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Factors associated with self-care behavior in persons with heart failure.

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FACTORS ASSOCIATED WITH SELF-CARE BEHAVIOR IN PERSONS WITH HEART FAILURE

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DEDICATION

I dedicate my dissertation work to my family and friends. A special feeling of gratitude to my loving parents, Munther Al-Hammouri and Hanan Al-Zoubi, whose words have given me the strength to reach for my goals and chase my dreams. My brothers and sisters Majdi, Manal, Rania, Khaled, and Omar and their families who never left my side. You are the stars that guide me pursuing my endeavors. Thank you all for your endless support.

I dedicate this work and give special thanks to my best friends and soulmates in this journey; my wife and my love Dana Mistarihi and our both sons Ryan and Mahdi for being there for me throughout the entire doctorate program.

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ABSTRACT

FACTORS ASSOCIATED WITH SELF-CARE BEHAVIOR IN PERSONS WITH HEART FAILURE

Mohammed Munther Al-Hammouri

June 28, 2016

Introduction: Heart failure is a serious illness that mostly affects the elderly. It is characterized by progressive deterioration of the heart muscle and affects the quality of life of those living with it. The progression of the illness has been shown to be slower with appropriate self-care. Several studies examined predictors of self-care extensively. The results were inconsistent and usually explained a small fraction of the variance in self-care in persons with heart failure, and they usually overlooked some potential predictors that could be related to self-care in person with heart failure.

Purpose: The purpose of this study was to explore impulsivity, perceived control, and perceived stress as predictors of self-care behavior in person with heart failure using the Hot/Cool System Model. This study examined the mechanism by which these variables interact to affect self-care behavior.

Methods: A cross-sectional exploratory study was conducted with 100 persons with heart failure from a heart failure clinic affiliated with Norton Healthcare using self-report questionnaires. Inclusion criteria were: a diagnosis of heart failure with no terminal illness or memory problems, at least 18 years of age, and able to read and speak English.

Participants received a $10 gift card as compensation for their participation. SPSS macros were used to investigate the proposed relationships among study variables.

Results: Perceived control mediated the effect of impulsivity on self-care maintenance only at low levels of stress. Backward regression showed that the best fit model for predicting self-care maintenance included impulsivity, perceived control, and functional status. A follow up mediation analysis showed that perceived control partially mediated the relationship between impulsivity and self-care maintenance. However, the results did not show any significant effect of those potential predictors on self-care management.

Conclusion: The current study added new insights and filled a gap in the literature. Further research is needed since this study is the first to introduce impulsivity and Hot Cool System Model to the nursing literature, and it is the first to study this combination of variables in persons with heart failure

Keyword: Heart failure, self-care, impulsivity, perceived control, perceived stress, Hot/Cool System Model, moderated mediation

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CHAPTER I

INTRODUCTION

Background and Significance

The purpose of this study was to evaluate the relationships of impulsivity, perceived stress, and perceived control with self-care behavior in persons with heart failure using the Hot/Cool System Model as a foundation (Metcalfe & Mischel 1999). The model suggests that emotion-related drives, such as impulsivity, are the main triggers for making everyday behavioral choices. It also suggests that cognitive processes act as mediators between the tendency to act impulsively and the individual's behavioral choice. According to the model, the imbalance between emotions or cognitive processes determines the choice of one behavioral alternative over another; however, other contextual variables such as stress have the ability to shift that imbalance from one side to another.

Heart failure (HF) is a syndrome characterized by permanent remodeling in the heart muscle that leads to a reduction in the heart's ability to contract and eject blood (Twedell, 2007). Remodeling is followed by a compensation mechanism that further changes and damages in the heart cells (Twedell). Lifelong behavior modifications are required to deal with these permanent changes and minimize disease progression (Twedell).

Heart failure is associated with high mortality, morbidity, and health care expenditures. It is one of the most debilitating diseases affecting the elderly population

(Grady, 2008; Salyer, Schubert, & Chiaranai, 2012). About half of all Americans have at least one risk factor for heart disease (Centers for Disease Control and Prevention [CDC], 2012a). The number of Americans who have heart failure is approaching six million, and half of them will die within five years of diagnosis (CDC, 2012b). The incidence and prevalence of heart failure are continually increasing (Macabasco-O'Connell, Crawford, Stotts, Stewart, & Froelicher, 2008). In 2008, heart failure was a contributing factor in more than 280,000 deaths in United States (U.S.), and it is the primary cause of death for more than 50,000 Americans each year (CDC, 2012b). It is also the major reason for hospital admissions and recurrent admission soon after discharge (Jurgens, Hoke, Byrnes, & Riegel, 2009). The annual cost of heart failure in the U.S. is about $35 billion in healthcare expenses and lost productivity (CDC, 2012b).

Kentucky is among the worst states in terms of mortality rate and hospitalizations in persons with heart failure. Between 2008 and 2010, the average mortality rate for all ages, all races, and both sexes per 100,000 persons with heart failure was between 98.1 and 151.3 (CDC, n.d.). During the same time, the hospitalization rate for those 65 years of age and above, all races, and both sexes was between 19.1 and 23.6 per 1,000 Medicare beneficiaries; however, most of these hospitalizations were discharged home (67.9%-70.9%) (CDC, n.d.). That means after being discharged, the majority of these patients and their families were left to take care of their illness.

Ways to minimize hospitalizations and deaths that result from the exacerbations related to the heart failure have been studied for decades. The main goals of care for persons with heart failure are maintaining physiologic integrity and preventing exacerbations (Lee, Moser, Lennie, & Riegel, 2011). Heart failure treatment usually

involves dietary modifications, taking medications such as diuretics and digoxin, and performing daily activities (CDC, 2012b). Heart failure hospitalizations and deaths are preventable through appropriate self-care behavior (Artinian, Magnan, Sloan, & Lange, 2002; CDC, 2012a; Lee et al., 2011; Macabasco-O'Connell et al., 2008). Self-care behavior improves health, prevents diseases, and restores health by enhancing the use of available resources through collaboration between persons with heart failure and their healthcare professionals (Arcury et al., 2009; Macabasco-O'Connell et al.).

Self-care behavior in patients with heart failure is associated with higher education, lower symptom severity, greater comorbidity, less depression, and lower self-care confidence (Cameron, Worrall-Carter, Riegel, Lo, & Stewart, 2009; Holzapfel et al., 2009; Schnell-Hoehn, Naimark, & Tate, 2009). However, all of these studies were able to only partially explain the variance in self-care behavior (Cameron et al.; Rockwell & Riegel, 2001). Thus, there is a need to identify other factors to explain the variance in self-care behavior. This study investigated three factors that predicted various behaviors in previous research: impulsivity, perceived control, and perceived stress.

Impulsivity is associated with various problematic, maladaptive, and unhealthy behavioral choices. For example, impulsivity was associated with gambling (Auger, Lo, Cantinotti, & O'Loughlin, 2010), hazardous drinking (CDC, 2012a), overeating (CDC, 2012b), offending behavior (Grady, 2008), aggressive behaviors (Derefinko, DeWall, Metze, Walsh, & Lynam, 2011), addiction (von Diemen, Bassani, Fuchs, Szobot, & Pechansky, 2008), and academic cheating (Allison, 2007). The relationship between impulsivity and self-care behavior has not been explored (Al-Hammouri & Hall, 2013).

The mechanism by which impulsivity may affect the decision making process about a specific course of actions is called delay discounting. Delay discounting refers to the depreciation of the value of the rewarding consequences or reinforcers of a behavior as the time between that behavior and its consequences increases (Madden, Francisco, Brewer, Stein, & Society for the Quantitative Analyses of Behavior, 2011). Most of the self-care related choices have rewarding consequences that are relatively far in the future (e.g., eating a low salt diet and staying healthy months or years later). On the other hand, unhealthy behavior results in more immediate rewarding consequences (e.g., eating a high salt diet and enjoying the taste of the food right now). Thus, the temporal differences between the behavior and its rewarding consequences play a major role in a person's willingness to adopt one behavior over another.

In an attempt to explain how delay discounting intervenes in controlling impulsive choices, Metcalfe and Mischel (1999) proposed the Hot/Cool System Model. Although the model was developed to explain previous research results related to impulsivity, it can be used to predict the relationships among variables in the model. One hypothesis derived from the model is that the relationship between the tendency to act impulsively and the selected behavioral choice (e.g., self-care behavior) is mediated by some cognitive processes. Another hypothesis is that the ability of cognitive processes to act as mediators is affected by contextual variables which in turn moderate the mediational role of cognitive processes in the model. To test the first hypotheses, a cognitive variable that has the ability to counter the effect of impulsivity is needed.

Perceived control is a cognitive variable associated with positive disease outcomes in persons with heart failure such as better functional status and lower levels of

anxiety, depression, and hostility (Dracup, Westlake, Erickson, Moser, Caldwell, & Hamilton, 2003). Although research on the relationship between perceived control and self-care behavior in persons with heart failure is limited (see Appendix A), perceived control was positively associated with self-care behavior in persons with heart failure (Hwang, Moser, & Dracup, 2014). In addition, perceived control was positively associated with health related quality of life in persons with heart failure (Heo, Moser, Lennie, Fischer, Smith, & Walsh, 2014). Thus, perceived control may be a cognitive process that has the ability to mediate the relationship between impulsivity and self-care behavior.

To test the second hypothesis, a contextual variable that has the ability to shift the imbalance between emotion-related derives and cognitive processes is required. Metcalfe and Mischel (1999) proposed stress as one contextual variable in their model that may serve this function. Stress is frequently associated with adverse health conditions and increases workload on the heart that may eventually lead to heart failure and other cardiovascular problems (Torpy, 2007). According to the Hot/Cool System Model, stress level can moderate the relationship of impulsivity and perceived control in predicting self-care behavior. Thus, the purpose of this study was to examine the potential moderating effect of stress on the relationships of impulsivity and perceived control with self-care behavior in persons with heart failure.

Specific Aim: Determine if perceived control differentially mediates the relationship between impulsivity and self-care behavior at different levels of perceived stress, controlling level of depression, heart failure knowledge, and functional status.

Hypothesis: The mediational effect of perceived control on the relationship between impulsivity and self-care behavior will be stronger at lower levels of stress and weaker at higher levels of stress controlling level of depression, heart failure knowledge, and functional status.

Theoretical Framework

The model that guided this study is the Hot /Cool System Model. The importance of the model lies in the hypotheses that can be derived from the model about the nature of relationships among the study variables. The first part of this section briefly explains the Hot/Cool System Model. The second part describes statistical terms that are essential to understand the proposed relationships among the study variables. The third part describes the proposed relationships among the study variables in light of the Hot/Cool System Model.

