective net worth, and specifically, debt changes, were positively associated with an array of financial health perceptions including the perception that one would seek financial help when needed, retirement satisfaction, financial preparedness, and subjective well-being (Asebedo & Seay, 2014; Britt et al., 2015; Headey & Wooden, 2004; Lersch, 2017; Sussman & Shafir, 2012).

A study using the Notre Dame Study of Health and Well-Being dataset supported some of the previous literature identified above (Montpetit et al., 2015). Specifically, the authors found that income inadequacy and a lack of effort put into one's current financial situation were negatively associated with psychological well-being, and therefore, financial health perceptions (Joo, 2008; Montpetit et al., 2015). The results from the literature summarized above suggest that income adequacy, effort that goes into one's financial situation, income, subjective assessments about debt changes, subjective net worth, and objective net worth are potential resources associated with predicting financial health perceptions.

### **Social Resources**

A review of the literature also found that social resources played an important role in predicting financial health perceptions. For example, a study using a nationally representative sample of the U.S. retired population found that family support was positively associated with reporting higher retirement satisfaction (Asebedo & Seay, 2014). Family support was measured with two questions that asked respondents whether they can rely on family members to help

them with serious problems and how much respondents feel like they can open up to family members about their worries. The authors noted that retirement satisfaction was strongly associated with other economic aspects (Asebedo & Seay, 2014), which suggests an association with financial health perceptions. The results from this study suggest that relying on family members to help with problems and opening up to family about worries are potential resources associated with predicting financial health perceptions.

### **Financial Mastery**

The literature also found a strong positive association between financial mastery and financial health perceptions. For example, a study of 540 Polish adults found that financial control moderated the effect of objective net worth on subjective net worth (Gasiorowska, 2014). Financial control was measured with a series of questions that measured the ability to budget, monitor, and control one's financial situation (Gasiorowska, 2014). A study using a nationally representative sample of the U.S. used perceptive control over one's finances as a financial health perception to predict socio-economic status (Glei, 2018). Another study found that a lack of control over one's current financial situation was negatively associated with psychological well-being (Montpetit et al., 2015). Previous research indicated that financial health perceptions were strongly associated with overall psychological well-being (Joo, 2008).

A study that attempted to create a conceptual model of financial well-being found that perceived behavioral control was positively associated with financial health perceptions (Shim et al., 2009). The authors measured perceived behavioral control using three questions that measured the respondent's ability to control their financial situation by spending money wisely, staying within a budget, and saving for the future. Two more similar studies also found that control over one's finances was associated with improved financial health perceptions (Vlaev &

Elliott, 2014; Zyphur et al., 2015). The studies summarized above suggest that financial mastery, defined as the perception of control over one's financial situation, is a potential resource associated with predicting financial health perceptions.

### **Demographic Variables**

The literature review also identified several demographic variables that were used as control variables when predicting financial health perceptions. One study found that education, homeownership, and the number of financially dependent children in the house were positively associated with financial satisfaction (Joo & Grable, 2004). Another study found that age and race predicted subjective net worth outcomes. Specifically, younger individuals, Blacks, and Hispanics reported a wider gap between their perceived net worth and their objective net worth when compared to older Whites (Zagorsky, 2000). A similar study of financially distressed consumers found that age, employment status (unemployment and part-time), number of financially dependent children, and self-reported health status were negatively associated with the perception that financial problems affected overall health (O'Neill et al., 2005). Marital status, and in particular, a divorced status, was negatively associated with perceptions about the ability to make ends meet and pay bills (Arber, Fenn, & Meadows, 2014).

In a confirmation of the demographic variables that were already identified above, a vigorous literature review of the financial health perception literature found that gender, age, education, and employment status were critical predictors of financial health perceptions (Bruggen et al., 2007). With respect to gender, a study that used a randomly selected sample of adults from Iowa found that there were several gender differences in financial health perceptions (Hira & Mugenda, 2000). For example, women reported less financial satisfaction than men even while at the same socio-economic level. The authors also found that women were less likely to

be satisfied with their handling of financial emergencies and their ability to meet long-term goals when compared to men. However, women were more likely to be satisfied with their level of savings when compared to men (Hira & Mugenda, 2000). These results suggest that gender is an important control variable when predicting financial health perceptions. The literature summarized above indicated that education, homeownership, the number of financially dependent children in the house, race, marital status, employment status, age, gender, and self-reported health status were necessary control variables when predicting financial health perceptions.

### **Empirical Evidence of Coping Processes**

Coping is a cognitive and behavioral strategy to manage the effects of stress (Lazarus & Folkman, 1984). This management process ultimately determines the severity of the effects of stress on an outcome. Conceptually, coping processes should mitigate the effects of chronic physiological stress on financial health perceptions. If coping strategies are successfully activated to deal with chronic physiological stress, financial health perceptions may be positively altered or even unaffected. If coping strategies are not successfully activated, financial health perceptions may worsen. Therefore, coping is an integral construct in the secondary appraisal process of the theory of cognitive appraisal (Lazarus & Folkman, 1984).

Traditionally, coping strategies were generally categorized as either problem-focused or emotion-focused (Lazarus & Folkman, 1984). Researchers interested in assessing the different ways in which people respond to stress traditionally asked participants to self-report their preferred use of a coping strategy through a questionnaire (Oakland & Ostell, 1996). Over time, researchers developed a number of self-report scales with acceptable reliability and validity in an attempt to implicitly elicit the type of preferred coping strategy of each participant (Oakland &

Ostell, 1996). For example, the Coping Inventory (COPE) scale consists of 14 coping sub scales that measure a range of dispositional coping strategies. Each sub scale comprises between two and four questions per scale. Examples of the coping strategies include active coping, planning, positive reinterpretation and growth, focusing on and venting emotions, seeking social support for instrumental reasons, seeking social support for emotional reasons, denial, behavioral disengagement, and restraint coping (Carver, Scheier, & Weintraub, 1989). Each sub coping scale was defined to provide a description of the type of strategy that the scale attempted to measure. For example, active coping was defined as taking direct action to remove the stressor or lessen its effects. Focusing on and venting emotions was described as the tendency to focus on the stress experience and ventilating those feelings (Carver et al., 1989).

Although the COPE scale was not originally designed to explicitly measure problem-focused and emotion-focused coping, prior research created such scales by choosing 7 of the 14 coping sub scales on a priori basis to proxy problem-focused and emotion-focused coping (Kling, Seltzer, & Ryff, 1997). The active coping, planning, positive reinterpretation and growth, and seeking social support for instrumental reasons sub scales were used to proxy problem-focused coping. The denial, focusing on and venting emotions, and behavioral disengagement sub scales were used to proxy emotion-focused coping. The authors reported Cronbach's alpha of 0.91 and 0.74, respectively, which indicated that the truncated scales were still reliable measures of the problem-focused and emotion-focused coping constructs (Kling et al., 1997). Another popular type of self-report scale is The Adolescent Coping Orientation for Problem Experiences (A-COPE) inventory (Patterson & McCubbin, 1987). The A-COPE scale was designed to investigate the coping strategies of adolescents facing difficult or stressful situations. Both scales used similar questions to proxy problem-focused and emotion-focused coping

strategies. Similar self-report scales exist and were widely used in the literature as acceptable methods for measuring the use of coping strategies (Kato, 2015).

A review of the financial planning literature revealed very few studies that delineated coping processes into problem-focused and emotion-focused coping strategies. One study that did delineate the coping processes used a college student population as its sample and found that problem-focused coping was more effective than emotion-focused coping at reducing the effects of financial stress on student grade point averages (Zepp, Potter, Haselwood, & Britt-Lutter, 2018). Most of the studies that did delineate coping processes came from the behavioral science field (Baker & Berenbaum, 2007). An important distinction emerged from the behavioral science literature, which suggested that coping strategies should not be ranked against each other as better or worse, but rather, coping strategy choice is based upon what works best for the individual to mitigate the effects of stress (Folkman et al., 1986; Lazarus, 1993b; Lazarus & Folkman, 1984). Therefore, coping strategy choice varies from person to person depending on the perceptions of the person experiencing stress and the type of stressor.

The concept of individual differences in coping strategy choice was further supported in an experimental design that found that individual differences were responsible for coping strategy choice (Baker & Berenbaum, 2007). It was found that women were more likely to engage in emotion-focused coping and men were more likely to engage in problem-focused coping. Gender was also found to moderate the effectiveness of using different coping strategies and the frequency of coping strategy use (Baker & Berenbaum, 2007). A study of couples found that men were less likely to engage in emotional coping tactics, but emotional coping limited the amount of chronic physiological stress experienced as the result of relationship conflict for both genders (Gunlicks-Stoessel & Powers, 2009). The literature also supported the concept that the

type of stressor mattered when it came to coping strategy choice. The same experimental design that found gender differences in coping strategy choice also found that participants who experienced stressors related to the achievement of a goal were more likely to use problem-focused coping (Baker & Berenbaum, 2007). Another study involving 166 college students found that problem-focused coping was correlated with specific efforts to reduce financial stressors (Brougham, Zail, Mendoza, & Miller, 2009). The literature that was reviewed suggests that problem-focused and emotion-focused coping strategy choice may play an important role in mitigating the effects of chronic physiological stress on financial health perceptions.

### **Summary**

The previously reviewed literature identified a broad relationship between physiological stress, financial decision-making, financial health perceptions, and objective financial health outcomes. However, the literature review also revealed a gap in the literature because the direct relationship between chronic physiological stress and financial health perceptions was relatively unexplored. Theory rooted in the field of psychophysiological economics predicts that individuals who experienced chronic physiological stress will carry a myopic perspective that places short-term financial needs over long-term financial needs (Grable, 2013). This myopic perspective is likely to contribute to negative financial health perceptions, and ultimately, negative objective financial health outcomes. Therefore, the theory of cognitive appraisal was used as the theoretical framework for this study to incorporate both physiological and psychological constructs to study the effects of chronic physiological stress on financial health perceptions (Lazarus & Folkman, 1984). Conceptually, chronic physiological stress will negatively influence financial health perceptions, but the severity of the influence will ultimately

be mitigated or reduced to a minimum if people have access to proper resources and can rely on coping strategies (Lazarus & Folkman, 1984).

While there are several frameworks that attempt to explain and predict outcomes as the result of stress, the theory of cognitive appraisal framework was the preferred framework for this research for three reasons: (a) the theory of cognitive appraisal incorporates both physiological and psychological constructs, which are the underpinnings of psychophysiological economic research (Grable, 2013); (b) the primary appraisal process construct is continuous, which provides optimal fitting of the chronic physiological stress variable that measures reoccurring episodes of acute physiological stress (Schneiderman et al., 2005); and (c) the secondary appraisal process accounts for the financial and social resources that previous research associated with financial health perception outcomes. The theory of cognitive appraisal served as the framework for this research to help explore the relationship between chronic physiological stress and financial health perceptions as measured by changes in financial satisfaction, changes in financial strain, and expectations about one's financial situation in the future.

## **Chapter 3 - Methodology**

### **Data and Sample**

The primary purpose of this study was to examine the relationship between chronic physiological stress and financial health perceptions as measured by changes in financial satisfaction, changes in financial strain, and expectations about one's financial situation in the future. To examine these relationships, the theory of cognitive appraisal served as the framework to provide directionality to the relationships among the variables used to proxy the primary and secondary appraisal constructs. The 2011-2014 Midlife in the United States Refresher study was used as the principal data source for this paper.

#### **The Midlife in the United States**

The Midlife in the United States (MIDUS) is a series of surveys organized by the John D. and Catherine T. MacArthur Foundation Research Network on Successful Midlife Development (MIDMAC). The MIDMAC consists of an array of multidisciplinary scholars from the fields of psychology, sociology, epidemiology, demography, anthropology, medicine, and health care. The purpose of the MIDMAC was to investigate the role of behavioral, psychological, physical, and social factors that contributed to age-related variations in health and well-being with a national representative sample of Americans. The MIDUS project surveys cover a range of topics including overall well-being, finance, cognitive functioning, biomarkers, and neuroscience (Survey Research Center, Institute for Social Research, 2011).

There are a total of three distinct MIDUS studies with varying purposes and scientific scopes. The original study is a longitudinal project with three survey waves that started in 1995 and remains ongoing. Currently, the third wave of the original MIDUS study is in the data collection phase with only partial survey data available. The second study pivoted from the

original study and used a cross-sectional probability sample of Japanese adults in lieu of an American sample. The third study, the MIDUS Refresher, used a cross-sectional national probability sample of American adults in an attempt to “refresh” and increase the sample size from the original study. Data for the MIDUS Refresher was collected between 2011 and 2014.

### **2011-2014 Midlife in the United States Refresher**

The MIDUS Refresher was used as the principal data source for this project given that this study contains the most recent biomarker assessment data needed to proxy chronic physiological stress. The primary purpose of the MIDUS Refresher was to investigate the role of behavioral, psychological, biological, neurological, and social factors that contributed to age-related variations in health and well-being with a national representative sample of Americans. A secondary purpose of the MIDUS Refresher was to update the sample from the original project and include questions related to the effects of the 2008-2009 economic recession. The MIDUS Refresher recruited a national probability sample of 3,577 adults aged 25 to 76 (Survey Research Center, Institute for Social Research, 2011).

The study population for the MIDUS Refresher was derived from two independent samples: (a) English speaking adults between the ages of 25 and 54 living in residential housing units in the U.S., and (b) English speaking adults between the ages of 55 and 76 living in residential housing units in the U.S. The former sample completed telephone interviews between November 2011 and October 2012, and the latter sample completed telephone interviews between July 2013 and May 2014. The MIDUS researchers used three sampling frames comprising cellphone numbers and landline numbers to select potential respondents. Probability samples were used to select respondents independently from each of the three sampling frames with a simple random sampling technique. After obtaining the study samples, the two

independent samples were pooled together with population weights comparative to the Census Current Population Survey. The final weighted sample resulted in a national probability sample of U.S. adults (Survey Research Center, Institute for Social Research, 2011).

Similar to the original MIDUS study, the MIDUS Refresher comprises five total projects. The first project (Project 1) contains baseline demographic, psycho-social, physical health, mental health, and financial information. For each respondent, collection for Project 1 consisted of one 30-minute phone interview followed by two 50-page mailed self-administered questionnaires. After completing Project 1, respondents were asked to complete a cognitive assessment by phone (Project 3). Respondents were then eligible to participate in the daily diary assessments (Project 2), biomarker assessment (Project 4), and neuroscience assessment (Project 5). Each Project had its own unique collection methodology. For example, respondents participating in the biomarker project (Project 4) stayed overnight at one of three regional Clinical Research Units (CRU). The protocol visits were standardized across all three CRUs so that data collection processes were consistent. On the first day, respondents completed a medication chart, medical history review, self-administered questionnaire, Pittsburgh sleep questionnaire, physical exam for vital assessments, and began a 12-hour urine collection process. On the second day, respondents completed a fasting blood draw, psychophysiological experimental protocol, physical exam for functional assessments, and finished the 12-hour urine collection process (Survey Research Center, Institute for Social Research, 2011).

### **Salivary Cortisol Collection Methodology**

During the psychophysiological experimental protocol administered on the second day, saliva samples were collected for cortisol assay at five different points: (a) Pre-protocol (prior to attaching the ECG leads); (b) Baseline: immediately before the Seated Baseline physiological

assessment; (c) Post-Cognitive Stress: after completing both Cognitive Stress Tasks and allowing the corresponding Recovery periods; (d) Standing: immediately following the orthostatic challenge; and (e) Recovery: 30 minutes after the orthostatic challenge. During each sample collection point, the respondents removed a cotton swab from the specially designed vessel, placed and rolled it in their mouth until sufficiently saturated, and then put the cotton swab back in the vessel. At the end of each session, the vessels were stored in a -80°F freezer and then shipped to the MIDUS Biocore lab for storage and subsequent cortisol assay. At the time of assay, the cotton swabs were thawed and centrifuged at 3,000 rpm for 5 minutes, resulting in a particulate-free, clear fluid of low viscosity. Concentrations of free cortisol were then identified using an immunoluminescence assay kit (Survey Research Center, Institute for Social Research, 2011). According to the Institute for Social Research at the University of Michigan, the assay kit used a “detection antibody conjugated to an agent capable of oxidizing luminol to 3-aminophthalic acid; this reaction emits light, which can be quantified, and which is proportional to the concentration of cortisol in the sample” (Survey Research Center, Institute for Social Research, 2011, p. 7). The final output of free cortisol was measured across the five samples in Nanomoles per litre (nmol/L).

### **Study Sample**

Given that participation in Projects 2-5 was voluntary, there were varying sample sizes associated with each project. For this paper, the main project (Project 1) and the biomarker project (Project 4) were merged to create a singular dataset that contained demographic, psychosocial, physical health, mental health, financial, and biomarker variables. Although the main project (Project 1) recruited a sample of 3,577 respondents, only 746 respondents completed the biomarker project (Project 4; Survey Research Center, Institute for Social Research, 2011).

Given that the purpose of this paper was to use a biomarker as a proxy for chronic physiological stress, the sample was reduced to only those respondents who completed both the main project and the biomarker project. This reduced the sample size from 3,577 adults down to 746 adults.

Given that this study was predicated on the use of salivary cortisol as a proxy for chronic physiological stress, the salivary cortisol data was reviewed to determine whether additional sample reductions were necessary. A review of the data revealed that none of the respondents had Cushing Syndrome or other notable medical issues that would cause artificially inflated salivary cortisol levels. However, 24 respondents did not complete the salivary cortisol assay and so those respondents were removed from the survey. Additionally, 19 more respondents had salivary cortisol data, but there were complications during the assay phase that resulted in insufficient data. The researchers responsible for administering the salivary assay process determined that the partial data was missing too many data points to extract a valid measurement of free cortisol (Survey Research Center, Institute for Social Research, 2011). Therefore, those 19 respondents were removed from the sample leaving a final sample of 703 adults aged 25 to 76. The demographic characteristics of the final study sample were similar to the characteristics of the national probability sample from Project 1.

## **Measurement**

### **Dependent Variables**

The theory of cognitive appraisal was traditionally used to explain the effects that physiological stress, resource management, and coping processes have on physical, social, and mental health outcomes. Given the association identified in the prior literature between physical health and financial health, this study adopted the theory of cognitive appraisal as the framework for explaining the effects of chronic physiological stress on financial health perceptions. This

study defined financial health perceptions as the subjective financial assessment of one's personal financial situation. The previously reviewed literature identified changes in financial satisfaction, changes in financial strain, and expectations about one's financial situation in the future as important financial health perceptions that predicted whether individuals would make positive financial decisions and exhibit certain financial behaviors that would positively contribute to their objective financial health.

**Changes in financial satisfaction.** The changes in financial satisfaction variable was created by coding and subtracting two variables in the dataset: (a) current financial satisfaction and (b) past financial satisfaction. Current financial satisfaction was measured with a one-item question that asked respondents the following: "Using a scale from 0 to 10 where 0 means "the worst possible financial situation" and 10 means "the best possible financial situation," how would you rate your financial situation these days?" Respondents were asked to rate their financial situation on an 11-point Likert-type scale with scores that ranged from 0 (worst financial situation) to 10 (best financial situation). Past financial satisfaction was measured with a one-item question directly below the current financial satisfaction question. The respondents were asked the following: "Looking back to just before the recession began in 2008, how would you rate your financial situation at that time using the same 0 to 10 scale?" Respondents were asked to rate their past financial satisfaction on an 11-point Likert-type scale with scores that ranged from 0 (worst financial situation) to 10 (best financial situation). The changes in financial satisfaction variable was then coded by subtracting past financial satisfaction from current financial satisfaction for a minimum score of -10 and a maximum score of 10. The responses were not re-coded given that the dependent variable was modeled with an ordinary least squares regression model.

**Changes in financial strain.** The changes in financial strain variable was measured with a one-item question that asked respondents the following: “How difficult [is it] to pay monthly bills compared to before [the] recession?” Respondents were asked to rate their difficulty on a 7-point Likert-type scale with scores that ranged from 1 (much more difficult now) to 7 (much less difficult now). Given the negative association between the difficulty in paying monthly bills and financial health outcomes, this variable was reverse coded so that 7 = much more difficult now and 1 = much less difficult now. The responses were not re-coded any further given that the dependent variable was modeled with a cumulative logistic regression.

**Expectations about the financial future.** The expectations about the financial future variable was measured with a single variable. Respondents were asked the following: “Looking ahead 10 years into the future, what do you expect your financial situation will be like at that time?” Respondents were asked to rate their expectations on an 11-point Likert-type scale with scores that ranged from 0 (worst expectations) to 10 (best expectations). The responses were not re-coded given that the dependent variable was modeled with a cumulative logistic regression.

### **Independent Variables**

Conceptually, the theory of cognitive appraisal posits that financial health perceptions are affected by the primary and secondary appraisal stages. Although the primary and secondary appraisal stages are demarcated, the processes occur simultaneously (Lazarus & Folkman, 1984). During the primary appraisal stage, people evaluate their environment to determine whether they feel threatened. If individuals feel threatened, physiological stress will occur. If stress occurs, people instantly transition into the secondary appraisal stage where individuals search for available resources and coping strategies to handle their stress. If there is a lack of available resources or coping strategies, financial health perceptions may be negatively affected by stress.

Therefore, the independent variables for this study were grouped into the following categories: (a) physiological stress, (b) resource management, and (c) coping.

**Chronic physiological stress.** The theory of cognitive appraisal suggested that individuals constantly evaluate their surroundings in the primary appraisal stage to determine whether a threat to their well-being exists (Lazarus & Folkman, 1984). Given the continuous nature of the primary appraisal stage, chronic physiological stress is the ideal measurement of the primary appraisal construct. Based on the literature review described above, salivary cortisol measurements are the optimal proxy for chronic physiological stress (Hellhammer et al., 2009). The MIDUS Refresher dataset had several salivary cortisol variables that were available for proxy.

For each observation in the dataset, there were total of six saliva cortisol variables: five variables for each individual sample collected during the psychophysiological experimental protocol and a sixth variable measuring the average cortisol level across the five individual samples. The prior literature found that cortisol levels can temporarily and artificially increase after certain events like eating and awaking (Hellhammer et al., 2009). Therefore, the average cortisol level across the five individual samples was used as the proxy for chronic physiological stress. Some observations did not provide all five individual samples, but the lab determined there were enough sample collection points to obtain a valid estimate of free cortisol in the saliva (Survey Research Center, Institute for Social Research, 2011). The mean cortisol level for the study sample was 16.06 nmol/L, which was consistent with the reported averages (17 nmol/L) from previous studies (Sharpley et al., 2016).

**Resource management.** Conceptually, during the secondary appraisal stage, resources are evaluated to manage the physiological stress that occurs as the result of the primary appraisal

stage (Lazarus & Folkman, 1984). The resources that are evaluated could theoretically be anything that the individual finds useful in combatting the effects of stress or relates to an outcome of interest (Lazarus & Folkman, 1984). If chronic physiological stress occurs as a result of some phenomenon in the environment, the resources that are evaluated to deal with the effects of chronic physiological stress will relate to financial health perceptions. A review of the literature identified five broad categories of resources that fit within the theoretical framework and may influence an individual's perception of their financial health: (a) financial stressors, (b) financial resources, (c) social resources, (d) financial mastery, and (e) demographic variables.

**Financial stressors.** As described above, financial stressors were identified in the literature review as a negative influence on financial health perceptions. A review of the dataset found two potential financial stressors that were identified in the literature review: (a) if the respondent ever declared bankruptcy and (b) if the respondent ever experienced a financial loss. Bankruptcy and financial loss were both measured with a question that asked respondents to check yes or no to whether they had experienced any of the financial events listed in the question. For bankruptcy, respondents checked yes or no next to "ever declared bankruptcy." For financial loss, respondents checked yes or no next to "ever suffered a financial or property loss unrelated to work." The answers were coded so that declared bankruptcy = 1 and never declared bankruptcy = 0 and experienced a financial loss = 1 and never experienced a financial loss = 0.

**Financial resources.** The literature review also identified a number of financial resources that were positively associated with financial health perceptions. A review of the dataset found the following financial resources that were also identified in the literature review: (a) financial effort, (b) income adequacy, (c) subjective debt changes, (d) household income, (e) subjective

net worth, and (f) objective net worth. The following paragraphs explain how these variables were measured in the dataset.

Financial effort was measured with a one-item question that asked respondents the following: “Using a 0 to 10 scale where 0 means “no thought or effort” and 10 means “very much thought and effort,” how much thought and effort do you put into your financial situation these days?” Respondents were asked to rate their thought/effort on an 11-point Likert-type scale with scores that ranged from 0 (no thought/effort) to 10 (very much use thought/effort). Income adequacy was measured with a one-item question that asked respondents the following: “In general, would you say you (and your family living with you) have more money than you need, just enough for your needs, or not enough to meet your needs?” Respondents were given the following options to choose from: (a) more money than you need, (b) just enough money, or (c) not enough money. The responses were coded so that more money than needed = 1; else more money than needed = 0, just enough money = 1; else just enough money = 0, and not enough money = 1; else not enough money = 0.

Subjective debt changes were measured with a one-item question that asked respondents the following: “Think back to how much you owed before the recession began in 2008. Compared to what you owed before the recession, do you currently owe much less, somewhat less, little less, about the same, little more, somewhat more or much more now?” Respondents were asked to rate their subjective changes in debt on a 7-point Likert-type scale with scores that ranged from 0 (much less debt now) to 7 (much more debt now). Given the positive association between financial resources and financial health perceptions, the subjective debt variable was reverse coded so that positive changes (less debt) in subjective debt levels = 7 and negative changes (more debt) in subjective debt levels = 0.

Household income comprised three total items: (a) respondent “wages, salaries, or other stipends from all your jobs, including self-employment” from the last calendar year, (b) spouse “wages, salaries, or other stipends from all your jobs, including self-employment” from the last calendar year, and (c) other family members in the household “wages, salaries, or other stipends from all your jobs, including self-employment” from the last calendar year. The MIDUS Refresher researchers then recoded the categorical responses to each of the three items above to represent an actual dollar amount (one continuous variable) using the mid-point of the category range. The household income variable was computed for all cases that had at least one valid response to any of the three items above.

Subjective net worth was measured with a single variable. Respondents were asked the following: “Suppose you and your spouse or partner cashed in all of your checking and savings accounts, and sold your homes, vehicles, stocks and bonds, real estate, and all of your valuable possessions. Then suppose you put that money toward paying off your mortgage and all of your other loans, debts, and credit cards. After paying your debts, would you still be in debt, just break even, or have a positive balance?” Respondents were given the following options to choose from: (a) be in debt, (b) just break even, or (c) have a positive balance.