The Hot/Cool System Model

The Hot/Cool System Model is described based on the Metcalfe and Mischel (1999) original article. This model was proposed to explain previous research findings from studies of human response to delayed gratification. These findings showed that rewards or reinforcers that drive our behaviors tend to lose their value if the access to them is far in future (Weatherly, Terrell, & Derenne, 2010). Thus, a smaller more immediate reinforcer value may exceed the value of a larger reinforcer that is distant in the future resulting in impulsive behavior (Gullo & Potenza, 2014).

The components of the Metcalfe and Mischel model are stimulus representations, hot system, cool system, and contextual variables (see Figure 1). Stimulus representations are a set of circumstances that trigger the decision making process to select a course of

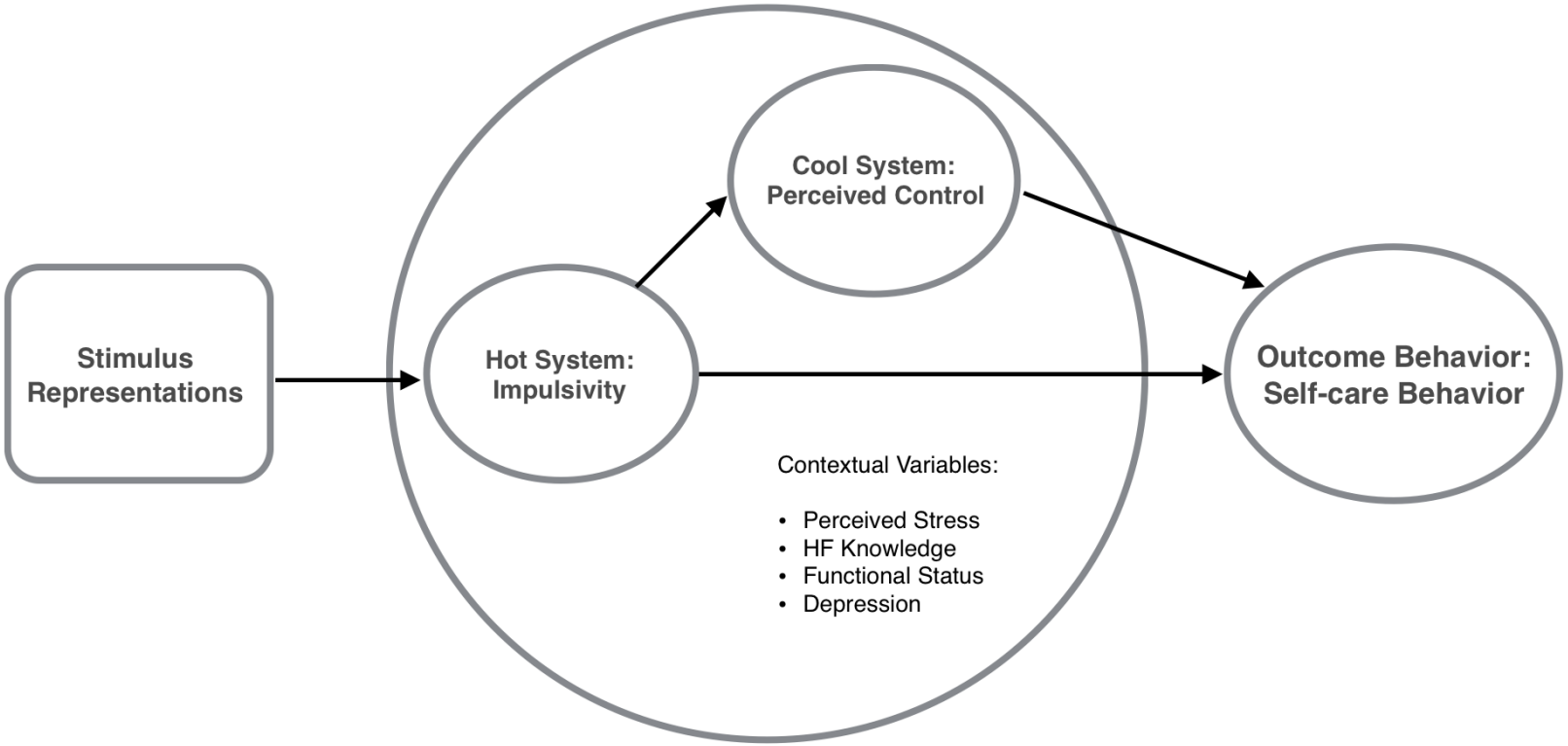

Figure 1. Hot/Cool System Model in Persons with Heart Failure

actions among available alternatives. For example, the presence of food with a salt shaker on the lunch table is a stimulus representation for making a decision regarding adding salt to the food or not (i.e., high versus low salt diet). Although such decisions seem simple, for persons with heart failure it is crucial to maintain their health and prevent future deterioration (Philipson, Ekman, Forslund, Swedberg, & Schaufelberger, 2013).

Although stimulus representations are important for triggering the decision making process, deciding on a specific behavioral alternative depends on the interaction between two main systems, i.e., the hot and cool systems. The hot system develops early in life and is associated with emotions, reflexivity, and rapid action; it is responsible for impulsive behaviors (Metcalfe & Mischel, 1999; Mischel, 2014). The cool system develops later in life and is associated with cognition, reflectivity, and self-control; it is responsible for making self-controlled behavioral choices (Metcalfe & Mischel; Mischel).

The hot and cool systems are composed of subsets of nodes that interact through within-system and between-system connections to control the individual's behavior (Metcalfe & Mischel, 1999; Mischel, 2014). This means triggering a node within a system may trigger other nodes within that system or the other system. Metcalfe and Mischel used the terms "hot spots" to refer to the nodes in the hot system and "cool nodes" to refer to the nodes in the cool system. According to Metcalfe and Mischel, when the person is presented with a stimulus representation, it triggers a hot spot. The activated hot spot tends to make the individual more apt to follow a course of behaviors characterized by being reflexive, rapid, and emotional--for example, eating a high salt

diet regardless of its negative consequences in the future. The hot spot also activates a corresponding cool node in the cool system. The cool node may activate other cool nodes that together act to suppress the effect of the hot system. The activation of the cool node makes the individual more likely to take a reflective, self-controlled, and responsible course of action--for example, avoiding eating a high salt diet because of its adverse effect on health in the future. The selected course of action (i.e., behavioral outcome) depends on the dominant system in correspondence with the specific stimulus representation or behavioral trigger under certain contextual conditions.

According to the Hot/Cool System Model, the dominant system in the Hot/Cool System Model depends mainly on two factors: the relative strength of each system and the effects of contextual variables. One specific contextual variable explicitly discussed by Metcalfe and Mischel (1999) is stress. According to Metcalfe and Mischel, stress has the ability to shift the dominancy in the Hot/Cool System Model from one system to another. In the case of high stress, the hot system tends to be the dominant system, as stress empowers the effect of the hot system and attenuates the effect of the cool system (Metcalfe & Mischel). In the case of low stress, the cool system is empowered and the hot system is attenuated which tends to make the cool system the dominant system (Metcalfe & Mischel). In other words, the interaction between the hot and cool systems is affected by the level of stress. To facilitate the analogy between study variables and the Hot/Cool System Model, a few statistical terms need to be explained first.

Mediation

One term of special importance to the proposed study is mediation. In mediation, there are three major variables: an independent variable, a dependent variable, and a

mediator. Mediation occurs when the independent variable affects the dependent variable through the mediator (MacKinnon, Krull, & Lockwood, 2000). In other words, if the effect of the mediator is controlled, the direct relationship between the independent and dependent variables will be weakened or disappear. Mediation includes three types of relationships (MacKinnon et al.). First, the direct effect refers to the relationship between the independent and dependent variables. Second, the indirect effect is the relationship between the independent and dependent variables through the mediator. Third, the total effect refers to the sum of both direct and indirect effects of impulsivity.

The Hot/Cool System Model and heart failure

In this study, the relationships of impulsivity, perceived control, and perceived stress with self-care behavior were examined. The Hot/Cool System Model was used to specify the expected relationships among these variables and how they relate to self-care behavior in persons with heart failure. A brief description of each variable is provided below.

Impulsivity is defined as choosing a small immediate reinforcer over a larger delayed reinforcer (Oberlin, Bristow, Heighton, & Grahame, 2010; Paloyelis, Asherson, Kuntsi, Mehta, & Faraone, 2010). Impulsivity occurs as a result of a process called delay discounting. In delay discounting, there is a continuous reduction in the value of the reinforcer as the time between the behavior that produces the reinforcer and consumption of that reinforcer increases (Madden et al., 2011). Thus, when presented with two reinforcers, one small and immediate and another large and delayed, the person tends to give more weight to the immediate reinforcer at the expense of the larger delayed one. At the point of making the behavioral choice, the delay before receiving the larger reinforcer

makes the instantaneous value of the immediate smaller reinforcer equal to or even greater than the delayed larger reinforcer. Behavioral outcomes of impulsivity can be described as rapid acting without thinking which is consistent with the Hot/Cool System Model description of the hot system (Gullo & Potenza, 2014; Metcalfe & Mischel 1999). Thus, impulsivity in the current study represented the hot system in the Hot/Cool Model.

Perceived control is defined as individuals' perceptions of their ability to exert control over their own lives and health (Heo et al., 2014). It is a cognitive characteristic of the person that determines the way of thinking about oneself in relation to a specific disease process. Perceived control was associated with positive health outcomes in persons with heart failure including better functional status, lower anxiety and depression, and decreased hostility (Dracup, Westlake, Erickson, Moser, Caldwell, & Hamilton, 2003; Heo et al., 2014). In the proposed study, it represents the cool system in the Hot/Cool System Model.

Perceived stress represents stress as a contextual variable as described by Metcalfe and Mischel (1999). The level of perceived stress represents a balance between environmental demands and perceived ability to deal with these demands (Richardson et al., 2012). Persons with heart failure are required to follow lifelong modifications in their life style (Lainscak et al., 2007) which means an increased demand on them. In addition, persons with heart failure suffer from symptoms such as shortness of breath (Riegel et al., 2010) that decrease their physical abilities. The increased demands plus the decreased ability to cope with demands make persons with heart failure vulnerable to stress.

Specific relationships among these variables based on the Hot/Cool System Model (see Figure 2) were evaluated. According to the Hot/Cool System Model,

impulsivity tends to push persons with heart failure toward quick decisions out of impulse. For example, when a person with heart failure is at the lunch table with food and a salt shaker is on the table, the taste of salty food will be favored compared to staying healthy far in the future. At the same time, perceived control, a cognitive variable, promotes more self-controlled and reasonable choices that reflect persons' perceptions of their own ability to control their illness. This suggests that perceived control mediates the effect of impulsivity on self-care behavior.

Although the mediation relationship between impulsivity and self-care behavior through perceived control seems straight forward, the Hot/Cool System Model adds more complexity to this relationship. The Hot/Cool System Model suggests that the mediation role of perceived control will differ based on the level of stress. This kind of relationship is called moderation. In moderation, the effect of one variable on another variable differs at varying levels of a third variable called a "moderator" (Edwards & Lambert, 2007). In the proposed study, the mediation role of perceived control (i.e., the mediator) on the relationship between impulsivity and self-care behavior was expected to differ based on the level of perceived stress. This complex set of relationships is called "moderated mediation."