There was no objective net worth variable available in the dataset. However, there were a series of questions that asked respondents to report various types of assets and debts. For assets, respondents were asked to report the total worth of each of the following assets: (a) respondent’s pension plans, (b) spouse’s pension plans, (c) respondent’s IRA/Keogh/Roth IRA plans, (d) primary residence, (e) businesses, (f) stocks/bonds/CDs/mutual funds, and (g) college savings plans. For debts, respondents were asked to report the debt values of each of the following debts: (a) credit cards, (b) personal loans, (c) student loans, (d) auto loans, (e) installment loans, (f)

mortgage for the primary residence, (g) home improvement/equity loans, (h) other residency loans, and (i) business loans. The objective net worth variable was manually calculated and coded by summing the total assets and total debts then subtracting total debts from total assets.

**Social resources.** The literature review also identified family support as a type of social resource positively associated with financial health perceptions. A review of the dataset found the following family support variables: (a) relying on family members and (b) opening up to family members. Relying on family members was measured with a one-item question that asked respondents the following: “Thinking about the members of your family, not including your spouse/partner, how much can you rely on them for help if you have a serious problem?” Respondents were asked to rate their capacity to rely on family members on a 4-point Likert-type scale with scores that ranged from 1 (can rely on family a lot) to 4 (cannot rely on family at all). Given the positive association between social resources and financial health perceptions, the variable was reverse coded so that 4 = can rely on family a lot and 1 = cannot rely on family at all.

Opening up to family members was measured with a one-item question that asked respondents the following: “Thinking about the members of your family, not including your spouse/partner, how much can you open up to them if you need to talk about your worries?” Respondents were asked to rate their capacity to open up to family members on a 4-point Likert-type scale with scores that ranged from 1 (can open up to family a lot) to 4 (cannot open up to family at all). Given the positive association between social resources and financial health perceptions, the variable was reverse coded so that 4 = can open up to family a lot and 1 = cannot open up to family at all.

**Financial mastery.** The literature also identified a strong positive relationship between financial mastery and financial health perceptions. A review of the dataset found a one-item question that asked respondents the following: “Using a 0 to 10 scale where 0 means “no control at all” and 10 means “very much control,” how would you rate the amount of control you have over your financial situation these days?” Respondents were asked to rate their perceived control on an 11-point Likert-type scale with scores that ranged from 0 (no control) to 10 (very much have control).

**Coping.** In addition to evaluating resources, coping processes are activated during the secondary appraisal stage to manage the effects of physiological stress (Lazarus & Folkman, 1984). Coping processes are generally categorized as either problem-focused or emotion-focused, and neither coping strategy is inherently better than the other. The efficacy of the coping process depends largely on what works best for the individual (Lazarus & Folkman, 1984). A review of the dataset found problem-focused and emotion-focused coping scales based on the popular COPE scale (Carver et al., 1989). The original COPE scale consisted of 14 coping sub scales, but due to space constraints on the questionnaire, the MIDUS Refresher researchers adopted a truncated COPE scale that was found to be a reliable scale for measuring problem-focused and emotion-focused coping strategies (Kling et al., 1997).

The problem-focused coping scale in the dataset comprised 12 items that used the positive reinterpretation and growth, active, and planning sub scales from COPE. For example, the active sub scale asked respondents to report their agreement with the following statements about their response to difficult or stressful events in their lives: (a) “I concentrate my efforts on doing something about it;” (b) “I take additional action to try to get rid of the problem;” (c) “I take direct action to get around the problem;” and (d) “I do what has to be one, one step at a

time.” Each item was measured with a 4 item scale where 1 = agreed with the statement a lot and 4 = did not agree with the statement at all. The respondent’s agreement level with the four statements determined their preference level for active coping. Responses were reverse coded when necessary so that higher scores across the 12 items indicated a stronger preference to cope with difficult or stressful events using problem-focused coping strategies.

The emotion-focused coping scale in the dataset comprised 12 items that used the focus on and venting of emotion, denial, and behavioral disengagement sub scales from COPE. For example, the denial sub scale asked respondents to report their agreement with the following statements about their response to difficult or stressful events in their lives: (a) “I say to myself “this isn’t real;” (b) “I refuse to believe that it has happened;” (c) “I pretend that it hasn’t really happened;” and (d) “I act as though it hasn’t even happened.” Each item was measured with a 4-item scale where 1 = agreed with the statement a lot and 4 = did not agree with the statement at all. The respondent’s agreement level with the four statements determined their preference level for denial coping. Responses were reverse coded when necessary so that higher scores across the 12 items indicated a stronger preference to cope with difficult or stressful events using emotion-focused coping strategies.

The problem-focused coping scale and emotion-focused coping scale reported a Cronbach’s alpha of 0.90 and 0.85, respectively. Respondents reported a mean additive score of 38.036 in the problem-focused coping scale and a mean additive score of 21.69 in the emotion-focused coping scale. Both scales were computed for cases that had valid values for at least half of the items in the scale. If observations had valid values for less than half the items, the scale was set to missing.

## Control Variables

The previous research identified a number of demographic and socioeconomic variables that were used to control for the effects of financial health perceptions. Conceptually, control variables are needed to properly test the relative relationship between the primary and secondary appraisal constructs and financial health perceptions. Therefore, this research utilized the following variables listed in Table 3.1 as control variables in the statistical models.

**Table 3.1. Control Variables**

<b>Marital Status</b>	<b>Education</b>
Married	HS or Less (Ref)
Single (Ref)	Some College
Widow	College Degree
Separated/Divorced	Grad Degree
<b>Gender</b>	<b>Employment Status</b>
Male (Ref)	Working (Ref)
Female	Unemployed
<b>Race</b>	Retired
White (Ref)	Other
Non-White	<b>Self-Report Health Status (1-10)</b>
<b>Homeowner</b>	<b>No. of Financially Dependent Children</b>
Yes (Ref)/No	<b>Age</b>

## Research Question

The primary research question for this paper was: After controlling for available resources and coping processes, what is the relationship between chronic physiological stress and financial health perceptions as measured by changes in financial satisfaction, changes in financial strain, and expectations about one’s financial situation in the future?

## **Hypotheses**

**H1:** Higher levels of salivary cortisol (chronic physiological stress) are associated with a decline in financial satisfaction, higher odds of reporting a higher financial strain level, and lower odds of reporting a higher expectation about the financial future.

**H2:** Bankruptcy and financial loss (financial stressors) are associated with a decline in financial satisfaction, higher odds of reporting a higher financial strain level, and lower odds of reporting a higher expectation about the financial future.

**H3:** Financial effort, income adequacy, positive subjective debt changes, household income, subjective net worth, and objective net worth (financial resources) are associated with an increase in financial satisfaction, lower odds of reporting a higher financial strain level, and higher odds of reporting a higher expectation about the financial future.

**H4:** Relying on family and opening up to family about problems (social resources) are associated with an increase in financial satisfaction, lower odds of reporting a higher financial strain level, and higher odds of reporting a higher expectation about the financial future.

**H5:** Financial mastery is positively associated with an increase in financial satisfaction, lower odds of reporting a higher financial strain level, and higher odds of reporting a higher expectation about the financial future.

**H6:** Stronger preference for using problem-focused coping strategies is associated with an increase in financial satisfaction, lower odds of reporting a higher financial strain level, and higher odds of reporting a higher expectation about the financial future.

**H7:** Stronger preference for using emotion-focused coping strategies is associated with an increase in financial satisfaction, lower odds of reporting a higher financial strain level, and higher odds of reporting a higher expectation about the financial future.

## Statistical Analyses

The purpose of this research was to examine the relationship between chronic physiological stress and financial health perceptions. To test this relationship, SAS and STATA statistical software packages were used to provide the analytics and output from the statistical models. Prior to running the statistical models, the data was screened to check for missing responses and violations of the regression assumptions. To check for missing responses, a frequency command was run on each variable included in the models. The frequency command identified that some variables had missing data; however, the data appeared to be missing completely at random (Allison, 2012a). In particular, the objective net worth variable had the most missing data due to the additive scale that required respondents to respond to all of the asset and debt questions to remain in a list-wise-delete strategy for handling missing data. Although, that data still appeared to be missing completely at random. Given that the data appeared to be missing completely at random, multiple imputation was used to predict the scores of the missing data using other known variables (Allison, 2012a). Multiple imputation was the preferred approach for handling the missing data to preserve the full 703-respondent sample that had valid salivary cortisol data.

Given that the change in financial satisfaction variable was an interval measurement with a minimum score of -10 and a maximum score of 10, an ordinary least squares (OLS) regression was used to model changes in financial satisfaction. Variance inflation factor (VIF) testing was conducted to check for multicollinearity. Additionally, other statistical tests were performed to ensure the model was linear in its parameters, the errors were normally distributed and statistically independent from one another, and the residuals had constant variance. The fit and

performance of the model was assessed with the F-test and adjusted R-squared. The associated beta coefficients of the independent variables were examined for significance.

Given the ordered and equal hierarchy of the variables that measured change in financial strain and expectations about one's financial situation, a cumulative logistic regression was used to model both dependent variables. It was noted that a cumulative logistic regression, rather than an OLS regression, may do a better job of producing estimates of the coefficients in Likert-type scales that have between 5 and 10 points of data (Allison, 2012b). Variance inflation factor (VIF) testing was conducted to check for multicollinearity. No statistical tests were needed to check for violations of assumptions of linearity, normality, or homoscedasticity since logistic regressions do not require the same assumptions as an OLS regression (Allison, 2012b). The fit and performance of the models were assessed with the model chi-square statistic and McFadden's R-squared. The beta coefficients of the independent variables were examined for significance and interpreted with the corresponding odds ratio estimates.

## **Chapter 4 - Results**

This chapter examines the composition of the study sample, addresses the necessary assumptions related to the use of regression models, describes the imputation methods used to address missing data, and provides analysis of the resulting model beta coefficients and odds ratio estimates in the context of answering the primary research question and hypotheses. The primary research question was: After controlling for available resources and coping processes, what is the relationship between chronic physiological stress and financial health perceptions as measured by changes in financial satisfaction, changes in financial strain, and expectations about one's financial situation in the future? Changes in financial satisfaction was modeled with an OLS regression and changes in financial strain and expectations about the financial future were modeled with cumulative logistic regressions.

### **Descriptive Statistics**

The descriptive statistics were reported using non-imputed data given that the imputation process was not mathematically designed to provide valid descriptive statistics (Peugh & Enders, 2004). Therefore, the number of observations per descriptive statistic varied based on how much data was missing. As illustrated in Table 4.1, the study sample characteristics mostly resembled the characteristics of the weighted national probability sample from Project 1 with a few exceptions. When compared to the weighted national probability sample, the study sample appeared to be slightly more educated, and respondents reported higher household incomes and net worth. Although this study cannot be considered nationally representative since participation in the project that produced the salivary cortisol variable was voluntary and not controlled by random selection, the similarity between the two samples provided evidence that the sample

study did not appear to be critically biased. After using multiple imputation, the final study sample consisted of 703 individuals.

**Table 4.1. Sample Characteristics on Non-Imputed Data & Weighted National Sample**

Variable	<u>Current Study Sample</u>				<u>Weighted National Sample</u>			
	<i>n</i>	<i>M</i>	<i>SD</i>	Range	<i>n</i>	<i>M</i>	<i>SD</i>	Range
Age	703	51.1	13.59	25 – 76	3,577	48.94	13.77	23 – 76
Male (Female)	703	0.50	0.50	0 – 1	3,577	0.48	0.50	0 – 1
White (Non-White)	699	0.81	0.39	0 – 1	3,552	0.82	0.39	0 – 1
Marital Status								
Single (Ref)	109	0.15	0.36	0 – 1	551	0.19	0.39	0 – 1
Married	454	0.65	0.48	0 – 1	2,283	0.62	0.48	0 – 1
Widow	29	0.04	0.20	0 – 1	199	0.04	0.19	0 – 1
Separated/Divorced	108	0.16	0.36	0 – 1	534	0.15	0.36	0 – 1
Highest Education								
HS or Less (Ref)	101	0.14	0.35	0 – 1	829	0.38	0.49	0 – 1
Some College	197	0.28	0.45	0 – 1	1,096	0.28	0.45	0 – 1
College Degree	214	0.31	0.46	0 – 1	909	0.19	0.39	0 – 1
Graduate Degree	191	0.27	0.45	0 – 1	736	0.15	0.35	0 – 1
Working Status								
Working (Ref)	448	0.68	0.47	0 – 1	2,223	0.68	0.46	0 – 1
Unemployed	30	0.05	0.21	0 – 1	121	0.05	0.21	0 – 1
Retired	136	0.21	0.41	0 – 1	689	0.17	0.37	0 – 1
Other	43	0.06	0.25	0 – 1	310	0.10	0.30	0 – 1
Household Income*	656	71.1	66.92	0 – 300	3,319	43.4	60.2	0 – 300
Household Net Worth*	412	586.3	1,283	8,804	2,363	208.2	694	12,150
No. of Fin Dep Children	703	0.81	1.16	0 – 9	3,577	0.89	1.22	0 – 11
Self-Report Health Status	701	7.43	1.57	0 – 10	2,604	7.19	1.71	0 – 10

\*Income and net worth reported in 1,000 units. The minimum for the net worth range was -\$3,530,700 for both samples.

## **Sample Characteristics Results**

The study sample was evenly split between males and females (50%) and respondents were between 25 and 76 years old with a mean age of 51 years old. Due to a limited number of respondents from other races, the race variable was re-coded into a binary variable that represented whether the respondent was white or another race. The study sample was predominately white (81%), married (65%), and currently working (68%). About 58% of the sample held either a college degree or graduate degree as their highest level of education. The mean household income was \$71,052 based on a low of \$0 and a high of \$300,000. The mean household net worth value was \$586,329 based on a low of negative \$3,530,700 and a maximum of \$8,804,000.