CHAPTER II

REVIEW OF THE LITERATURE

In this section the literature is reviewed to evaluate the state of the science of the study variables in relation to the study aim. In addition, this section provides an overview to understand the proposed relations among the study variables. A rationale for including some of the health related variables as covariates is presented. Finally, the significance of the study is discussed.

Self-care Behavior

Self-care is "an active, cognitive process in which persons engage for the purpose of maintaining their health or managing their disease and illness" (Dickson, Deatrick, & Riegel, 2008, p. 171). In general, self-care behavior enhances health, prevents diseases, limits illnesses, and restores health by promoting patients' ability to deal with their illness (Arcury et al., 2009; Macabasco-O'Connell et al., 2008). Self-care in heart failure requires dealing with a complex treatment regimen. The treatment regimen for persons with heart failure includes daily weighing, fluid restriction, sodium restriction, taking medications, and symptom monitoring (Barnason, Zimmerman, & Young, 2011).

Self-care in persons with heart failure was extensively discussed in literature. Based on a review of past research findings, Moser et al. (2012) reported that the benefits of self-care behavior for persons with heart failure can exceed those of pharmacological treatments. They also reported that non-adherence to self-care behavior puts persons with heart failure at greater risk for negative outcomes. Thus, optimal self-care was advised.

Optimal self-care behavior was consistently linked with positive outcomes in persons with heart failure. It was associated with enhanced disease outcomes and better quality of life in persons with heart failure (Grady, 2008; Lee, Moser, Lennie, & Riegel, 2001). Self-care behavior was associated with a lower mortality rate (Gohler et al., 2006; McDonald, 2010), fewer heart failure related hospitalizations (McDonald; Jovicic, Holroyd-Leduc, & Straus, 2006), better general health status (Lee, Suwanno, & Riegel, 2009), and lower healthcare costs (Macabasco-O'Connell et al., 2008). However, self-care behavior in persons with heart failure is not always optimal. Riegel et al. (2009) studied more than 2,000 persons with heart failure from developed and developing countries and found that they generally had poor self-care. Poor self-care was not associated with a single factor; rather, it was linked with various factors (Davidson, Inglis, & Newton, 2013) which makes it harder to predict in persons with heart failure.

The literature is rich with studies that explored potential predictors of self-care behavior in persons with heart failure. These factors included self-care knowledge (Hanyu & Nauman, 1999), social support (Sayers, Riegel, Pawlowski, Coyne, & Samana, 2008), cognitive functioning (Cameron et al., 2010b; Vaughan, Lee, & Riegel, 2011), information comprehension (Vaughan et al., 2011), perceived self-efficacy (Hanyu & Nauman, 1999), and symptom experience (Cameron, Worrall-Carter, Page, & Stewart, 2010a). These variables were studied to explain individual differences in self-care behavior.

To deal with the complex nature of self-care behaviors, researchers began to formulate models to explain individual differences in self-care behavior. For example, Rockwell and Riegel (2001) tested a model of seven predictors: patient characteristics,

symptom severity, comorbidity, social support, education, age, socioeconomic status, and gender. The full model only explained about 10.3% of the variance in self-care behavior. Education and symptom severity were significant predictors of self-care (Rockwell & Riegel). Cameron et al. (2009) tested a model composed of cognitive function, depressive symptoms, age, sex, social isolation, self-care confidence, and comorbid illness as potential predictors of self-care maintenance and self-care management subscales of the Self-care of Heart Failure Index. The best predictive model for both subscales contained significant predictors of sex, moderate-to-severe comorbidity, depression, and self-care confidence; it explained 39% of the variance in self-care maintenance and 38% of the variance in the self-care management. Age and moderate-to-severe comorbidity were the only significant predictors of self-care maintenance.

Other potential predictors of self-care behavior need to be considered for two reasons. First, when previously identified predictors of self-care behavior were entered into a model with other variables, their contribution became nonsignificant (Cameron et al., 2009; Riegel, 2001). Second, models formulated to explain individual differences in self-care behavior in persons with heart failure only partially explained the variance in self-care. In other words, there is a considerable amount of variance left unexplained. The only way to improve the explained variance in these models is by testing new models with new potential predictors of self-care behavior. In this study, three of these variables were tested in a hypothesis derived from the Hot/Cool System Model: impulsivity, perceived control, and perceived stress. The potential of these variables to serve as predictors of self-care behavior is discussed next.

Impulsivity

Impulsivity is defined as the preference of a smaller immediate reinforcer over a larger delayed reinforcer (Ainslie, 1974; Paloyelis et al., 2010). Impulsive behavior represents a person's inability to wait for a larger reinforcer distant in the future (McNamara, Dalley, Robbins, Everitt, & Belin, 2010). The behavioral process behind impulsivity is called delay discounting. In delay discounting, a reinforcer is continuously losing its value as the time between the behavior and its consequent reinforcer increases (Madden et al., 2011). Two conditions must be met before a behavior can be labeled as impulsive. First, the person who is making the choice must know the consequences of all available behavioral alternatives. For example, a heart failure patient who is not taking his or her medications to avoid its side effects must know that he is sacrificing his future health by doing so; otherwise, his choice cannot be considered impulsive. Second, the person must be functionally able to carry out that behavior. For example, not taking the prescribed medications because of physical limitations that prevent the patient from acting independently do not qualify as impulsive. Thus, this study controlled for the effect of the heart failure knowledge and functional status.

Impulsivity is associated with various problematic behaviors such as cigarette and alcohol cravings (Doran, Cook, McChargue, & Spring, 2009; Joos et al., 2013), academic cheating (Anderman, Cupp, & Lane, 2010), and being overweight in children (Braet, Claus, Verbeken, & Vlierberghe, 2007). Higher levels of impulsivity were associated with uncontrolled eating (Leitch, Morgan, & Yeomans, 2013) and a greater change in appetite and desired portion size of food when adults had been exposed to a food cue while they were food deprived (Tetley, Brunstrom, & Griffiths, 2010). Impulsivity was

significantly associated with difficulty falling asleep in women (Granö et al., 2007a) and a variety of adverse heath related conditions. Granö et al. (2006) found a positive relationship between impulsivity and 2-year incidence of peptic ulcer. In another study, Granö et al. (2007b) reported that impulsivity was a significant predictor of the onset of depression. However, no studies were identified that examined the role of impulsivity in health-related behavior, such as self-care behavior, in medical literature in general or in nursing literature specifically (see Appendix A).

Perceived Control

Perceived control refers to the belief about one's own ability to cope with negative life events (Moser et al., 2009). There are relatively few studies of perceived control in persons with heart failure (see Appendix A). Perceived control was associated with health related variables such as anxiety in undergraduates (Ballash, Pemble, Usui, Buckley, & Woodruff-Borden, 2006), symptom severity in women with ovarian cancer (Donovan, Hartenbach, & Method, 2005), quality of life in female heart transplant recipients (Evangelista, Moser, Dracup, Doering, & Kobashigawa, 2004), and psychological adaptation in recently divorced individuals (Thuen & Rise, 2006). In addition, Bonetti and Johnston (2008) found that perceived control was a significant predictor of individual-specific disability and walking recovery after surgery following stroke. In persons with heart failure, higher levels of perceived control were associated with higher quality of life (Heo et al., 2014) whereas lower levels of perceived control were associated with poorer self-care (Hwang et al., 2014). Better self-care behavior was associated with higher perceived control in men but not in women (Heo, Moser, Lennie, Riegel, & Chung, 2008).

According to the Hot/Cool System Model, perceived control may mediate the relationship between impulsivity and self-care behavior. Thus, the literature was searched for studies that investigated the relationship between perceived control and impulsivity. In the only study that was located, Kabbani and Kambouropoulos (2012) studied the relationship between impulsivity and alcohol use. Their hypothesis that perceived control mediates the relationship between impulsivity and alcohol use was supported.

Stress

According to Metcalfe and Mischel (1999), the dominancy of one system (i.e., hot or cool systems) over the other is affected by contextual variables. Among those contextual variables, Metcalfe and Mischel emphasized the importance of stress in determining the dominant system in making behavioral decisions regarding a specific course of actions. Stress adds strain to patients' coping with heart failure which requires life long modifications to cope with the disease process and improve clinical outcomes (Fãrcas & Nãstasã, 2014; Moser, 2002). These modifications are a source of stress for persons with heart failure.

Heart failure was associated with higher levels of stress (Moser, 2002) which can worsen clinical outcomes of the disease (Fãrcas & Nãstasã, 2014). Increased levels of perceived stress were associated with longer duration of heart failure, lower income level, less education, and poorer quality of life (Fãrcas & Nãstasã, 2014). Luskin, Reitz, Newell, Quinn, and Haskell (2002) evaluated a stress management intervention with persons with heart failure. Although the intervention led to reduction in the perceived stress level in the intervention group compared to the control group, both groups had high levels of perceived stress.

Cohen and Williamson (1988) set the standard for normative scores for perceived stress, measured by Perceived Stress Scale (PSS), based on data from 2,387 respondents. Persons aged 65 years old and older, the age group most affected by heart failure, had a normative perceived stress score of 12 (Grady, 2008; Salyer et al., 2012). In the Luskin et. al (2002) study, the average perceived stress score for persons with heart failure was above 20. Since the Hot/Cool System Model suggests that stress can affect which system is dominant, persons with heart failure may tend to make impulsive decisions as a result of the effects of perceived stress on their lives.

Depression

Depression was included as a covariate in this study because of its relevance to the heart failure. The combined negative effect of these two conditions, depression and heart failure, on a person's health is worse than their separate effects (Nair, Farmer, Gongora, & Dehmer, 2012). Thus, persons with heart failure who are depressed have worse morbidity and recovery compared to those who are not depressed (Nair, Farmer, Gongora, & Dehmer).

The relationship between heart failure and depression can be best described as cyclical in nature. Depression may lead to the worsening of heart failure, while the worsening of the heart failure may lead to greater depression (Nair, Farmer, Gongora, & Dehmer, 2012). Thus, it might be hard to study heart failure without considering depression.

Heart failure and depression share some of the same disease outcomes such as functional status and quality of life (Dimos, Stougiannos, Kakkavas, & Trikas, 2009; Holland, et al., 2010; Nair et al., 2012). With a higher prevalence of depression in

persons with heart failure compared to normal populations (Dimos et al.; Ege, Yilmaz, & Yilmaz, 2012), this study took into the account the effect of depression on self-care behavior in heart failure by including depression as a covariate.

Heart Failure Knowledge and Functional Status

As discussed previously, two conditions must be met before labeling a behavior as impulsive. First, the person must have the knowledge about how to do self-care behavior in addition to its consequences. Second, the patient must have the functional capacity to carry out self-care behavior. Thus, heart failure knowledge and functional status were entered as covariates in this study.

In addition, these two variables were linked to heath related behaviors and outcomes in persons with heart failure. For example, heart failure knowledge was associated with positive health outcomes. Increased knowledge was correlated with reduction in cardiac events and medical cost (Kato et al., 2013). Lack of knowledge was associated with poor adherence behavior (Hanyu & Nauman, 1999). Low heart failure knowledge was also associated with poor prognosis (Lainscak & Keber 2006).

Functional status is measured by New York Heart Association class (NYHA) to describe the impact of heart failure on the persons' ability to carry out daily activities (Bennett, Riegel, Bittner, & Nichols, 2002). Lower functional status, i.e., higher NYHA class, was associated with frequent hospitalization, lower quality of life, and higher mortality among persons with heart failure (Holland, Rechel, Stepien, Harvey, & Brooks, 2010). Functional status was negatively correlated with dyspnea on exertion, ankle swelling, depressive symptoms, and fatigue in women with heart failure (Song, Moser, & Lennie, 2009).

Summary

Self-care behavior in persons with heart failure had been studied extensively in the literature. However, it appears that the literature has a gap that prevents us from effectively predicting and promoting self-care in persons with heart failure. The current literature looked at many potential predictors; however, those predictors were either variables derived from the disease process or patients' demographics. The literature showed a gap in investigating potentially powerful predictors from other fields. Impulsivity is an example of potential predictors of problematic behaviors that has been overlooked and has the potential to be a good predictor of self-care in persons with heart failure. The current study investigated the nature of the relationships of impulsivity, perceived control, and perceived stress in predicting self-care.

CHAPTER III

METHODS

Design

This study was a non-experimental, cross-sectional study. Data were collected from eligible participants while they were visiting a heart failure clinic for their follow-ups using self-report questionnaires. Patients were contacted face-to-face and through advertisements posted in the heart failure clinic.

Sample

A convenience sample of persons with heart failure attending an outpatient clinic was recruited. The sample size was determined based the expected effect size using multiple linear regression to test the mediation relationship. Impulsivity and its relationship to self-care behavior was not studied in prior research. Thus, there were no available references to determine the expected effect size. Cohen (1988) reported that there are three main levels of effect sizes: small (0.02), medium (0.15), and large (0.35). The sample composed of 100 persons with heart failure was based on a small to medium effect size (0.10) and power of 0.80. The inclusion criteria were a diagnosis of heart failure, at least 18 years of age, and able to read and speak English. Exclusion criteria were diagnosis of dementia and coexisting terminal illnesses.

Setting

The sample was recruited from a heart failure clinic affiliated with Norton Hospital in Louisville, KY. Because patients in heart failure clinics tend to be more

stable, a heart failure clinic was deemed an appropriate setting for recruitment. The clinic's main role is supportive in that its services are composed of providing consultation and teaching for persons with heart failure.

Measures

Heart failure self-care behavior

The level of self-care behavior was determined using the Self-Care of Heart Failure Index Version 6 (SCHFI-V6). The SCHFI-V6 consists of 22 items divided into three subscales; self-care confidence, self-care maintenance, and self-care management (Riegel, Lee, Dickson, & Carlson, 2009). Self-care maintenance and self-care management were used as the indicators of the level of self-care behavior in persons with heart failure. Individual subscales scores were used in the analysis as recommended by Reigel et al. (2009). According to Reigel et al., self-care maintenance refers to the choice of behaviors that maintain physiological stability, whereas self-care management refers to the behavioral response to symptoms of heart failure. Self-care confidence refers to the person's confidence in overall self-care practice (Reigel et al., 2009). Each question on the SCHFI-V6 has a 4-point Likert-type scale response option. The estimated time to complete the SCHFI-V6 is 5 to 10 minutes (Cené et al., 2013). The Flesch-Kincaid grade levels for this scale and all of the following measures were assessed using Microsoft Word 2010. The Flesch-Kincaid grade level for the SCHFI-V6 is 5.1.

Scores were standardized by converting each subscale score to a 100-point scale for ease of comparisons among different subscales, different studies, and different versions of self-care measures (Riegel et al., 2009). Higher scores reflect better levels of

self-care behavior. A cutoff score of 70 out of 100 defines adequate self-care behavior (Riegel et al., 2009).

In a sample of 154 persons with heart failure (Riegel et al., 2009), the coefficient alpha was .55 for the self-maintenance, .60 for self-care management, and .83 for self-care confidence. The developers of the SCHFI-V6 justified lower coefficient alphas due to the low number of symptomatic patients in their sample (Riegel, et al., 2009). The validity of the SCHFI-V6 was assessed using quantitative and qualitative approaches. The European Heart Failure Self-care Behavior Scale (EHFScB) had a moderate negative correlation with the self-care maintenance subscale of the SCHFI-V6 in 34 patients with heart failure as expected ($r = -.65, p < .001$) (Riegel et al., 2009). On the other hand, the EHFScB score was not significantly correlated with self-care confidence and self-care management (Riegel et al., 2009). These results were expected as the Heart Failure Self-care Behavior Scale measures self-care maintenance (Riegel et al., 2009). Construct validity was tested with confirmatory factor analysis using data from 154 persons with heart failure (Riegel et al., 2009). In general, the model fit of the SCHFI was adequate.

The validity of the SCHFI-V6 was tested qualitatively using data from three mixed methods studies (Riegel et al., 2009). In the first study, self-care behavior was assessed using the SCHFI-V6 and by asking about any improvements in self-care behaviors. There was congruence between the results of the two methods. Patients who showed increases in self-care behaviors using the SCHFI-V6 also reported increased self-care levels. In the second study, persons with heart failure were classified as poor, good, and expert in self-care behaviors based on the results of semi-structured interviews. The SCHFI-V6 score increased linearly as the level of experience in self-care behavior

increased. The third study used different categories: inconsistent, novice, or expert. The results supported the validity of the SCHFI-V6, as it discriminated among the three groups in the expected ways.

Impulsivity

The level of impulsivity of persons with heart failure was assessed using the Barrett Impulsiveness Scale (BIS-11). The BIS-11 is the most widely used measure to assess impulsivity (Stanford et al., 2009). It consists of 30 items divided into three subscales: non-planning impulsivity (11 items); motor impulsivity (11 items); and attention impulsivity (8 items). The total BIS-11 score was used as an indicator for the level of impulsivity. Items are rated on a 4-point Likert-like scale from 1 (Rarely/Never) to 4 (Almost Always). Total scores range between 30 and 120. The higher the BIS-11 score, the greater the impulsivity. Stanford et al. (2009) suggested the following categorization of total scores: 72 or above as high impulsivity, 52-71 as normal impulsivity, and 30-51 as over-control. The Flesch-Kincaid grade level for the modified version is 3.7.

The BIS-11 is available in 11 languages (Stanford et al., 2009). According to Stanford et al. (2009), all translated versions have acceptable internal consistency: Cronbach's alphas ranged from .71 to .83 (Stanford et al., 2009). Stanford et al. reported an internal consistency of .83 and Spearman's Rho for one month test-retest reliability of .83 in a sample of adults. Internal consistency of the BIS-11 was .87 for a mixed sample of 13 women with bulimia nervosa and 13 women without the condition (Kemps & Wilsdon, 2010).

The BIS-11 showed evidence of construct validity. For example, in a sample of 32 controls and 37 adults actively cocaine-dependent, the cocaine-dependent group had a higher mean BIS-11 score compared to the control group (Liu et al., 2011). The BIS-11 also differentiated between heavy and light alcohol drinkers (Papachristou, Nederkoorn, Havermans, Horst, & Jansen, 2012). Heavy drinkers scored higher on the BIS-11 compared to light drinkers. Although the literature was filled with examples that support the construct validity of the BIS-11 in different samples, the psychometrics of BIS-11 were not examined in persons with heart failure.

Perceived control

Perceived control was assessed using the Control Attitudes Scale-Revised (CAS-R) (Moser et al., 2009). Moser and Dracup (1995) developed the original 4-item Control Attitudes Scale (CAS). One issue with the CAS was that two of the four questions asked about perceived control by family and close friends which posed a problem if the patient did not have a family or close friends (Moser et al., 2009). The CAS-R was developed to solve this problem. It consists of eight items rated on a Likert-like scale from 1 (totally disagree) to 5 (totally agree). Two of these items were taken from the CAS and the other six were adapted from the Cardiac Attitudes Index (Moser et al., 2009). The total score ranges from 8 to 40; higher scores indicate greater perceived control. The Flesch-Kincaid grade level for the CAS-R is 3.6.

The authors of the revised version extensively studied its psychometrics. Cronbach's alpha for the CAS-R in persons with heart failure was .76 (Moser et al., 2009). Corrected item-to-total correlations ranged from .34 to .58 (Moser et al., 2009). Inter-item correlations were between .30 and .70. Factor analysis supported the construct

validity of the CAS-R (Moser et al., 2009). In addition, construct validity was supported using hypothesis testing. Consistent with previous research, perceived control was negatively correlated with anxiety and depression (Moser et al., 2009; Pacheco, & Santos, 2014). Subsequent studies showed that the Portuguese version of the CAS-R had comparable psychometrics with Cronbach's alpha of .65 for Portuguese persons with heart failure (Pacheco & Santos, 2014).

Perceived stress

Perceived stress was assessed using the Perceived Stress Scale-10 (PSS)(Cohen & Williamson, 1988). Lee (2012) reviewed the psychometrics of the three versions of the PSS (PSS-4, PSS-10, and PSS-14) and showed that PSS-10 has the best psychometrics among the three versions, while the PSS-4 has the worst. Thus, the PSS-10 was used in this study. The PSS-10 is composed of 10 items answered on a 5-point Likert-like scale from 0 (never) to 4 (very often). The total score ranges from 0 to 40. The higher the score, the higher the level of perceived stress.

Among the studies Lee (2012) reviewed, Cronbach's alpha for PSS-14 was above .70 in 11 out 12 studies. Cronbach's alpha for the PSS-10 was above .70 in all 12 studies reviewed. Lee found that test-retest reliability for PSS-10 was assessed in four studies and was acceptable in all (above .70). Criterion validity of the PSS was evaluated by correlating the PSS score with the mental component of the Medical Outcomes Study-Short Form 36 (Ware, Snow, Kosinski, & Grandek, 1993). The PSS was strongly correlated with the mental component of health status.

Covariates

Depression

Depression was evaluated using the Patient Health Questionnaire (PHQ-9) (Kroenke, Spitzer, & Williams, 2001). The PHQ-9 is composed of nine items (Hammash et al., 2013) that ask about the frequency of problems that persons suffered in the last two weeks. The response options for those questions are: 0 "not at all"; 1 "several days"; 2 "more than half the days"; and 3 "nearly every day". The total score ranges between zero and 27; the higher the score, the more severe the level of depression. According to Kroenke, Spitzer, and Williams, scores of 5, 10, 15, and 20 on the PHQ-9 represent mild, moderate, moderate to severe, and severe levels of depression, respectively.