## **Study Sample Variables**

**Change in financial satisfaction.** As indicated in Table 4.2, respondents from the sample reported a mean score of -0.66 on the change in financial satisfaction scale. A maximum score of 10 represented a 10-point increase in financial satisfaction from before the great recession to present. A minimum score of -10 represented a 10-point decline in financial satisfaction from before the great recession to present. A score of 0 meant the respondent did not report a change in financial satisfaction. The mean score of -0.66 means that the average respondent experienced a slight decline in financial satisfaction from before the great recession to present. This would indicate a worsened perception about one's financial health.

**Change in financial strain.** Respondents from the sample reported a mean score of 4.41 on the change in financial strain scale. The variable was reverse coded so that a higher score indicated that paying monthly bills was much more difficult now when compared to before the great recession. A minimum score of 1 was the best hierarchical response and indicated that the

respondent experienced an improvement in paying monthly bills. A maximum score of 7 was the worst hierarchical response and indicated that paying bills now was much more difficult. A score of 4 meant that the respondent had the same difficulty in paying bills from before the recession to present. The mean score of 4.41 indicated that the average respondent did not report a change in their ability to pay monthly bills from before the great recession to present. A higher score indicated a worsened perception about one's financial health.

**Expectations about the financial future.** Respondents reported a mean score of 7.13 on the expectations about their financial future scale. A maximum score of 10 represented the highest expectation about one's financial situation in the future. A minimum score of 0 represented the lowest expectation about one's financial situation in the future. A mean score of 7.13 meant that respondents were fairly optimistic about their financial future and had high expectations for their future financial situation. This would indicate a positive perception about one's financial health.

**Chronic physiological stress.** According to theory of cognitive appraisal, individuals are routinely engaged with their environment during the primary appraisal stage to determine whether a threat to their well-being exists (Lazarus & Folkman, 1984). If a threat is perceived, physiological stress will ensue. Given its continuous nature, chronic physiological stress was an optimal proxy of the primary appraisal stage. According to the literature, salivary cortisol is a valid and reliable proxy for chronic physiological stress (Kirschbaum et al., 1993). The mean salivary cortisol level of the study sample was 16.06 nmol/L, which was consistent with the reported averages from previous studies (Sharpley et al., 2016).

**Table 4.2. Study Sample Variables on Non-Imputed Data**

Variable	<i>n</i>	<i>M</i>	<i>SD</i>	Range	$\alpha$
<b>Dependent Variables</b>					
Change in Financial Satisfaction	697	-0.66	2.37	-10 – 10	
Change in Financial Strain	701	4.41	1.47	1 – 7	
Expectations about the Financial Future	698	7.13	2.12	0 – 10	
<b>Primary Appraisal</b>					
Salivary Cortisol	703	16.06	13.05	2 – 284	
<b>Secondary Appraisal</b>					
<i>Financial Stressors</i>					
Bankruptcy (No)	703	0.11	0.31	0 – 1	
Financial Loss (No)	703	0.11	0.31	0 – 1	
<i>Financial Resources</i>					
Financial Effort	700	7.60	2.17	0 – 10	
Income Adequacy					
Not Enough	178	0.25	0.44	0 – 1	
Just Enough (Ref)	372	0.53	0.50	0 – 1	
Plenty	150	0.22	0.41	0 – 1	
Subjective Net Worth					
Negative	106	0.16	0.37	0 – 1	
About Even (Ref)	102	0.15	0.36	0 – 1	
Positive	456	0.69	0.46	0 – 1	
Subjective Changes in Debt	680	4.20	1.92	1 – 7	
Household Income	656	71,052	66,924	0 – 300,000	
Household Net Worth*	412	586,329	1,283	8,804,000	
<i>Social Resources</i>					
Rely on Family	701	3.50	0.82	1 – 4	
Open up to Family	701	3.14	0.92	1 – 4	
<i>Financial Mastery</i>					
Financial Mastery	698	6.44	2.60	0 – 10	
<i>Coping Strategies</i>					

Problem-focused Coping	703	39.46	9.19	12 – 98	0.90
Emotion-focused Coping	703	22.53	10.86	13 – 98	0.85

\*The minimum for the net worth range was -\$3,530,700.

**Financial stressors.** During the literature review, financial stressors were identified as a common resource that predicted financial health perceptions. The current sample did report the experience of some financial stressors. For example, approximately 11% of the sample filed for bankruptcy and experienced a financial loss unrelated to work.

**Financial resources.** An array of financial resources were also identified during the literature review as important predictors of financial health perceptions. Respondents reported a mean score of 7.60 for financial effort, which indicated that sample generally put above average thought and effort into their finances. Approximately 53% of respondents felt like they had just enough money to meet their needs while 25% reported that they did not have enough money. Approximately 22% of the sample indicated that they had more money than they needed to meet their needs. The average respondent in the sample appeared to be in good objective financial health. For example, mean household income was \$71,052. Nearly 70% of the sample reported a positive subjective net worth with a mean objective household net worth value of \$586,329. Respondents also reported a mean score of 4.20 on the subjective changes in debt scale, which asked respondents to compare how much debt they held compared to before the recession. A mean score of 4.20 indicated that the amount of debt held by respondents before the recession compared to the present was about the same.

**Social resources.** The theory of cognitive appraisal posited that social relationships were a key tenant of the secondary appraisal process and the resource management transaction (Lazarus & Folkman, 1984). The two variables that were used to proxy social relationships were scales that asked respondents to report on their capacity to rely on family to help with serious

problems and open up to family about their worries. With respect to relying on family, respondents reported a mean score of 3.5, which was squarely in the middle between being able to rely on family a lot and sometimes. In terms of opening up to family about their worries, respondents reported a mean score of 3.14, which indicated that the average respondent could open up to their family sometimes.

**Coping strategies.** Coping ability is a major construct put forth by the theory of cognitive appraisal framework. Coping refers to the cognitive and behavioral efforts to manage stress. Theoretically, a strong ability to rely on problem-focused or emotion-focused coping strategies should reduce the negative effects from physiological stress and positively influence outcomes (Lazarus & Folkman, 1984). The sample reported a mean score of 39.46 on the problem-focused coping additive scale and a 22.53 on the emotion-focused coping additive scale. A comparison between the two scales indicated that respondents generally preferred problem-focused coping strategies.

### **OLS Regression Assumptions**

In order to model changes in financial satisfaction with an OLS regression, the following assumptions could not be violated: (a) there was noncollinearity of the independent variables, (b) the model was linear in its parameters, (c) the errors were normally distributed, (d) the errors were statistically independent from one another, and (e) the residuals had constant variance (homoscedasticity; Allison, 2012b). A series of procedures were run to examine whether any of the assumptions were violated.

Collinearity of the independent variables was checked with variance inflation factor (VIF) testing, and the results were provided in Table 4.3. Multicollinearity of the independent variables did not appear to be an issue as the VIF scores were below five for each variable

(O'Brien, 2007). To evaluate whether the model was linear in its parameters, a scatterplot of the residuals against the predicted values was examined on both the non-imputed data and imputed data (Bodner, 2008). The scatterplot generated in SAS (non-imputed) and STATA (imputed) did not reveal a pattern that would indicate a violation of the linearity assumption.

A univariate procedure in SAS was used to evaluate whether the errors were normally distributed. To check for normality, the univariate procedure was run on each non-imputed continuous variable in the model. All of the continuous variables reported kurtosis and skewness within the acceptable range of -2.00 to +2.00 with the exception of salivary cortisol, household income, household net worth, and number of financially dependent children living at home (Westfall, 2014). Each of the four identified variables exhibited kurtosis and skewness above the acceptable range, which suggested that the errors of those variables were not normally distributed. Therefore, an inverse hyperbolic sine transformation was performed on each variable to correct the distribution. The inverse hyperbolic sine transformation was preferred over the traditional log transformation because of its ability to appropriately handle negative values and zeros (Burbidge, Magee, & Robb, 1988). After the transformation, household income, household net worth, and number of financially dependent children living at home exhibited acceptable kurtosis and skewness. The salivary cortisol variable exhibited acceptable skewness (0.33), but kurtosis was slightly outside of the acceptable range (5.15). However, a small amount of kurtosis was unlikely to influence the validity of the results (Westfall, 2014).

Cross-sectional studies that use random sampling to obtain observations generally do not violate the assumption of independent errors (Allison, 1999). However, a test for autocorrelation was run as a robustness check. The Durbin-Watson test was run on non-imputed data rather than the imputed data given that the imputation process was not mathematically designed for a

correlation test (Bodner, 2008). All four Durbin-Watson tests were not statistically significant, which indicated that the assumption of independent errors was not violated (Allison, 1999).

Homoscedasticity was evaluated with the same scatterplot used to evaluate normality of the data. The residuals against the predicted values scatterplot did not reveal a pattern that would indicate a violation of the homoscedasticity assumption. A second evaluation of homoscedasticity was performed on the final imputed model as a robustness check. The final imputed model was run with both standard errors and robust standard errors. The standard errors assumed homoscedasticity while the robust standard errors relaxed the homoscedasticity assumption. The statistical significance of the beta coefficients were largely unchanged regardless of whether significance was determined with standard errors or robust standard errors. This provided additional evidence that the homoscedasticity assumption was not violated (Allison, 1999).

### **Cumulative Logistic Regression Assumptions**

Changes in financial strain and expectations about the financial future were modeled with cumulative logistic regressions. The cumulative logistic regression does not require the same assumptions as the OLS regression. Therefore, no statistical tests were needed to check for violations of the assumptions of linearity, normality, or homoscedasticity (Allison, 2012b). However, there were two assumptions that could not be violated: (a) the dependent variables comprised ordinal and hierarchal categories that were equally spaced, and (b) there was noncollinearity of the independent variables. Both dependent variables were Likert-type scales that comprised hierarchical and equally spaced categories. Collinearity of the independent variables was checked with VIF testing, and the results were provided in Tables 4.4 and 4.5.

Multicollinearity of the independent variables did not appear to be an issue as the VIF scores were below five for each variable (O'Brien, 2007).

Although the cumulative logistic regression did not require the assumption of normality, the imputation technique described below expected a normal distribution for each variable. Therefore, the inverse hyperbolic sine transformation of salivary cortisol, household income, household net worth, and number of financially dependent children living at home were used in both cumulative logistic regressions.

### **Multiple Imputation**

Multiple imputation is one of several strategies that can be used to handle missing data from secondary datasets. There are four primary types of missing data: (a) data missing by definition of the subpopulation, (b) data missing completely at random (MCAR), (c) data missing at random (MAR), and (d) data that is not missing at random (NMAR; Acock, 2005). To check for missing data, a frequency distribution was conducted on each variable that was included in the three statistical models. The frequency distributions revealed that all but one of the variables had nearly complete data. Under a list-wise-delete approach, the objective net worth variable was missing nearly 41% of its observations. This appeared to be caused by the nature of the coding scheme used to calculate the objective net worth variable. As a reminder, the dataset did not have an objective net worth variable. Researchers that wanted an objective net worth variable needed to individually code several asset and debt questions and then subtract the total debts from the total assets. This additive scale required respondents to respond to all of the asset and debt questions to remain in a list-wise-delete model. So if a respondent answered all but one of these questions, they were removed entirely from the model under a list-wise-delete strategy.

Given the importance of including an objective net worth variable in the statistical models, multiple imputation was used to impute the missing data from the objective net worth variable and any other variable that had missing data. As indicated in Tables 4.1 and 4.2, the following variables had missing data (< 703 observations): race (4), marital status (3), working status (46), household income (47), net worth (286), self-reported health status (2), change in financial satisfaction (6), change in financial strain (2), expectations about the financial future, (5), financial effort (3), income adequacy (3), subjective net worth (39), subjective changes in debt (23), rely on family (2), open up to family (2), and financial mastery (5).

After identifying all of the variables with missing data, a missing-value patterns command was run in STATA to determine whether that was an obvious pattern of missing data. An obvious pattern of missing data might indicate that the data was not missing at random or missing completely at random (UCLA Statistical Consulting Group, 2019). No obvious patterns were identified through the missing-value patterns command. Additionally, a correlation command was run in STATA to determine whether additional variables might serve as auxiliary variables for the imputation process. Auxiliary variables are variables that are correlated with the missing variables but not included in the statistical model. The identification and inclusion of auxiliary variables during the imputation process may help improve the accuracy of the imputation results (UCLA Statistical Consulting Group, 2019). No additional auxiliary variables were identified through the correlation command.

After checking the missing data patterns, the missing data appeared to be missing completely at random. Therefore, multiple imputation was used to replace each missing value with  $m$  pseudo-random values across  $m$  complete datasets with known values (Bodner, 2008). In other words, multiple values were estimated to reflect the uncertainty around the true value for

each missing value. The missing values were estimated using the non-missing data from the dependent and independent variables from all three statistical models. This process was then repeated a specific number of times and then pooled together to produce a final coefficient and standard error for each imputed variable (UCLA Statistical Consulting Group, 2019).

While several imputation techniques were available, the multivariate normal distribution (MVN) imputation technique was used for this study given its popularity in the social sciences literature (Acock, 2005). The MVN imputation technique was paired with the Markov Chain Monte Carlo (MCMC) procedure. The MCMC procedure used a data augmentation (DA) algorithm to fill in missing data by drawing from a multivariate normal distribution of the missing data given the other observed variables included in the imputation process (UCLA Statistical Consulting Group, 2019). The MCMC procedure assumed that all of the variables included in the imputation model had a joint multivariate normal distribution (Allison, 2012b). As described above, all of the variables across all three statistical models had normally distributed data with the exception of salivary cortisol, household income, household net worth, and number of financially dependent children. The distributions of those variables were corrected with the inverse hyperbolic sine transformation before running the imputation process (Burbidge et al., 1998).