The psychometric properties of PHQ-9 were examined with a sample of 322 persons with heart failure (Hammash et al., 2013). The PHQ-9 had good internal consistency with Cronbach's alpha of .83. Inter-item correlations ranged from .22-.66 (Hammash et al.). The Flesch-Kincaid Grade level for PHQ-9 is 8.4.

Functional status

Functional status was assessed using the New York Heart Association (NYHA) functional classification (The Criteria Committee of the New York Heart Association, 1994). The NYHA was developed in 1963 and was revised in 2001 (Apostolakis & Akinosoglou, 2007). The NYHA class is determined by the occurrence of the fatigue, dyspnea, angina, or palpitations with different levels of physical activity. The NYHA class ranges from I (no symptoms with ordinary physical activity) to IV (symptoms occur at rest) (Mills, & Haught, 1996). The Flesch-Kincaid grade level for the NYHA is 14.8.

Construct validity of the NYHA was supported in different ways. For example, the agreement between the NYHA and Four Weber classifications of the exercise test was 41.7% (p = .005) (Bennett et al., 2002). In addition, the NYHA class was concordant

with the 6-minute walk test in 42% of patients (p = .001) (Bennett et al.). Goldman, Hashimoto, Cook, and Loscalzo (1981) assessed inter-observer reliability of the NYHA; agreement was 56% between cardiologists and patient physicians. In another study, inter-observer reliability was assessed using the inter-class correlation coefficient (Demers, McKelvie, & Yusuf, 2000). The ICC in persons with heart failure for the NHYA was .58.

Heart failure knowledge

Heart failure knowledge was assessed using the Dutch Heart Failure Knowledge Scale. This scale consists of 15 questions about heart information in general and heart failure treatment, symptoms, and symptom recognition (Van der wal, Jaarsma, Moser, & Vanveldhuisern, 2005). Response options vary based on how the question is asked. The total score can be obtained by counting the number of correct answers. The score ranges between zero and 15. The higher the score the better knowledge about heart failure. The Flesch-Kincaid grade level for the Dutch Heart Failure Knowledge Scale is 3.1.

Van der wal et al. (2005) tested the psychometric properties of the Dutch Heart Failure Knowledge Scale with persons with heart failure from 19 hospitals in the Netherlands. Cronbach's alpha for the scale was .62. Content validity was assessed by a panel of 10 expert nurses and two cardiologists. No items were added to or deleted from the scale by the panel of experts. Face validity was evaluated by asking persons with heart failure to assess the measure's relevance. Patients did not add or delete any items from the scale. Construct validity was assessed using the known groups method. The scale discriminated between newly diagnosed patients who received education and those who were newly diagnosed but had not received education (Van der wal et al).

Sociodemographic and clinical characteristics

Data also included descriptive questions about sociodemographic and clinical characteristics. These data included income, number of the household members, sex, race, and age. These data were collected with a self-report form. Help was provided when needed.

Procedure

IRB approval was obtained from the University of Louisville Institutional Review Board and the Norton Hospital Office of Research Administration. Recruitment took place face-to-face and through advertisements at a heart failure clinic affiliated with Norton healthcare. Eligibility for the study was determined by inclusion and exclusion criteria in the invitation flyers posted in the clinic. Those who met the inclusion criteria and agreed to participate were handed the study questionnaires to complete. The first page after the cover page was the preamble. That indicated participants were agreeing to take part in the study by filling out the study questionnaires. Since the data were collected from persons with heart failure who were visiting a heart failure clinic, participants were in stable condition which allowed them to fill out the study questionnaire with minimal help. Patients had the option to withdraw from the study at any time. Participants were compensated for their time with a $10 gift card awarded to them immediately upon returning the completed questionnaires.

Data Analysis

The data were analyzed using SPSS® version 22 (IBM, Armonk, NY). Mean, median, range, and standard deviations of the continuous variables, and frequencies for categorical variables, were used to address sample characteristics and look for any potential problems with the data. Before starting the data analysis process, the data were

examined for missing data. Simple mean replacement was used to replace missing data with dependent, independent, and covariate variables because the rates of missing data for all of them were less than 7%, except for BIS-11 items 13 and 16. For BIS-11, items 13 and 16 were not missing at random; all of the participants who did not answer these items wrote a side comment indicating that those item were not applicable to them. Item 13 asked about planning job security and item 16 asked about changing jobs. The majority of the sample were not employed at the time of participation (n = 81). Thus, missing values for these items were left blank. An alpha level of .05 was used in this study.

Self-care maintenance and self-care management were standardized based on the SCHFI V6 author scoring instructions. Bivariate relationships among the study variables (i.e., self-care maintenance, self-care management, impulsivity, perceived control, and perceived stress) and between study variables and covariates (depression, heart failure knowledge, and functional status) were examined. For testing the model with self-care maintenance as the dependent variable, Pearson's Product Moment correlations were used to examine the bivariate relationships among continuous variables. Because functional status was a categorical variable, one-way ANOVA was used to examine differences in means for self-care maintenance, impulsivity, perceived control, and perceived stress. By functional status. When self-care management was the dependent variable in the model, Chi square and t-test were used to test bivariate relationships.

Testing these bivariate relationships is a prerequisite for moderated mediation analysis (Baron & Kenny, 1986). In addition, bivariate analysis was used to determine which variables should be included in the model. For a variable to be included as a

covariate in the model, a significant correlations with the dependent variable and one or more of the study variable were required. Thus, bivariate relationships between study variables and demographic and clinical characteristics were examined to check if any of them qualified to be included as a covariate using correlations, one-way ANOVA, chi square, and t-test.

Assumptions of regression were examined before starting moderated mediation analysis. Normality was tested using histograms and Kolmogorov-Smirnov test. Linearity was examined using normal Q-Q plots. Multicollinearity was tested using correlations, Variance Inflation Factors (VIF), and tolerance. Homoscedasticity was examined using detrended Q-Q plots. Outliers were examined using the Mahalanobis test. Any variable that deviated from these assumptions was transformed until it met the assumptions. Perceived control and self-care management violated the normality assumption. Although the transformation solved the perceived control violation, it did not work for self-care management; thus, it was dichotomized into high and low self-care management. The high self-care management group consisted of those who scored above the median score, and the low self-care management group consisted of those who scored below the median score. Perceived control was transformed by raising the score to the power two, and then dividing by 100.

The independent variables (impulsivity, perceived stress, and perceived control) were centered by subtracting the mean from the raw scores. This was done for two reasons. Centering the data makes interpretation of results easier. Second, whenever an interaction between variables is used in regression analysis, it is highly likely there will

be multicollinearity violations between the interaction terms and the main effects of the original variables. Thus, centering the data was used to avoid these violations.

For both outcome variables (self-care maintenance and self-care management), the analysis for the moderated mediation model was done using regression-based SPSS macros developed by Andrew Hayes (Hayes, 2013). The data were analyzed based on model number 59 (see Figure 2). Based on that model, two levels of relationships were tested. At the first level, the mediation relationship was tested. To determine if entering perceived control as a mediator would affect the direct relationship between impulsivity and self-care maintenance. At the second level, the moderation effect of perceived stress was tested. The moderation effect was tested on the direct and indirect relationships, assuming that the perceived stress moderated the relationships between impulsivity and self-care maintenance, impulsivity and perceived control, and perceived control and self-care maintenance. Bootstrapping with 95% confidence intervals using 1000 replications was used to test if that effect was significant. The same process was followed for the outcome of self-care management.

Self-care Maintenance as the Dependent Variable.

In the case of self-care maintenance SPSS macros was based on multiple regression. The analysis indicated that the interaction between impulsivity and perceived

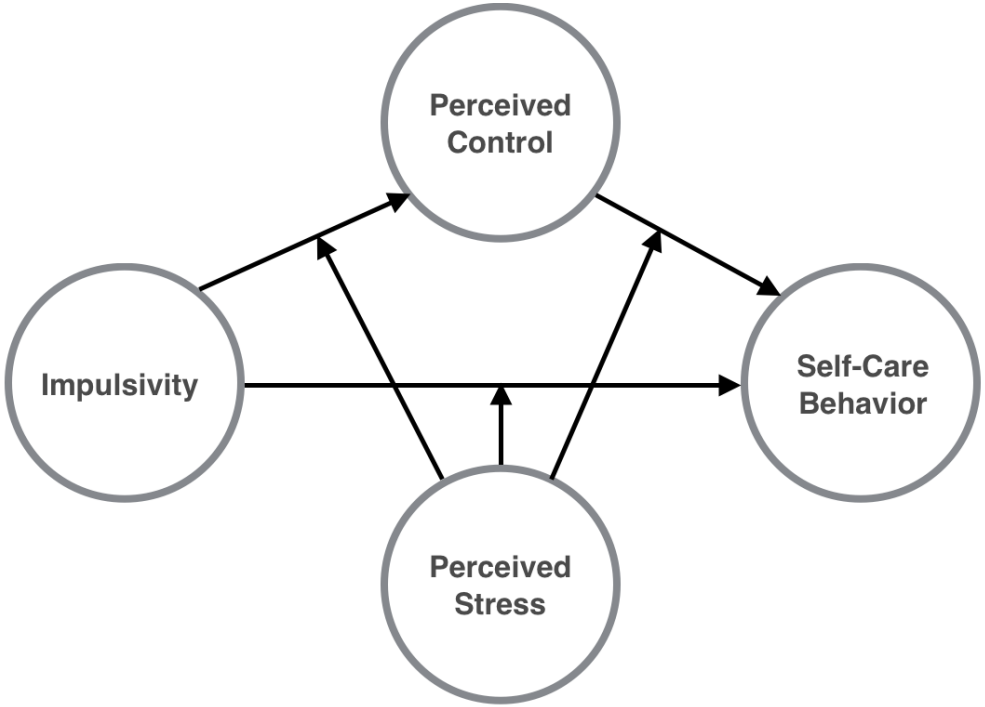

Figure 2. Model for Testing Moderated Mediation Relationship.

stress and between perceived control and perceived stress were not significant. Thus, best fit model was examined by initially entering all variables, including covariates, into the regression model. Using backward regression, at each step the least significant variable was removed until only significant variables remained in the model.

Although originally model 59 was used to test the relationships among the study variables, it was appropriate to re-run the SPSS macros with best fit model variables. Since the proposed moderator, perceived stress, was eliminated from the best fit model, model 4 was the appropriate model to test. Model 4 represented simple mediation relationship with functional status as the sole covariate in the model.

Self-care Management as the Dependent Variable.

In the case of self-care management, SPSS macros was based on logistic regression. The results of the SPSS macros were nonsignificant for all relationships except for the interaction between perceived control and perceived stress. This led to an assumption that perceived stress might only moderate the relationship between perceived control and self-care management. The interaction between impulsivity and perceived stress was excluded for the model. To do this, model 14 in the SPSS macros was used. The SPSS macros were re-run to test this model. However, the results were exactly the same; the interaction between perceived control and perceived stress was the only significant effect. These results warranted further testing to understand why the interaction term between perceived control and perceived stress was significant while the main effects were not significant.