The MVN imputation command drew inferential statistics every 1,000 iterations to provide a sufficient number of random distributions that would produce valid coefficients and standard errors for the sample size (Bodner, 2008). The imputed values were drawn after the first 100 iterations and again every 100 iterations thereafter until a complete set of coefficients and standard errors were produced. This process was repeated a total of 10 times to provide 10 sets of beta coefficients and standard errors. The 10 sets of beta coefficients and standard errors were

then algorithmically averaged to produce one set of inferential statistics for the 703 observations (UCLA Statistical Consulting Group, 2019). This process was repeated for each of the three regression models reported in this paper.

## **Regression Results**

The purpose of this study was to examine the relationship between chronic physiological stress and financial health perceptions while controlling for resources and coping mechanisms. Financial health perceptions were measured by changes in financial satisfaction, changes in financial strain, and expectations about one's financial situation in the future. Three regression models were fit with predictor variables identified from the literature. Given the continuous nature of the variable, an OLS regression model was fit to examine the relationship between chronic physiological stress and changes in financial satisfaction. Given the hierarchical and equal nature of the variables, two cumulative logistic regressions were fit to examine the relationship between chronic physiological stress and changes in financial strain and expectations about the financial future. The results from the regression models were summarized in Tables 4.3, 4.4, and 4.5.

### **Changes in Financial Satisfaction Model Results**

An OLS regression model was fit to examine the relationship between chronic physiological stress and changes in financial satisfaction. Positive beta coefficients indicated an improved financial satisfaction from before the recession to present. The results from the model were summarized in Table 4.3. Overall, the model produced an adjusted R-squared of .2543, which meant that 25.43% of the variance in changes in financial satisfaction was explained by the independent variables in the model. The statistically significant F-test and adjusted R-squared of 25.43% indicated a good fit. The analysis of the individual predictor variables was categorized

into the following seven sections: (a) chronic physiological stress, (b) financial stressors, (c) financial resources, (d) social resources, (e) financial mastery, (f) coping strategies, and (g) demographic variables. Chronic physiological stress was the proxy for the primary appraisal construct and financial stressors, financial resources, social resources, financial mastery, and coping strategies were the proxies for the secondary appraisal construct.

**Table 4.3. OLS Regression Results for Changes in Financial Satisfaction ( $N = 703$ )**

Variable	<i>b</i>	<i>SE</i>		<i>VIF</i>
Constant	1.57	1.10		
<b>Primary Appraisal</b>				
Salivary Cortisol (IHS)	-0.14	0.19		2.04
<b>Secondary Appraisal</b>				
<i>Financial Stressors</i>				
Bankruptcy (No)	-0.05	0.27		1.12
Financial Loss (No)	-0.36	0.26		1.07
<i>Financial Resources</i>				
Financial Effort	-0.09	0.04	*	1.16
Income Adequacy (Just Enough Ref)				
Not Enough	-1.24	0.22	***	1.43
Plenty	0.41	0.22		1.31
Subjective Net Worth (About Even Ref)				
Negative	-0.87	0.25	**	2.01
Positive	-0.47	0.25		2.13
Subjective Changes in Debt	0.09	0.05	*	1.19
Household Income (IHS)	0.02	0.03		1.08
Household Net Worth (IHS)	0.01	0.01		1.82
<i>Social Resources</i>				
Rely on Family	-0.11	0.13		1.80
Open up to Family	0.05	0.12		1.85
<i>Financial Mastery</i>				
Financial Mastery	0.22	0.04	***	1.52
<i>Coping Strategies</i>				
Problem-focused Coping	-0.01	0.01		1.68
Emotion-focused Coping	0.01	0.01		1.75
<b>Demographic Variables</b>				

Age	-0.03	0.01	***	2.31
Male (Female)	0.06	0.17		1.18
White (Non-White)	-0.13	0.22		1.19
Marital Status (Single)				
Married	0.09	0.27		2.78
Widow	-0.37	0.48		1.53
Separated/Divorced	-0.04	0.31		2.01
Highest Education (HS or Less)				
Some College	-0.09	0.27		2.31
College Degree	-0.03	0.27		2.49
Graduate Degree	-0.01	0.28		2.46
Working Status (Working)				
Unemployed	-1.29	0.43	**	1.24
Retired	0.38	0.31		2.39
Other	-1.25	0.35	***	1.17
No of Financially Dependent Children (IHS)	-0.08	0.14		1.64
Self-Reported Health Status	-0.05	0.06		1.23
Adjusted R-square	25.43%			

Note: \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

**Chronic physiological stress.** The salivary cortisol variable was not statistically significant in the model. This was not the predicted result based on the hypothesis formed from the theory of cognitive appraisal.

**Financial stressors.** No financial stressors were statistically significant in the model. This was not the predicted result based on the hypothesis formed from the theory of cognitive appraisal.

**Financial resources.** Several financial resources were statistically significant in the model and included financial effort ( $b = -.09, p < .05$ ), negative income adequacy ( $b = -1.24, p < .001$ ), negative subjective net worth ( $b = -.87, p < .01$ ), and subjective changes in debt from before the recession to present ( $b = .09, p < .05$ ). Surprisingly, holding all else equal, a one-unit

increase in financial effort was associated with a .09 unit decline in financial satisfaction from before the recession to present. With respect to income adequacy, when compared to just enough income to meet needs, not enough income to meet needs was associated with a 1.24 unit decline in financial satisfaction from before the recession to present when holding everything constant. With respect to subjective net worth, when compared to breakeven net worth, negative net worth was associated with a .87 unit decline in financial satisfaction from before the recession to present when holding all else constant. Finally, holding everything constant, a one-unit increase on the subjective debt scale was associated with a .09 unit increase in financial satisfaction from before the recession to present. Higher numbers on the subjective debt scale indicated a decline in debt from before the recession to present. This suggested that the reduction of debt was associated with an increase in financial satisfaction.

**Social resources.** Neither of the variables that measured the presence of social resources were statistically significant in the model. This was not the predicted result based on the hypothesis formed from the theory of cognitive appraisal.

**Financial mastery.** As expected, financial mastery was statistically significant in the model ( $b = .22, p < .001$ ). Holding all else equal, a one-unit increase in the financial mastery scale was associated with a .22 unit increase in financial satisfaction from before the recession to present.

**Coping.** Problem-focused coping and emotion-focused coping strategies were not statistically significant in the model. This was not the predicted result based on the hypotheses formed from the theory of cognitive appraisal.

**Demographic Variables.** The demographic variables that were statistically significant in the model included age ( $b = -.03, p < .001$ ), unemployment ( $b = -1.29, p < .01$ ), and other

employment status ( $b = -1.25, p < .001$ ). Holding all else equal, a one-unit increase in age was associated with a .03 unit decline in financial satisfaction from before the recession to present. With respect to working status, when compared to working and holding all else equal, unemployment was associated with a 1.29 unit decline in financial satisfaction from before the recession to present. When compared to working and holding everything constant, an “other” working status was associated with a 1.25 unit decline in financial satisfaction from before the recession to present. The “other” category collapsed a number of working statuses due to low frequency of responses and consisted of the following statuses: (a) homemaker, (b) full-time student, (c) part-time student, (d) maternity or sick leave, (e) permanently disabled, and (f) other.

### **Changes in Financial Strain Model Results**

A cumulative logistic regression model was fit to examine the relationship between chronic physiological stress and changes in financial strain as measured by changes in difficulty paying bills before the recession to present. The dependent variable was coded so that higher scores indicated an increase in financial strain. The results from the model were summarized in Table 4.4. Overall, the model chi-square statistic was significant ( $p < .001$ ), which meant that the full model was an upgrade over the null model with zero predictors. The model also produced a McFadden’s R-squared of .1285, which meant that the full model was a 12.85% improvement from the null model. These values indicated an adequate model fit. The analysis of the individual predictor variables was categorized into the following seven sections: (a) chronic physiological stress, (b) financial stressors, (c) financial resources, (d) social resources, (e) financial mastery, (f) coping strategies, and (g) demographic variables. Chronic physiological stress was the proxy for the primary appraisal construct and financial stressors, financial resources, social resources, financial mastery, and coping strategies were the proxies for the secondary appraisal construct.

**Table 4.4. Cumulative Logistic Results for Changes in Financial Strain (N = 703)**

Variable	Estimate	Odds	VIF
<b>Intercepts</b>			
2	4.44 **	-	-
3	2.74 *	-	-
4	1.17	-	-
5	-1.86	-	-
6	-2.52	-	-
7	-3.50 *	-	-
<b>Primary Appraisal</b>			
Salivary Cortisol (IHS)	0.06	1.1	2.06
<b>Secondary Appraisal</b>			
<i>Financial Stressors</i>			
Bankruptcy (No)	-0.15	0.86	1.12
Financial Loss (No)	0.81 **	2.26	1.07
<i>Financial Resources</i>			
Financial Effort	0.10 **	1.10	1.15
Income Adequacy (Just Enough Ref)			
Not Enough	1.34 ****	3.84	1.44
Plenty	-0.68 **	0.51	1.30
Subjective Net Worth (About Even Ref)			
Negative	0.48	1.61	1.97
Positive	0.63	1.07	2.14
Subjective Changes in Debt	-0.20 ****	0.82	1.19
Household Income (IHS)	0.03	1.03	1.09
Household Net Worth (IHS)	-0.01	0.99	1.82
<i>Social Resources</i>			
Rely on Family	-0.06	0.94	1.80
Open up to Family	0.01	1.01	1.85
<i>Financial Mastery</i>			
Financial Mastery	-0.20 ****	0.82	1.53
<i>Coping Strategies</i>			
Problem-focused Coping	-0.01	0.99	1.67
Emotion-focused Coping	0.01	1.01	1.74

### Demographic Variables

Age	0.02 *	1.02	2.33
Male (Female)	-0.21	0.81	1.18
White (Non-White)	0.10	1.10	1.19
Marital Status (Single)			
Married	0.13	1.13	2.78
Widow	-0.29	0.75	1.52
Separated/Divorced	-0.05	0.95	2.02
Highest Education (HS or Less)			
Some College	-0.02	0.98	2.32
College Degree	-0.13	0.88	2.49
Graduate Degree	-0.21	0.81	2.46
Working Status (Working)			
Unemployed	1.13 **	3.10	1.23
Retired	0.09	1.10	2.41
Other	1.04 **	2.83	1.17
No of Financially Dependent Children (IHS)	-0.17	0.84	1.63
Self-Reported Health Status	0.04	1.04	1.23
McFadden's R-squared	12.85%		

Note: \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

**Chronic physiological stress.** The salivary cortisol variable was not statistically significant in the model. This was not the predicted result based on the hypothesis formed from the theory of cognitive appraisal.

**Financial stressors.** As predicted under the theoretical framework, financial loss was statistically significant in the model ( $b = .81, p < .01, OR = 2.26$ ). Holding all else equal, reporting a financial loss unrelated to work was associated with a 126% increase in the predicted odds of reporting an increase in financial strain from before the recession to present.

**Financial resources.** As predicted by the theoretical framework, there were several financial resources that were statistically significant in the model. The statistically significant variables included financial effort ( $b = .10, p < .01, OR = 1.10$ ), negative income adequacy ( $b =$

1.34,  $p < .001$ ,  $OR = 3.84$ ), positive income adequacy ( $b = -.68$ ,  $p < .01$ ,  $OR = .51$ ), and subjective changes in debt from before the recession to present ( $b = -.20$ ,  $p < .001$ ,  $OR = .82$ ). Surprisingly, holding all else equal, a one-unit increase in financial effort was associated with a 10% increase in the predicted odds of reporting an increase in financial strain. With respect to income adequacy, when compared to just enough income to meet needs, not enough income to meet needs was associated with a 284% increase in the predicted odds of reporting an increase in financial strain when holding everything else constant. Conversely, holding all else equal, reporting more than enough income to meet needs was associated with .51 times the odds of reporting an increase in financial strain when compared to reporting just enough income to meet needs. Finally, holding everything constant, a one-unit increase on the subjective debt scale was associated with .82 times the predicted odds of reporting an increase in financial strain from before the recession to present. Higher numbers on the subjective debt scale indicated a decline in debt from before the recession to present. This suggested that the reduction of debt was associated with lower odds of reporting an increase in financial strain.

**Social resources.** Neither of the variables that measured the presence of social resources were statistically significant in the model. This was not the predicted result based on the hypothesis formed from the theory of cognitive appraisal.

**Financial mastery.** As predicted by the theoretical framework, financial mastery was statistically significant in the model ( $b = -.20$ ,  $p < .001$ ,  $OR = .82$ ). A one-unit increase in the financial mastery scale was associated with .82 times the predicted odds of reporting an increase in financial strain from before the recession to present.

**Coping.** Problem-focused coping and emotion-focused coping strategies were not statistically significant in the model. This was not the predicted result based on the hypotheses formed from the theory of cognitive appraisal.

**Demographic variables.** The demographic variables that were statistically significant in the model included age ( $b = .02, p < .05, OR = 1.02$ ), unemployment ( $b = 1.13, p < .01, OR = 3.10$ ), and other employment status ( $b = 1.04, p < .01, OR = 2.83$ ). Holding all else constant, a one-unit increase in age was associated with a 2% increase in the predicted odds of reporting an increase in financial strain from before the recession to present. With respect to working status, when compared to working and holding all else equal, unemployment was associated with a 210% increase in the predicted odds of reporting an increase in financial strain from before the recession to present. When compared to working and holding everything constant, an “other” working status was associated with a 183% increase in the predicted odds of reporting an increase in financial strain. The “other” category collapsed a number of working statuses due to low frequency of responses and consisted of the following statuses: (a) homemaker, (b) full-time student, (c) part-time student, (d) maternity or sick leave, (e) permanently disabled, and (f) other.

### **Expectations about the Financial Future Model Results**

A cumulative logistic regression model was fit to examine the relationship between chronic physiological stress and expectations about the financial future. The dependent variable was coded so that higher responses indicated a higher expectation about the financial future. The results from the model were summarized in Table 4.5. Overall, the model chi-square statistic was significant ( $p < .001$ ), which meant that the full model was an upgrade over the null model with zero predictors. The model also produced a McFadden’s R-squared of .1467, which meant that the full model was a 14.67% improvement from the null model. These values indicated an

adequate model fit. The analysis of the individual predictor variables was categorized into the following seven sections: (a) chronic physiological stress, (b) financial stressors, (c) financial resources, (d) social resources, (e) financial mastery, (f) coping strategies, and (g) demographic variables. Chronic physiological stress was the proxy for the primary appraisal construct and financial stressors, financial resources, social resources, financial mastery, and coping strategies were the proxies for the secondary appraisal construct.

**Table 4.5. Cumulative Logistic Results for Financial Future Expectations ( $N = 703$ )**

Variable	Estimate	Odds	VIF
<b>Intercepts</b>			
2	5.32 **	-	-
3	4.59 **	-	-
4	3.76 *	-	-
5	3.22 *	-	-
6	2.00	-	-
7	1.08	-	-
8	0.19	-	-
9	-1.38	-	-
10	-3.20 *	-	-
11	-5.31 **	-	-
<b>Primary Appraisal</b>			
Salivary Cortisol (IHS)	-0.41 *	0.67	2.05
<b>Secondary Appraisal</b>			
<i>Financial Stressors</i>			
Bankruptcy (No)	0.41	1.04	1.13
Financial Loss (No)	0.01	1.01	1.07
<i>Financial Resources</i>			
Financial Effort	0.07 *	1.07	1.15
Income Adequacy (Just Enough Ref)			
Not Enough	-0.19	0.82	1.42
Plenty	0.84 ***	2.31	1.30
Subjective Net Worth (About Even Ref)			
Negative	-0.11	0.90	2.00
Positive	-0.10	0.91	2.14
Subjective Changes in Debt	0.10 *	1.10	1.19

Household Income (IHS)	0.01		1.01	1.64
Household Net Worth (IHS)	-0.01		0.99	1.86
<i>Social Resources</i>				
Rely on Family	-0.10		0.91	1.80
Open up to Family	-0.12		0.88	1.85
<i>Financial Mastery</i>				
Financial Mastery	0.42	***	1.52	1.53
<i>Coping Strategies</i>				
Problem-focused Coping	0.04	***	1.04	1.68
Emotion-focused Coping	-0.03	**	0.97	1.75
<b>Demographic Variables</b>				
Age	-0.05	***	0.95	2.31
Male (Female)	0.09		1.09	1.18
White (Non-White)	-0.65	**	0.52	1.19
Marital Status (Single)				
Married	0.11		1.11	2.78
Widow	-0.22		0.80	1.53
Separated/Divorced	-0.60	*	0.55	2.02
Highest Education (HS or Less)				
Some College	0.11		1.11	2.31
College Degree	0.12		1.13	2.49
Graduate Degree	0.12		1.13	2.46
Working Status (Working)				
Unemployed	0.56		1.75	1.24
Retired	0.24		1.27	2.39
Other	0.07		1.07	1.16
No of Financially Dependent Children (IHS)	-0.03		0.97	1.64
Self-Reported Health Status	0.20	***	1.22	1.23
McFadden's R-squared	14.67%			

Note: \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

**Chronic physiological stress.** Unlike the two prior models, the theoretical prediction was correct as the salivary cortisol was statistically significant in this model ( $b = -.41$ ,  $p < .05$ ,  $OR = .67$ ). Given that the salivary cortisol variable was transformed with the inverse hyperbolic

sine, the beta coefficient was back transformed before the odds were interpreted (Cornell Statistical Consulting Unit, 2012). A back transformation was performed with the following mathematical equation:  $\ln(1.10)^*(b) = 3.91\%$ . Therefore, holding all else constant, for every 10% increase in nmol/L (the measurement of salivary cortisol), the predicted odds of reporting higher expectation about the financial future were 3.91% lower. In other words, on average, higher levels of chronic physiological stress negatively influenced expectations about the financial future.

**Financial stressors.** No financial stressors were statistically significant in the model. This was not the predicted result based on the hypothesis formed from the theory of cognitive appraisal.

**Financial resources.** As predicted by the theoretical framework, there were several financial resources that were statistically significant in the model. The statistically significant variables included financial effort ( $b = .07, p < .05, OR = 1.07$ ), positive income adequacy ( $b = .84, p < .001, OR = 2.31$ ), and subjective changes in debt from before the recession to present ( $b = .10, p < .05, OR = 1.10$ ). Holding all else equal, a one-unit increase in the amount of effort put into personal finances was associated with a 7% increase in the predicted odds of reporting a higher expectation about the financial future. Expectedly, having more than enough income to meet needs was associated with a 131% increase in the predicted odds of reporting a higher expectation about the financial future when compared to having just enough income to meet needs and holding all else constant. Finally, holding all else equal, a one-unit increase on the subjective debt scale was associated with a 10% increase in the predicted odds of reporting a higher expectation about the financial future. Higher numbers on the subjective debt scale indicated a decline in debt from before the recession to present. This suggested that the reduction

of debt was associated with higher odds of reporting a higher expectation about the financial future.

**Social resources.** Neither of the variables that measured the presence of social resources were statistically significant in the model. This was not the predicted result based on the hypothesis formed from the theory of cognitive appraisal.

**Financial mastery.** As predicted by the theoretical framework, financial mastery was statistically significant in the model ( $b = .42, p < .001, OR = 1.52$ ). A one-unit increase in the financial mastery scale was associated with a 52% increase in the predicted odds of reporting a higher expectation about the financial future.

**Coping.** Unlike the two prior models, problem-focused coping ( $b = .04, p < .001, OR = 1.04$ ) and emotion-focused coping ( $b = -.03, p < .01, OR = .97$ ) were statistically significant in the model. Holding all else equal, a one-unit increase in the problem-focused coping scale was associated with a 4% increase in the predicted odds of reporting a higher expectation about the financial future. Additionally, while holding all else constant, a one-unit increase in the emotion-focused coping scale was associated with .97 times the predicted odds of reporting a higher expectation about the financial future. The theoretical prediction was that both problem-focused and emotion-focused coping would be positively associated with reporting higher expectations about the financial future. However, the results indicated that problem-focused coping positively influenced expectations about the financial future while emotion-focused coping negatively influenced expectations about the financial future.

**Demographic variables.** The demographic variables that were statistically significant in the model included age ( $b = -.05, p < .001, OR = .95$ ), race ( $b = -.65, p < .01, OR = .52$ ), separated or divorced ( $b = -.60, p < .05, OR = 0.55$ ), and self-reported health status ( $b = .20, p <$

.001,  $OR = 1.22$ ). Holding all else constant, a one-unit increase in age was associated with .95 times the predicted odds of reporting a higher expectation about the financial future. Due to the large number of race categories but low frequencies within those categories, the race variable was recoded to white or non-white categories. Holding everything equal, when compared to all other races, white respondents had .52 times the predicted odds of reporting a higher expectation about the financial future. Expectedly, when compared to being single and holding all else equal, being separated or divorced was associated with .55 times the predicted odds of reporting a higher expectation about the financial future. Finally, holding everything constant, a one-unit increase in the self-reported health status scale was associated with a 22% increase in the predicted odds of reporting a higher expectation about the financial future.

## **Chapter 5 - Discussion**

The primary purpose of this study was to examine the relationship between chronic physiological stress and financial health perceptions. The theory of cognitive appraisal was the theoretical framework for this study and provided the overall direction of the research and formed the hypotheses (Lazarus & Folkman, 1984). The 2011-2014 MIDUS Refresher main project (Project 1) and biomarker assessment project (Project 4) were pooled together to create the cross-sectional dataset for this study. Three regression models were fit to explain the relationship between chronic physiological stress and financial health perceptions while controlling for resources and coping strategies.

### **Financial Health Perceptions**

Financial health perceptions was broadly defined in this paper as the subjective financial assessment of one's personal financial situation. The literature review from Chapter 2 identified a positive relationship between financial health perceptions and objective financial health outcomes. The literature review also identified a gap in the literature as the relationship between chronic physiological stress and financial health perceptions was unexplored. Therefore, three regression models were fit to examine the relationship between chronic physiological stress and financial health perceptions as measured by changes in financial satisfaction, changes in financial strain, and expectations about the financial future. The rest of this chapter provides a discussion of the regression results, contributions to the literature, implications, limitations, and recommendations for future research.

### **Primary Appraisal**

During the primary appraisal stage, the theory of cognitive appraisal posited that individuals are constantly engaged with their environment to determine whether there is a threat

to their well-being (Lazarus & Folkman, 1984). If a threat is not perceived, stress does not occur and the individual's subsequent behavior is not affected by stress. However, if a threat is perceived, then physiological stress occurs and outcomes are negatively affected by stress (Lazarus & Folkman, 1984).

### **Chronic Physiological Stress**

Given the continuous nature of the primary appraisal construct, chronic physiological stress was used to proxy primary appraisal. Specifically, salivary cortisol levels were used as the proxy for chronic physiological stress. Based on the theoretical framework, this paper hypothesized that higher salivary cortisol levels would have a negative relationship with changes in financial satisfaction, changes in financial strain, and expectations about the financial future. The salivary cortisol variable was not statistically significant in the regressions that modeled changes in financial satisfaction and changes in financial strain. These results were unexpected based on the theoretical and empirical predictions. Considering the mean scores for both dependent variables indicated that the average respondent did not report much of a change in financial satisfaction or financial strain, the lack of significant results could be the result of lack of variance in the dependent variable.

While the salivary cortisol variable was not significant in two of the models, it was statistically significant in the regression that modeled expectations about the financial future. This study found that higher salivary cortisol levels negatively influenced respondent's expectations about their financial future. So respondents who experienced more chronic physiological stress in their life had lower expectations for their financial future. Considering that positive expectations about the financial future previously predicted the use of a regular savings plan (Zepp & Heckman, 2018), saving more money (Furnham, 1984), and socio-

economic status (Glei et al., 2018), the results from this study suggest that chronic physiological stress may have a negative relationship with objective financial health outcomes. This potential relationship would be consistent with the findings from the financial planning literature that examined acute physiological stress outcomes. For example, prior research found that acute physiological stress was negatively associated with myopic decision-making (Grable & Britt, 2012b), irrational financial decision-making even when an expert (Coates & Herbert, 2008), not seeking financial help (Grable et al., 2014), and not making positive financial behavior changes (Britt et al., 2016). Although chronic physiological stress and acute physiological stress are distinct stress processes, the results from this paper were directionally consistent with both the theoretical predictions and the empirical findings from the acute physiological stress literature.

The results from this paper were also directionally consistent with the results from the chronic physiological stress literature. For example, prior research found that chronic physiological stress was negatively associated with accelerated aging, increased susceptibility to infectious diseases, microscope changes in the brain, deterioration in the immune system, depression, and hostile and negative behaviors during martial conflict (Mariotti, 2015; Robles & Kiecolt-Glaser, 2003). Given that none of the identified studies previously examined the influence of chronic physiological stress on a financial outcome, this study adds new evidence to the chronic physiological stress literature. Chronic physiological stress negatively impacts a number of life domains, and the results from this study adds financial planning to the list of impacted domains.

### **Secondary Appraisal**

If there is an appraisal of a potential threat, individuals move into the secondary appraisal stage (Lazarus, 1999). The move into the secondary appraisal stage indicates a shift in the

appraisal process from whether a threat exists to dealing with the threat. Secondary appraisal is strictly a cognitive evaluation of potential resources and available coping strategies (Tomaka et al., 1993). A review of the financial health perception literature identified a number of resources that were associated with financial health perceptions and were subsequently categorized into the following types of resources: (a) financial stressors, (c) financial resources, (d) social resources, and (e) financial mastery.

### **Financial Stressors**

During the evaluation of potential resources, if people determine that they have inadequate resources to handle stress, their outcomes are likely to be negatively influenced by stress (Lazarus & Folkman, 1984). A review of the financial health perceptions literature revealed a number of financial stressors that might negatively influence financial health perceptions (Glei, 2018; Joo & Grable, 2004; Prawitz et al., 2006). This study used bankruptcy and financial loss as financial stressor proxies. Therefore, it was hypothesized that bankruptcy and financial loss would negatively influence the three dependent variables that measured financial health perceptions. However, the only statistically significant finding across the three models involved financial loss.

In the model that predicted changes in financial strain, reporting a financial loss was statistically significant. Specifically, respondents who experienced a financial loss unrelated to work also reported that their ability to pay bills got worse from before the recession to present. Intuitively, this result made sense as a financial loss meant a reduction in financial resources, and thus, a worsened ability to pay bills. Again, from a theoretical perspective, this result was also consistent with the theoretical expectations as a lack of resources would indicate a negative association with stress-related outcomes. Although chronic physiological stress was not

statistically significant in the model, the theory still correctly predicted that a lack of resources would have a negative association with the outcome. Empirically, these results were consistent with prior research that found that financial losses negatively influenced similar financial health perceptions (Joo & Grable, 2004).

Overall, financial stressors were mostly insignificant across the three models. A possible explanation for the lack of significance could be related to the lack of depth in measurement. For example, a financial loss could mean many different things. It could signal that a respondent experienced paper losses in the stock market, or it could mean that a respondent lost their entire savings. Additionally, bankruptcy and financial loss are fairly severe financial stressors and do not capture daily stressors such as missing payments or struggling to meet a financial goal. Future research might benefit from the use of diverse, common, and distinct financial stressors, which were not available in the dataset used by this paper.