Logistic regression was used to answer this question. The first logistic regression model included self-care management as a dependent variable and impulsivity, perceived

control, perceived stress, and the interaction between perceived stress and perceived control as the independent variables in the model. Again, the interaction effect was the only significant effect. To break it down, one more regression was run. However, before running these models, the data were dichotomized into low and high perceived stress groups using the mean of perceived stress as the cutoff point. The model included self-care management as the dependent variable and impulsivity and perceived control as the independent variables. The model was run twice, once for the low perceived stress group and again for high perceived stress group.

CHAPTER IV

RESULTS

Sample Characteristics

One hundred and one participants completed the study survey. One participant's data were eliminated because the impulsivity measure was not completed. Participants were recruited from the Heart Failure Clinic at Norton Hospital Audubon. The mean age of the sample was 67.3 years (*SD* = 15.1). The participants ranged in age 30 to 96 years. Demographic and clinical characteristics of the sample are displayed in Table 1. Descriptive statistics for the continuous study variables are shown in Table 2. Examining means, ranges, standard deviations, and frequencies of the data did not show any potential problems. According to the Stanford et al. (2009) categorization, the largest category in the current sample was the normal impulsivity group (*n* = 66), followed by the over controlled group (*n* = 25), and finally by the high impulsivity group (*n* = 9). According to the Kroenke, Spitzer, and Williams (2001) categorization of the PHQ-9, half of the sample (*n* = 50) had scores of 5 and above indicating mild to severe depression.

Regression Assumptions

Self-care maintenance, impulsivity, and perceived stress met the regression assumptions. Self-care management and perceived control violated the assumption of normality (see Figure 3 and Figure 4). The Kolmogorov-Smirnov statistic for self-care management was .13 ($p = .02$), and .11 ($p < .001$) for perceived control which meant that

Table 1

Demographic and Clinical Characteristics of Study Sample (N = 100)

Variable		*n*	Percentage
Sex	Female	44	44%
	Male	55	55%
	Missing	1	1%
Race	White	73	73%
	African American	20	20%
	American Indian or Alaska Native	1	1%
	Other	3	3%
	Missing	3	3%
Employment	Employed	17	17%
	Not employed	81	81%
	Missing	2	2%
Education	Did not complete high school	15	15%
	High school diploma	46	46%
	Vocational or some college	23	23%
	College	14	14%
	Missing	2	2%
Functional status	Class I	22	22%
	Class II	30	30%
	Class III	28	28%
	Class IV	20	20%
	Missing	0	0%
Income	0 to $20,000	38	38%
	$20,001 to $40,000	22	22%
	$40,001 to $60,000	18	18%
	$60,001 to $80,000	5	5%
	$80,001 or more	8	8%
	Missing	9	9%

Table 2

Descriptive Statistics for the Continuous Variables ($N = 100$)

Variable	n	Range		Mean	Standard deviation
		Observed minimum	Observed maximum		
Self-care maintenance	100	26.66	96.66	69.53	14.44
Self-care management	60	20.00	100.00	66.85	20.12
Impulsivity	100	31.00	92.00	58.80	10.58
Perceived control	100	17.00	40.00	29.47	4.94
Perceived stress	100	1.00	34.00	16.27	6.88
Depression	100	0.00	24.00	6.08	5.89
Heart failure knowledge	100	6.00	15.00	12.08	1.88
Functional status	100	1.00	4.00	2.46	1.05

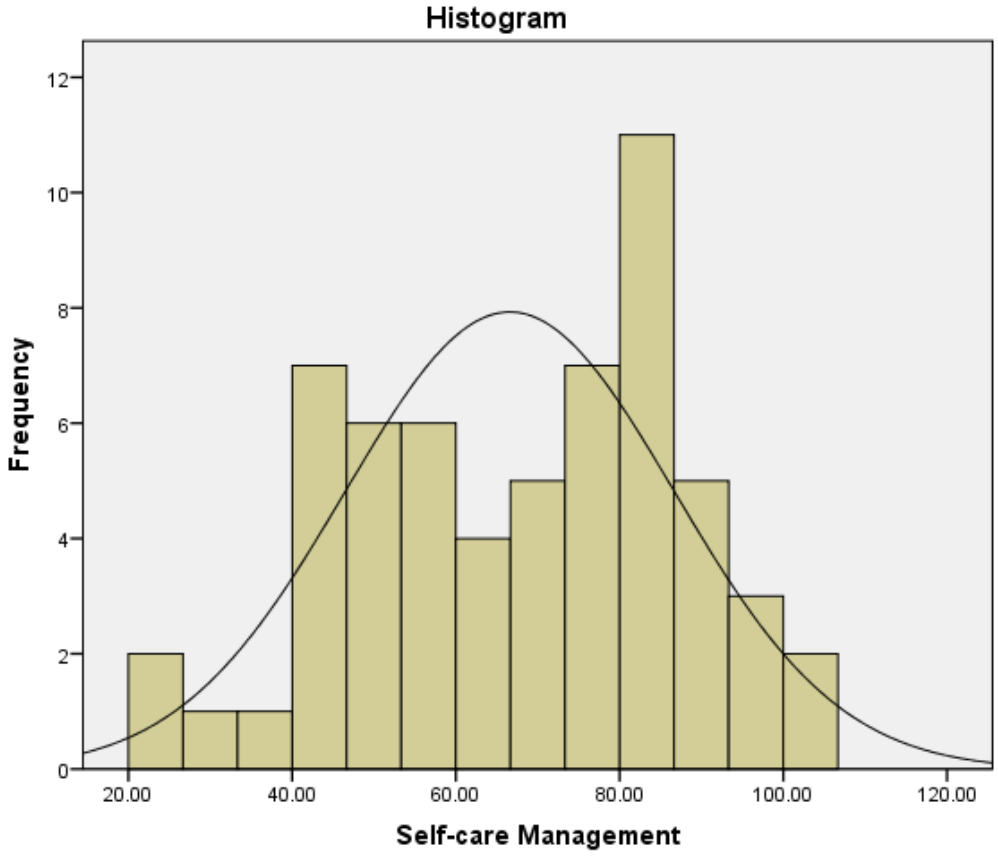

Figure 3. Histogram for Self-care Management (N = 100)

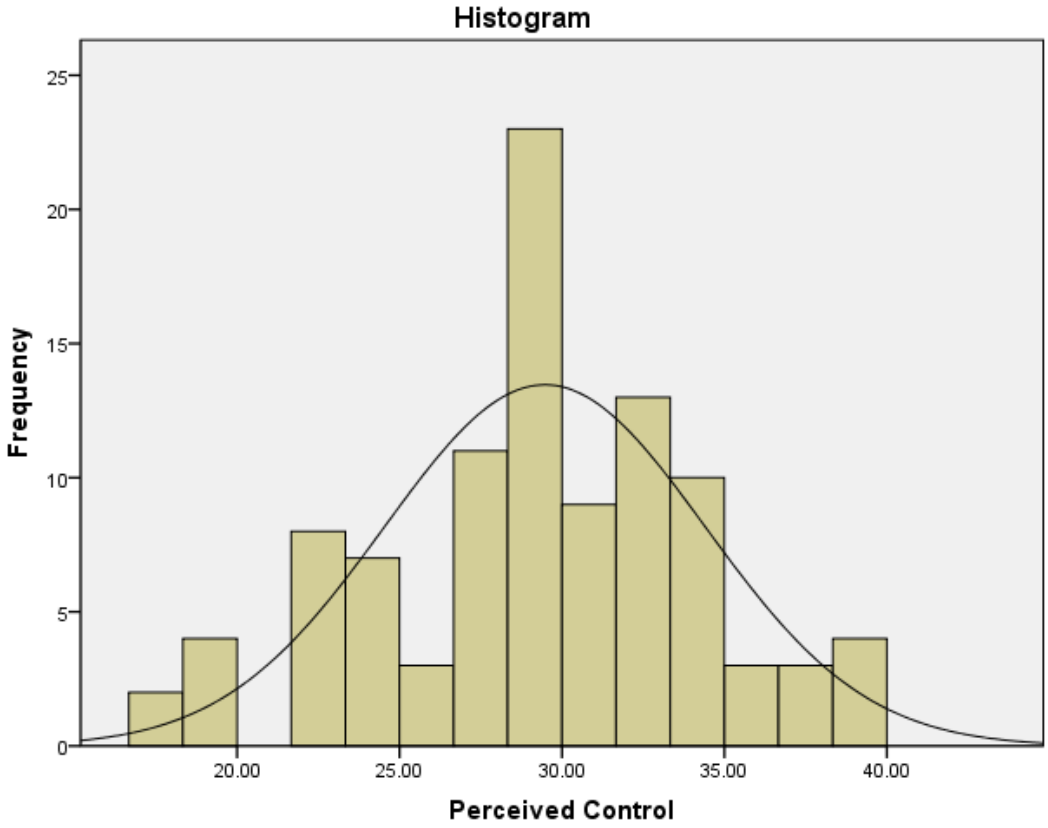

Figure 4. Histogram for Perceived Control (N = 100)

both distributions were not normally distributed. Perceived control was transformed by raising it to the power of 2 and dividing it by 100. Kolmogorov-Smirnov statistic for the transformed perceived control was .07 (p = .14) which means that the distribution of the transformed variable was normally distributed (see Figure 5). Internal consistencies of the measures were comparable to those in prior studies (Table 3). All measures showed acceptable internal consistencies except for the Self-Care of Heart Failure Index and the Dutch Heart Failure Knowledge Scale.

The distribution of self-care management was bimodal (Figure 3). This variable could not be transformed in a way to solve the violation of normality; thus, it was dichotomized. The low self-care management group, defined as having a score at or below the median score, consisted of 32 participants (53% of the sample); their mean score was 50.9 (SD = 13.1). The high self-care management group, defined as having a self-care management score above the median (median score = 70), consisted of 28 participants (47% of the sample). The mean score for this group was 84.5 (SD = 8.0).

Analysis by Study Aim

Specific Aim: Determine if perceived control differentially mediates the relationship between impulsivity and self-care behavior at different levels of perceived stress, controlling level of depression, heart failure knowledge, and functional status.

The following discussion of the analysis results of the study aim is divided into two sections, one for self-care maintenance and another for self-care management. The analysis for self-care maintenance as a dependent variable was based on multiple linear regression; for self-care management, it was based on logistic regression.