### **Financial Resources**

The variables used to proxy financial resources in this paper included both objective and subjective financial variables that could be used as a resource during secondary appraisal. Objective financial resources included household income and net worth. Subjective financial resources included variables such as subjective assessments of debt and perceptions of income adequacy. Not surprisingly, a number of financial resources were statistically significant across all three models, and the results were largely directionally consistent with the theoretical and empirical hypotheses.

The financial resources that were statistically significant in the regression that modeled changes in financial satisfaction included financial effort, negative income adequacy, negative subjective net worth, and the subjective assessment of changes in debt from before the recession

to present. Surprisingly, respondents who believed they put more thought and effort into their financial situation also reported a decrease in their financial satisfaction from before the recession to present. Respondents who did not think they had enough income to meet needs reported a decline in financial satisfaction. Respondents who subjectively reported a negative net worth also reported a decline in financial satisfaction. As expected, respondents who reported that they reduced their debt levels from before the recession to present also reported an increase in financial satisfaction during the adjacent time period.

The financial resources that were statistically significant in the regression that modeled changes in financial strain included financial effort, negative and positive income adequacy, and the subjective assessment of changes in debt from before the recession to present. Specifically, respondents who believed they had more than enough income to meet needs and subjectively reported a decline in debt from before the recession to present also reported less difficulty with paying bills. Conversely, respondents who believed they put more thought and effort into their financial situation and believed they did not have enough income to meet needs also reported more difficulty in paying bills. The finding related to financial effort was unexpected, but interestingly, directionally consistent with the findings from the regression that modeled changes in financial satisfaction.

The financial resources that were statistically significant in the regression that modeled expectations about the financial future included financial effort, positive income adequacy, and the subjective assessment of changes in debt from before the recession to present. Specifically, respondents who believed they put more thought and effort into their financial situation, believed they had more than enough income to meet needs, and subjectively reported a decline in debt from before the recession to present also reported a higher expectation for their financial future.

The finding related to financial effort was consistent with the theoretical expectations, but interestingly, inconsistent when compared to the directional findings from the regressions that modeled changes in financial satisfaction and financial strain from before the recession to present.

The results across all three models were mostly directionally consistent from both a theoretical and empirical perspective. From a theoretical perspective, respondents who were able to positively rely on subjective financial resources such as positive income adequacy and the subjective assessment of debt reductions were able to positively deal with stress and the outcome. Conversely, respondents who lacked the proper resources necessary to positively deal with stress, such as negative income adequacy, had negative outcomes. Empirically, the results were largely consistent with prior studies in terms of their directional relationships with various financial health perceptions (Bruggen et al., 2007; Joo & Grable, 2004; Prawitz et al., 2006). For example, respondents who did not believe they had enough income to meet their needs had worse financial health perceptions across two of the three models. This was consistent with prior studies that found a negative relationship between income adequacy and financial satisfaction and overall well-being (Joo & Grable, 2004; Montpetit et al., 2015). Overall, these results suggest that subjective financial resources play an important role in the relationship between chronic physiological stress and financial health perceptions.

The findings related to financial effort were inconsistent from a theoretical and empirical lens, but also inconsistent across all three models. Theoretically, it was expected that respondents who put thought and effort into their finances would rely on that resource to positively influence their financial health perceptions. Empirically, putting thought and effort into financial decisions was positively associated with several financial health perceptions (Bruggen et al., 2007;

Montpetit et al., 2015). The financial effort variable was positively associated with expectations about the financial future, but negatively associated with changes in financial satisfaction and financial strain from before the recession to present. Given the negative financial impact that the recession had on personal finances, it is possible that respondents who put considerable thought and effort into their finances were perhaps disappointed with the results of their financial situation after the recession, and therefore, had negative financial health perceptions.

Interestingly, across all three models, the objective financial resource variables (income and net worth), were not statistically significant. This suggested that subjective resources may matter more in terms of predicting financial health perceptions. Although, it should be noted the dataset used in this paper lacked additional variables that would measure other objective financial resources and that could possibly explain the lack of significance. Additionally, some of the subjective assessments of financial resources, such as the decline in debt from before the recession to present, could be objectively accurate and a valid proxy for objective financial resources.

### **Social Resources**

According to the theory of cognitive appraisal, social resources are a critical construct in the relationship between chronic physiological stress and outcomes (Lazarus & Folkman, 1984). Additionally, there was some empirical evidence that indicated that social resources positively influenced financial health perceptions (Asebedo & Seay, 2014). Therefore, it was hypothesized that social resources would positively influence the dependent variables in this study. However, the two variables used in this study to proxy social resources were not statistically significant in any of the three regression models. This result is surprising considering there was theoretical and empirical support for the hypotheses.

A possible explanation for the lack of statistical significance could be related to the lack of diversity in the social resource proxy. For this study, the two variables used to proxy social resources related to the ability to open up to and rely on family members for help. However, social support can come from a number of areas including friends, co-workers, community, and recreational groups. These types of social resources were unavailable in the dataset used for this study. Given that the respondents were around 50 years old and had relatively high household income and net worth, it is possible that this particular sample did not find family support helpful and instead relied on other social resources.

### **Financial Mastery**

Financial mastery was hypothesized to have a positive influence on financial health perceptions from both a theoretical and empirical lens. Theoretically, domain-specific mastery provides individuals with an invaluable resource during a stressful encounter (Lazarus & Folkman, 1984). Empirically, financial mastery was positively associated with a number of different financial health perceptions (Gasiorowska, 2014; Gleib, 2018; Shim et al., 2009). The results from this study were consistent with both the theoretical and empirical predictions as financial mastery positively predicted all three dependent variables. Specifically, financial mastery positively predicted an increase in financial satisfaction from before the recession to present, positively predicted a decline in difficulty paying bills, and positively predicted higher expectations about the financial future. Thus, respondents who were able to rely on their financial resourcefulness and control their financial situation improved their financial health perceptions.

The findings from the three models suggest that financial mastery is an important resource for maintaining positive financial health perceptions. Additionally, financial mastery

may be an important variable in the relationship between chronic physiological stress and financial health perceptions. In particular, given the positive relationship between financial mastery and financial health perceptions (Gasiorowska, 2014; Gleib, 2018), and the positive relationship between financial health perceptions and objective financial health (Furnham, 1984; Zepp & Heckman, 2018), control over one's finances may be a valuable resource in dealing with the negative effects of chronic physiological stress on financial health perceptions and objective financial health outcomes.

### **Coping**

A perceived lack of resources will trigger the process of seeking available coping strategies to deal with perceptions of stress (Lazarus & Folkman, 1984). Under the theoretical framework, coping strategies were categorized into problem-focused coping or emotion-focused coping. Problem-focused coping strategies focus on the problem or issue at hand and emotion-focused coping alters the perceptions of the problem (Lazarus, 1993b). Theoretically, neither coping strategy is inherently better than the other (Folkman et al., 1986), so it was hypothesized that a strong preference for either problem-focused or emotion-focused coping would have a positive influence on financial health perceptions.

Problem-focused coping and emotion-focused coping were statistically significant in the regression that modeled expectations about the financial future. Respondents who had a strong preference for problem-focused coping strategies had higher expectations for their financial future. Conversely, respondents who had a strong preference for emotion-focused coping strategies had lower expectations for their financial future. Thus, problem-focused coping had a positive influence on expectations about the financial future while emotion-focused coping had a negative influence on expectations about the financial future.

These results were inconsistent from a theoretical lens as the theoretical framework predicted that a strong preference for either coping strategy would have a positive influence on the expectations about the financial future. Interestingly, the results were consistent from an empirical lens as prior research seemed to suggest that problem-focused coping strategies were more likely to have a positive influence on an outcome. For example, one study found that problem-focused coping strategies positively influenced student GPA while emotion-focused coping did not have statistical relationship with GPA (Zepp et al., 2018). Another study found that participants who experienced stressors related to the achievement of a goal were more likely to use problem-focused coping strategies (Baker & Berenbaum, 2007). Additional evidence came from another study that found that problem-focused coping was correlated with specific efforts to reduce financial stressors (Brougham et al., 2009). So the results from this study were consistent with the empirical findings from other studies that found that problem-focused coping was the better coping strategy.

Although most of the empirical research seemed to suggest that problem-focused coping strategies were better than emotion-focused coping strategies, one study did find that emotional coping limited the amount of chronic physiological stress experienced as the result of relationship conflict among couples (Gunlicks-Stoessel & Powers, 2009). Theoretically, since emotion-focused coping limited the amount of chronic physiological stress, then the use of emotion-focused coping strategies was expected to have a positive influence on financial health perceptions. Thus, the negative relationship between emotion-focused coping and expectations about the financial future was unexpected. Although, despite its negative relationship, it is possible that emotion-focused coping may have positively mediated the relationship between chronic physiological stress and expectations about the financial future. Future research in this

area would benefit from exploring the discreet relationships between coping strategies and their potential mediating effects on the relationship between chronic physiological stress and financial health perceptions.

The problem-focused and emotion-focused coping scales were not statistically significant in the other two regressions that modeled changes in financial satisfaction and changes in financial strain. Interestingly, in both models, the coping scales and the salivary cortisol variable were not statistically significant. From a theoretical perspective, this may make sense if an assumption is made on its face that chronic physiological stress does not influence either changes in financial satisfaction or changes in financial strain. If chronic physiological stress does not influence either dependent variable, then it might be the case that coping processes simply were not needed, and therefore, were not statistically significant in the models. So these results may still be consistent from a theoretical lens. Future research that included these three variables would strengthen this potential explanation.

### **Demographic Variables**

The literature review identified a number of demographic variables that were included in the regression models to strengthen the analysis of the relationship between the variables used to proxy the theoretical constructs and the dependent variables. Age, unemployment, reporting an “other” working status, separated or divorced, and self-reported health status were statistically significant in the models and had a negative relationship with financial health perceptions. These results were largely expected from an empirical perspective. Specifically, older respondents reported a decline in financial satisfaction and an increase in financial strain from before the recession to present. Older respondents also had lower expectations for their financial future.

This was consistent with prior research that found that age was negatively associated with an array of financial health perceptions (O'Neill et al., 2005).

Unemployed respondents, when compared to working respondents, reported a decline in financial satisfaction and an increase in financial strain from before the recession to present. Similarly, respondents who reported an “other” working status (e.g., were not working, retired, or unemployed) also reported a decline in financial satisfaction and an increase in financial strain from before the recession to present. Respondents who self-reported a better health status had higher expectations for the financial future. Respondents who were separated or divorced reported lower expectations for the financial future when compared to single respondents. Finally, when compared to non-white respondents, white respondents reported lower expectations for the financial future.

Overall, the demographic variables that were statistically significant were consistent with the theoretical and empirical predictions. In particular, older respondents and respondents who were either unemployed or had an “other” working status reported negative financial health perceptions across all three models. This suggests that age and working status may be important factors that determine financial health perceptions, which is consistent with the prior literature (O'Neill et al., 2005). Additionally, age, race, marital status, and health status were statistically significant in the model that found a negative relationship between chronic physiological stress and expectations about the financial future. This suggests that certain demographic characteristics, such as marital status, play a role in determining stress-related outcomes. This result is also consistent with the prior literature (Arber et al., 2014; O'Neill et al., 2005).

## **Contributions to the Literature**

Psychophysiological economics is an emerging field of study within the financial planning field, but it is also a relatively new field with limited literature. Most of the studies within the field of psychophysiological economics relied on small quasi-experimental designs without proper control groups to observe correlations between acute physiological stress and an outcome. Although the prior literature was critical in establishing the necessary foundation and purpose for this paper, the lack of control group and use of acute physiological stress measurements limited the strength of the results. The unique design of this paper provided two primary advantages over the prior literature: (a) the large sample size for this paper (703 respondents) provided the opportunity to use stronger analytical tools such as multivariate regressions and (b) the measurement of chronic physiological stress over acute physiological stress provided stronger evidence for the directional relationship between physiological stress and the outcome of interest. These advantages uniquely contributed to the current psychophysiological economic literature.

This study also contributes to the rather scarce literature on biomarkers. Most of the literature that examined the use of biomarkers came from the medical field. This paper offers researchers within the social sciences field evidence that the use of biomarkers may not be limited to just medical studies. Finally, a review of multiple search engines for peer-reviewed articles did not identify any traditional financial planning studies that examined chronic physiological stress as a primary variable of interest. Therefore, this study may be one of the first studies within the financial planning literature to study the relationship between chronic physiological stress and financial health perceptions.

## **Implications of Findings**

For stress researchers, the findings provide additional evidence that the salivary cortisol variable may be a valid and reliable proxy for chronic physiological stress. Although the variable was not statistically significant in two of the models, the results from the regression that modeled expectations about the financial future were consistent with expectations. Based on the results, chronic physiological stress negatively influences expectations about the financial future.

Additionally, problem-focused coping and emotion-focused coping strategies were statistically significant in the same model, which adds credibility to the results with respect to the salivary cortisol variable. The availability of the salivary cortisol variable in a large secondary dataset as a valid proxy for physiological stress means that stress researchers may not need to exclusively rely on primary data collection and experimental designs, which can be both costly and time consuming.