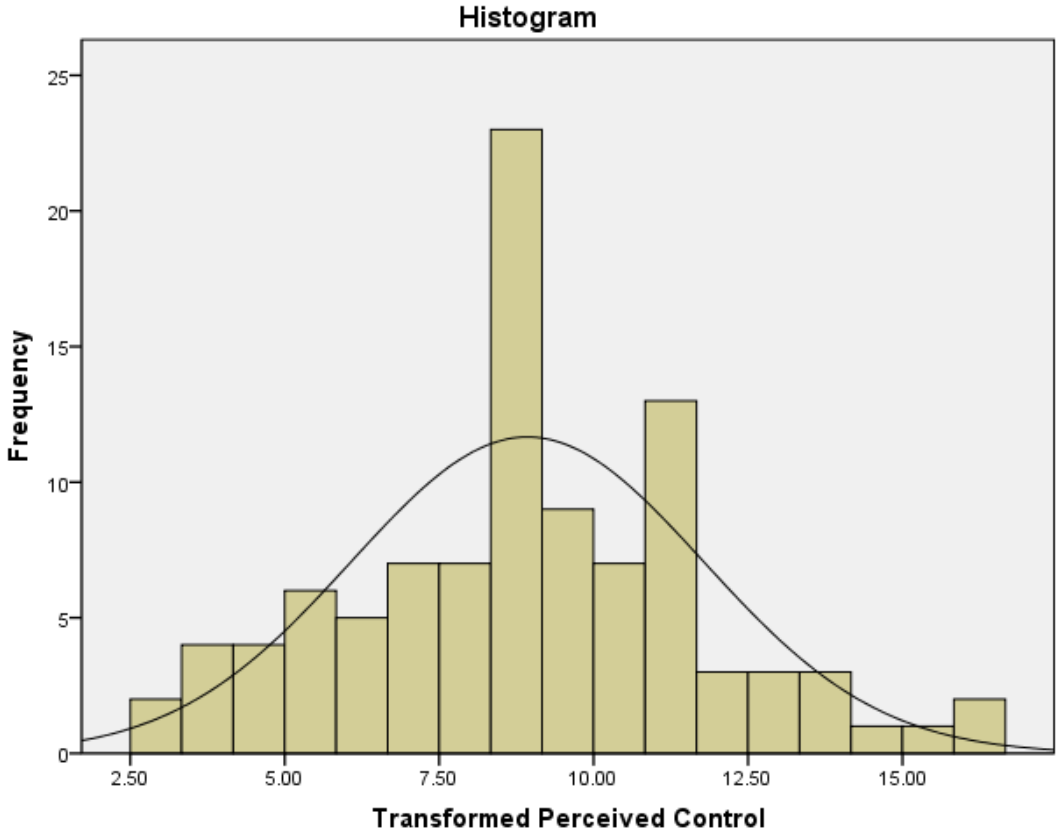

Figure 5. Histogram for Transformed Perceived Control (N = 100)

Table 3

Internal Consistencies of the Study Measures Compared to Prior Studies

Measure	Variable	Number of items	Cronbach's alpha for current study	Cronbach's alpha previous studies	Sample
Self-care Heart Failure Index Version 6	Self-care maintenance	10	.63	.55 (Riegel et al., 2009),	Persons with heart failure
	Self-care management	6	.65	.60 (Riegel et al., 2009),	Persons with heart failure
Barret Impulsiveness Scale-11	Impulsivity	30	.82	.71 to .83 (Stanford et al., 2009).	Mixed/ No information about the measure in persons with heart failure
Control Attitudes Scale-Revised	Perceived control	8	.82	.76 (Moser et al., 2009)	Persons with heart failure
Perceived Stress Scale-10 items	Perceived stress	10	.86	Above .70 (Lee, 2012)	Mixed/cardiac patients
Patient Health Questionnaire 9	Depression	9	.88	.83 (Hammash et al., 2013)	Persons with heart failure
Dutch Heart Failure Knowledge Scale	Heart failure knowledge	15	.51	.62 (Van der wal et al., 2005)	Persons with heart failure

Self-care maintenance

Correlations

The correlations among study variables and between study variables and participants' demographic characteristics were examined. First, the correlations between the main study variables and the proposed covariates (heart failure knowledge, functional status, depression) are presented in Table 4. One-way ANOVA showed that the functional status classes differed significantly on mean self-care maintenance (F (3, 94) = 6.61, $p < .001$) and perceived control (F (3, 94) = 7.00, $p < .001$), but not on impulsivity (F (3, 94) = 0.67, $p = .57$) and perceived stress (F (3, 94) = 1.93, $p = .13$). Heart failure knowledge was not correlated with self-care maintenance which meant that heart failure knowledge should not be included in the model as a covariate. Heart failure knowledge was conceptually proposed as an important covariate; thus, a further step was taken to make sure that excluding heart failure knowledge would not affect the results of the analysis. Regression was used to check the effect of excluding heart failure knowledge from the model on the regression coefficients for impulsivity, perceived control, and perceived stress in a regression model with heart failure knowledge included in the model. The percentages of change in regression coefficients of impulsivity, perceived control, and perceived stress between two models were calculated. A 10% change in regression coefficient criterion was imposed which is a frequently used criterion to identify potential confounders (Lee, 2014). The percentages of change in regression coefficients were below 10%, the cutoff point for impulsivity and perceived control. However, the regression coefficient for perceived stress changed by 19%. Thus, heart failure knowledge was retained in the model despite its non-significant correlation with the self-care maintenance.

Table 4

Correlations among the Study Variables and Covariates (N = 100)

Variables	Self-care maintenance	Impulsivity	Perceived control	Perceived stress	Heart failure knowledge	Depression
Self-care maintenance	1.00	-.35**	.39**	-.29**	-.02	-.27**
Impulsivity		1.00	-.29**	.43**	-.09	.44**
Perceived control			1.00	-.42**	.01	-.34**
Perceived stress				1.00	.11	.72**
Heart failure knowledge					1.00	.06
Depression						1.00

*p < .05, **p < .01

The association between participants' demographic characteristics (age, income, sex, race, and education) and study main variables were examined to check if any of them would qualify as potential covariates. Pearson's Product Moment correlations were used with age and one–way ANOVA was used with education, sex, race, and income. Age was the only variable significantly correlated with any study variables and it was negatively related to perceived stress (r = -.25, p = .01). One-way ANOVA indicated that self-care maintenance, impulsivity, perceived control, and perceived stress did not differ by education, income, race, or sex. Thus, these variables were excluded from the analysis.

Moderated mediation analysis for self-care maintenance

SPSS macros developed by Andrew Hayes were used to test the proposed moderated mediation model (Hayes, 2013). Table 5 shows the results of regression based analysis of the model. In the first step of testing the proposed model, perceived control was regressed onto impulsivity, perceived stress, heart failure knowledge, functional status, depression, and the interaction between impulsivity and perceived stress. The only significant variables in this model were perceived stress and functional status (Table 5). This model explained 30% of the variance in perceived control (F (3, 96) = 6.58, p < .001). The next step was regressing self-care maintenance onto impulsivity, perceived control, perceived stress, heart failure knowledge, functional status, depression, the interaction between impulsivity and perceived stress and the interaction between perceived control and perceived stress. The model explained 30% of the variance in self-care maintenance (F (3, 96) = 4.95, p < .001). In this model, the only significant variables were impulsivity and functional status (Figure 6). To test the moderation effect of

Table 5

Regression Results for Perceived Control and Self-care Maintenance Models (N = 100)

Dependent variable	Predictor	*B*	SE	*t*	*p*
Perceived control	Constant	1.90	1.87	1.02	.31
	Impulsivity	-.05	.03	-1.75	.08
	Perceived stress	-.12	.05	-2.20	.03
	Impulsivity X perceived stress	.01	.00	1.56	.12
	Heart failure knowledge	-.00	.14	-.02	.98
	Functional status	-.86	.26	-3.35	< .0001
	Depression	.01	.07	.18	.86
Self-Care Maintenance	Constant	87.10	9.60	9.07	.00
	Perceived control	.91	.53	1.71	.09
	Impulsivity	-.35	.14	-2.45	.02
	Perceived control X perceived stress	-.07	.06	-1.14	.25
	Perceived stress	-.12	.28	-.42	.67
	Impulsivity X perceived stress	-.01	.02	-.46	.64
	Heart failure knowledge	-.70	.70	-.99	.32
	Functional status	-4.30	1.39	-3.11	< .0001
	Depression	.18	.33	.55	.58

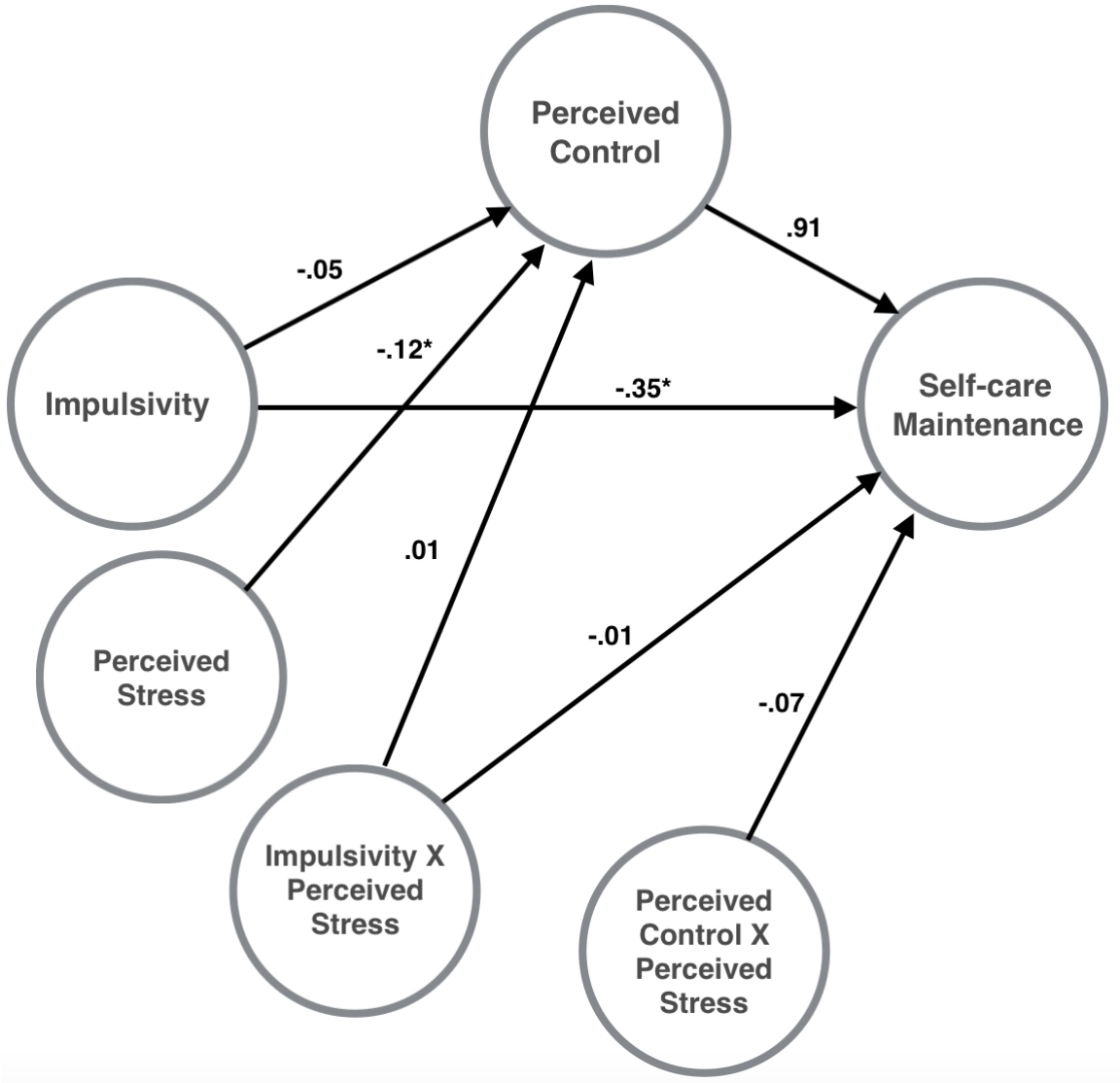

Figure 6. Moderated Mediation Model Controlling for Heart Failure Knowledge, Functional Status, and Depression with Unstandardized Coefficients (*p < .05)

perceived stress on the direct and indirect relationships between impulsivity and self-care maintenance, the direct and the indirect relationships were tested at +/- 1 *SD* and at the mean of the centered perceived stress (Table 6). These categories represented low (-1 SD), moderate (the mean), and high (+1 SD) perceived stress levels. The direct relationship between impulsivity and self-care maintenance was significant for high and moderate levels of perceived stress. In contrast, the indirect relationship between impulsivity and self-care maintenance through perceived control was only significant at the low level of perceived stress.

Because the interaction effects were nonsignificant, a linear regression model was formulated in which self-care maintenance was regressed onto impulsivity, perceived control, perceived stress, heart failure knowledge, functional status, depression, the interaction between impulsivity and perceived stress, and the interaction between perceived control and perceived stress to identify the best fitting model for self-care maintenance. This model yield only three significant predictors of self-care maintenance: impulsivity, perceived control, and functional status (see Table 7). The model explained 28.4% of the variance in self-care maintenance (F (8, 91) = 12.68, $p < .001$).

A follow-up macro analysis was carried out by including those significant variables in the best fit model. This model tested the simple mediation relationship between impulsivity and self-care maintenance through perceived control (Table 8 and Table 9). Perceived control partially mediated the relationship between impulsivity and self-care maintenance (see Figure 7). The mediational path between impulsivity and self-

Table 6

Regression Results for Conditional Direct and Indirect Effects of Impulsivity on Self-care Maintenance (N = 100)

Conditional direct effect of impulsivity on self-care maintenance at perceived stress score = +/-1 SD					
Perceived stress score	Effect	SE	*t*	*p*	95% CIs
-1 SD (-6.88)	-.29	.22	-1.36	.18	-.7192, .1357
Mean (0.00)	-.35	.14	-2.45	.02	-.6357, -.0668
+1 SD (6.88)	-.41	.16	-2.47	.02	-.7414, -.0801

Conditional indirect effect of impulsivity on self-care maintenance at perceived stress score = +/-1 SD			
Perceived stress score	Effect	Boot SE	Boot 95% CIs
-1 SD (-6.88)	-.12	.09	-.3577, -.0010
Mean (0.00)	-.04	.05	-.1838, .0146
+1 SD (6.88)	.00	.03	-.1230, .0345

Notes: CIs, confidence intervals.

Table 7

Best Fit Model for Self-care Maintenance (N = 100)

Predictor	*B*	SE	*t*	*p*
Constant	79.44	3.42	23.25	< .0001
Impulsivity	-.35	.12	-2.86	.005
Perceived control	1.01	.49	2.04	.044
Functional status	-4.03	1.29	-3.12	.002

Table 8

Regression Results for Perceived Control and Self-care Maintenance Models Based on the Best Fit Model (N = 100)

Dependent variable	Predictor	*B*	SE	*t*	*p*
Perceived control	Constant	15.31	1.51	10.11	< .0001
	Impulsivity	-.07	.02	-2.74	.01
	Functional status	-1.00	.25	-4.05	< .0001
Self-care Maintenance	Constant	91.11	10.56	8.63	< .0001
	Perceived control	1.01	.49	2.04	.04
	Impulsivity	-.35	.12	-2.86	.01
	Functional status	-4.03	1.29	-3.11	< .0001

Table 9

Regression Results for Total, Conditional Direct, and Conditional Indirect Effects of Impulsivity on Self-care Maintenance Based on the Best Fit Model (N = 100)

Type of effect	Effect	SE	t	p	95% CIs
Total Effect	-.42	.12	-3.48	< .0001	-.6583, -.1802
Direct Effect	-.35	.12	-2.86	.01	-.5960, -.1075

	Effect	Boot SE	Boot 95% CIs
Indirect effect	-.07	.05	-.1994, -.0050

Notes: CIs, confidence intervals.

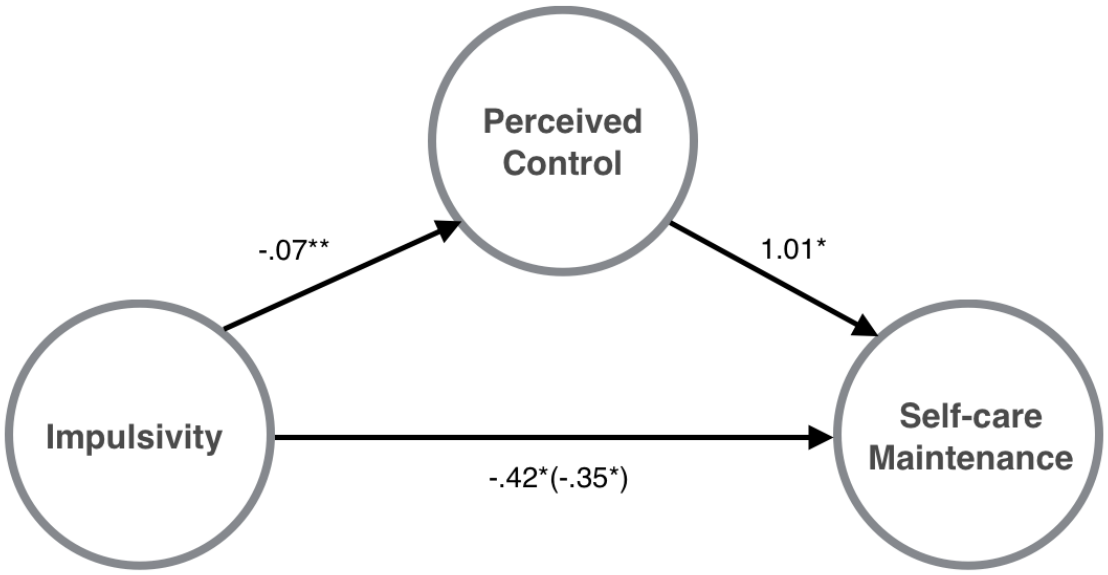

Figure 7. Regression Results for Simple Mediation Based on Best Fit Model Results with Unstandardized Coefficients (*p < .05, **p < .01)

care maintenance was significant. However, the mediational path did not account for all the relationship between impulsivity and self-care maintenance as the direct effect remained significant even after accounting for the effect of perceived control.

Self-care management

Chi square and t-test

Chi square was used to check for differences in proportions of low and high self-care management by functional status (Table 10). Two cells (25%) had expected counts less than five. When more than 20% of the cells have expected values less than five, Chi square tests are invalid. Thus, Fisher's exact test was used. The *p*-value for the Fisher's exact test was .96 which provided strong evidence that there were no significant differences in self-care management by functional status. Chi square also showed that there were no significant association between self-care management (high/low) and sex, race, education, or income. The t-test was used to test for the differences between high and low self-management in terms of impulsivity, perceived control, perceived stress, heart failure knowledge, and depression (Table 11). The t-test indicated that age diagnosis did not differ by self-care management.

Low and high self-care management groups did not differ in terms of impulsivity, perceived control, perceived stress, heart failure knowledge, functional status, and depression. Despite these results, SPSS macros were run to see if the analysis would reveal further insight into the nature of the relationships among the model variables or their interaction effects.

Moderated mediation analysis

SPSS macros was used to test are moderated mediation. Noteworthy is that the sample size for this analysis was reduced from 100 to 60 participants as a result

Table 10

Cross-tabulation of Self-care Management and Functional Status (n = 60)

Self-care management		NYHA Functional status						
		Class I	Class II	Class III	Class IV	χ^2	*df*	*p*
						.39	3	.94
Low	Observed	3 (9.4%)	12 (37.5%)	12 (37.5%)	5 (15.6%)			
	Expected	2.7	11.7	11.7	5.9			
High	Observed	2 (7.2%)	10 (35.7%)	10 (35.7%)	6 (21.4%)			
	Expected	2.3	10.3	10.3	5.1			

Table 11

T-test Results Comparing High and Low Self-care Management Groups on Means for Impulsivity, Perceived Stress, Perceived Control, Depression, and Heart Failure Knowledge (n = 60)

Variable	Low self-care management		High self-care management			
	M	SD	M	SD	*t*	*p*
Impulsivity	59.29	10.44	57.04	11.04	0.786	.635
Perceived stress	17.55	5.77	18.11	7.30	-0.33	.177
Perceived control	8.30	2.49	8.58	2.89	-0.41	.596
Depression	6.56	5.44	8.06	5.17	-1.09	.713
Heart failure knowledge	12.25	1.74	12.25	1.71	0.00	.576

Table 12

Demographic and Clinical Characteristics for Participants with a Self-care Management Score (n = 60)

Variable		*n*	Percentage
Sex	Female	28	47%
	Male	32	53%
	Missing	0	0%
Race	White	47	78%
	African American	11	18%
	American Indian or Alaska Native	0	0%
	Other	1	2%
	Missing	1	2%
Employment	Employed	9	15%
	Not employed	51	85%
	Missing	0	0%
Education	Did not complete high school	9	15%
	High school diploma	28	47%
	Vocational or some college	13	22%
	College	10	16%
	Missing	0	0%
Functional status	Class I	5	8%
	Class II	22	37%
	Class III	22	37%
	Class IV	11	18%
	Missing	0	0%
Income	0 to $20,000	23	38%
	$20,001 to $40,000	10	17%
	$40,001 to $60,000	12	20%
	$60,001 to $80,000	3	5%
	$80,001 or more	4	7%
	Missing	8	13%

of coding instructions from the author of the self-care management measure. The self-care management subscale asked about the person's response to symptoms of fluid overload; thus, score was not calculated for those who did not show any symptoms of fluid overload even if they answered all items for this subscale. Compared to the 60 participants who received a score, the 40 participants who were excluded from this analysis had significantly higher perceived control (t (95) = 2