For financial planners and the financial planning community, the results provide more evidence of the negative financial outcomes associated with physiological stress. The results from this study may push practitioners to consider offering stress reductions or other methods to address physiological stress in their practice as a more holistic approach to personal financial planning. Similarly, the results from the secondary appraisal construct should be concerning for practitioners. In particular, subjective financial resources appeared to be more important than objective financial resources in predicting financial health perceptions. Considering the predictive relationship between financial health perceptions and objective financial health outcomes, such as saving, practitioners may want to consider addressing their clients' subjective assessments of their financial resources in addition to the traditional objective assessments. This recommendation is consistent with the recommendation made in prior research that found that

perceptions of the financial future predicted whether people engaged in low discount choices (Zepp & Heckman, 2018).

### **Limitations of the Study**

While this paper positively contributes to the literature and its findings have important implications for the financial planning field, there are limitations that require further discussion. As discussed in more detail in Chapter 2 of this paper, there is an inherent reciprocal relationship between stress and stress outcomes. Therefore, it is critically important to account for the reciprocal relationship when designing a study to examine the effects of stress on an outcome. To address this issue, this paper used three dependent variables that had discrete timing effects to isolate the directional relationship between chronic physiological stress and financial health perceptions. However, this strategy was limited by the use of cross-sectional data. A longitudinal study that followed the same sample and observed changes in the variables at different times would provide a stronger study design that addresses the reciprocal relationship. Unfortunately, longitudinal data with salivary cortisol measurements is not available at the current time, and the lack of longitudinal data is a limitation with this study.

This study was also limited because the dataset did not have a measure of childhood economic strain. In particular, prior literature indicated that economic strain in childhood influenced the basal levels of salivary cortisol in children (Blair et al., 2011). Since this study measured salivary cortisol levels in adulthood, it is possible that economic strain in childhood contributed to the salivary cortisol levels in adulthood. Therefore, childhood economic strain may have contributed to the relationship between chronic physiological stress, measured by salivary cortisol, and the dependent variables. If childhood economic strain was included in the

regression models as a control variable, the results related to the salivary cortisol variable would be stronger.

This study was also limited by the lack of objective health indicators that were included in the statistical models. Prior research indicated that mental and physical health play an important role in stress occurrences and the relationship between stress and outcomes (Lazarus & Folkman, 1984). Although the self-reported health status variable included in all three models may have served as a sufficient proxy for mental and physical health, the inclusion of objective health indicators would have bolstered the results. In particular, poor mental and physical health may have contributed to the relationship between the salivary cortisol variable and financial health perceptions. In such a case, the inclusion of proxies for mental and physical health may have reduced the spurious measurement outcomes associated with the salivary cortisol variable and strengthened the results from this study (Shirtcliff et al., 2014).

Even though the salivary cortisol variable was statistically significant in one of the models, the variable is inherently complex. Several studies identified in the literature review found either contradicting evidence of the relationship between salivary cortisol and chronic physiological stress or questioned whether the variable exclusively measured the existence of chronic physiological stress (Shirtcliff et al., 2014). It is possible that the salivary cortisol variable was not statistically significant in two of the models from this paper because the variable has spurious measurement characteristics. Although, the salivary cortisol variable was statistically significant and directionally consistent with the expected results from the regression that modeled expectations about the financial future.

Additionally, although prior research cautiously supported the use of salivary cortisol as a proxy for chronic physiological stress (Hellhammer et al., 2009; Shirtcliff et al., 2014), the

variable did not distinguish between the various types of stressors individuals experience during the primary appraisal stage. For example, physiological stress from public speaking is viewed as a positive stress because it challenges people in a constructive manner (Feldman et al., 2004). If individuals experienced mostly positive stress in their life, their salivary cortisol levels could be similar to those that experienced mostly negative stress in their life. As a result, this study may have been limited by the broad assumption that high salivary cortisol levels were indicative of negative physiological stress experiences.

Finally, in an attempt to address the reciprocal relationship between stress and stress outcomes, two of the dependent variables chosen for this study were variables that measured financial health perception changes that occurred sometime prior to the recession to present. However, the independent variables represented cross-sectional observations, which complicated the directional causality between some of the independent variables and the two dependent variables. For example, income adequacy was a statistically significant independent variable in the regression that modeled changes in financial strain from before the recession to present. Given the discreet timing effect of the change in financial strain variable and the cross-sectional nature of the income adequacy variable, determining whether income adequacy influenced the change in financial strain or the change in financial strain influenced income adequacy was open to discussion. This paper attempted to address this limitation by structuring the research design around a strong theoretical framework and relying on the theoretical constructs to determine directional relationships among the independent variables and dependent variables. Although this approach helped, directional causality is still a limitation.

## **Recommendations for Future Research**

Given some of the limitations addressed above, there are several recommendations for future research. Perhaps the most obvious recommendation for future research is the use of longitudinal data to strengthen the directional relationship between stress, the independent variables, and the dependent variable of interest. Longitudinal data would also help address the reciprocal relationship with stress and stress outcomes. In particular, observations from the same sample over different time periods would help isolate the directional causality between stress and the outcome of interest. Additionally, given that financial resources are generally fungible, longitudinal data should help identify the discrete relationships between financial resources and the outcome of interest.

Future research would also benefit from including objective mental and physical health indicators given the relationship between mental and physical health and stress outcomes (Lazarus & Folkman, 1984). Along those same lines, future research should include distinct proxies for the various types of stressors people experience during the primary appraisal stage. For example, positive stress as the result of a challenge is not the same construct as negative stress as the result of the perception of harm. If future studies could find a way to proxy physiological stress but include distinct measures to capture the depth of stress experiences, the results would make a significant contribution to the literature.

This study did not include personality factors in the statistical models because the theoretical framework explicitly omitted personality from its conceptualization (Lazarus & Folkman, 1984). However, future research might benefit from using a different theoretical framework that includes personality factors to explore whether personality contributes to the relationship between chronic physiological stress and financial health perceptions. Future

research would also benefit from using the salivary cortisol variable to predict other financial-related outcomes. Given the inconsistent findings in the salivary cortisol literature, additional studies are needed. Specifically, additional research that finds a statistical relationship between salivary cortisol levels and a financial outcome would strengthen the validity and reliability of salivary cortisol as a proxy for chronic physiological stress. As of now, the findings from this paper certainly provides evidence of a relationship, but the lack of additional studies in this area limits the strength of evidence.

In terms of the secondary appraisal construct, future research that uses the theory of cognitive appraisal as the theoretical framework might benefit from using other variables besides family support to proxy social resources. The social resource variables in this study were not statistically significant across all three models, which was unexpected from both a theoretical and empirical lens. Finally, future research might benefit from running a similar study on a different dataset for two reasons: (a) although similar in demographic characteristics, the study sample was not nationally representative and (b) the objective net worth variable had too much missing data that required the use of multiple imputation. If a similar study with a different sample and no missing data issues on the objective net worth variable found similar results, it would strengthen the empirical evidence put forth by this paper.

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## Appendix A - Descriptive Statistics after Imputation

**Table A.1. Sample Characteristics on Imputed Data & Weighted National Sample**

Variable	<u>Current Study Sample</u>				<u>Weighted National Sample</u>			
	<i>n</i>	<i>M</i>	<i>SD</i>	Range	<i>n</i>	<i>M</i>	<i>SD</i>	Range
Age	703	51.1	13.59	25 – 76	3,577	48.94	13.77	23 – 76
Male (Female)	703	0.50	0.50	0 – 1	3,577	0.48	0.50	0 – 1
White (Non-White)	703	0.81	0.39	0 – 1	3,552	0.82	0.39	0 – 1
Marital Status								
Single (Ref)	110	0.15	0.36	0 – 1	551	0.19	0.39	0 – 1
Married	456	0.65	0.48	0 – 1	2,283	0.62	0.48	0 – 1
Widow	29	0.04	0.20	0 – 1	199	0.04	0.19	0 – 1
Separated/Divorced	108	0.16	0.36	0 – 1	534	0.15	0.36	0 – 1
Highest Education								
HS or Less (Ref)	101	0.14	0.35	0 – 1	829	0.38	0.49	0 – 1
Some College	197	0.28	0.45	0 – 1	1,096	0.28	0.45	0 – 1
College Degree	214	0.31	0.46	0 – 1	909	0.19	0.39	0 – 1
Graduate Degree	191	0.27	0.45	0 – 1	736	0.15	0.35	0 – 1
Working Status								
Working (Ref)	472	0.67	0.47	0 – 1	2,223	0.68	0.46	0 – 1
Unemployed	35	0.05	0.21	0 – 1	121	0.05	0.21	0 – 1
Retired	147	0.21	0.40	0 – 1	689	0.17	0.37	0 – 1
Other	49	0.06	0.25	0 – 1	310	0.10	0.30	0 – 1
Household Income*	703	68.9	67.60	0 – 300	3,319	43.4	60.2	0 – 300
Household Net Worth*	703	591.1	1,325	8,804	2,363	208.2	694	12,150
No. of Fin Dep Children	703	0.81	1.16	0 – 9	3,577	0.89	1.22	0 – 11
Self-Report Health Status	703	7.43	1.57	0 – 10	2,604	7.19	1.71	0 – 10

\*Income and net worth reported in 1,000 units. The minimum for the net worth range was -\$3,530,700 for both samples.

\*\*Imputed data was not weighted.

**Table A.2. Study Sample Variables on Imputed Data**

Variable	<i>n</i>	<i>M</i>	<i>SD</i>	Range	$\alpha$
<b>Dependent Variables</b>					
Change in Financial Satisfaction	703	-0.66	2.37	-10 – 10	
Change in Financial Strain	703	4.41	1.47	1 – 7	
Expectations about the Financial Future	703	7.13	2.12	0 – 10	
<b>Primary Appraisal</b>					
Salivary Cortisol	703	16.06	13.05	2 – 284	
<b>Secondary Appraisal</b>					
<i>Financial Stressors</i>					
Bankruptcy (No)	703	0.11	0.31	0 – 1	
Financial Loss (No)	703	0.11	0.31	0 – 1	
<i>Financial Resources</i>					
Financial Effort	703	7.60	2.17	0 – 10	
Income Adequacy					
Not Enough	176	0.25	0.44	0 – 1	
Just Enough (Ref)	380	0.54	0.50	0 – 1	
Plenty	147	0.21	0.41	0 – 1	
Subjective Net Worth					
Negative	112	0.16	0.37	0 – 1	
About Even (Ref)	106	0.15	0.36	0 – 1	
Positive	485	0.69	0.47	0 – 1	
Subjective Changes in Debt	703	4.21	1.92	1 – 7	
Household Income	703	68,978	67,603	0 – 300,000	
Household Net Worth*	703	591,058	1,325	8,804,000	
<i>Social Resources</i>					
Rely on Family	703	3.50	0.82	1 – 4	
Open up to Family	703	3.14	0.91	1 – 4	
<i>Financial Mastery</i>					
Financial Mastery	703	6.44	2.59	0 – 10	
<i>Coping Strategies</i>					
Problem-focused Coping	703	39.46	9.19	12 – 98	0.90
Emotion-focused Coping	703	22.53	10.86	13 – 98	0.85

\*The minimum for the net worth range was -\$3,530,700.

\*\*Imputed data was not weighted.

## Appendix B - Summary Table of Model Results

**Table B.3. Summary of Model Results Across All Three Models (N = 703)**

Dependent Variable	<u>Model 1</u>	<u>Model 2</u>	<u>Model 3</u>
Variable	<i>b</i>	<i>Odds</i>	<i>Odds</i>
<b>Primary Appraisal</b>			
Salivary Cortisol (IHS)	-0.14	1.10	0.67*
<b>Secondary Appraisal</b>			
<i>Financial Stressors</i>			
Bankruptcy (No)	-0.05	0.86	1.04
Financial Loss (No)	-0.36	2.26**	1.01
<i>Financial Resources</i>			
Financial Effort	-0.09*	1.10**	1.07*
Income Adequacy (Just Enough Ref)			
Not Enough	-1.24***	3.84***	0.82
Plenty	0.41	0.51**	2.31***
Subjective Net Worth (About Even Ref)			
Negative	-0.87**	1.61	0.90
Positive	-0.47	1.07	0.91
Subjective Changes in Debt	0.09*	0.82***	1.10*
Household Income (IHS)	0.02	1.03	1.01
Household Net Worth (IHS)	0.01	0.99	0.99
<i>Social Resources</i>			
Rely on Family	-0.11	0.94	0.91
Open up to Family	0.05	1.01	0.88
<i>Financial Mastery</i>			
Financial Mastery	0.22***	0.82***	1.52***
<i>Coping Strategies</i>			
Problem-focused Coping	-0.01	0.99	1.04***
Emotion-focused Coping	0.01	1.01	0.97**
<b>Demographic Variables</b>			
Age	-0.03***	1.02*	0.95***
Male (Female)	0.06	0.81	1.09
White (Non-White)	-0.13	1.10	0.52**
Marital Status (Single)			
Married	0.09	1.13	1.11
Widow	-0.37	0.75	0.80

Separated/Divorced	-0.04	0.95	0.55*
Highest Education (HS or Less)			
Some College	-0.09	0.98	1.11
College Degree	-0.03	0.88	1.13
Graduate Degree	-0.01	0.81	1.13
Working Status (Working)			
Unemployed	-1.29**	3.10**	1.75
Retired	0.38	1.10	1.27
Other	-1.25***	2.83**	1.07
No of Financially Dependent Children (IHS)	-0.08	0.84	0.97
Self-Reported Health Status	-0.05	1.04	1.22***
Adjusted R <sup>2</sup> /McFadden's R <sup>2</sup>	25.43%	12.85%	14.67%

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Model 1: OLS Regression Results for Changes in Financial Satisfaction

Model 2: Cumulative Logistic Regression Results for Changes in Financial Strain

Model 3: Cumulative Logistic Regression Results for Expectations about the Financial Future

Note: \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .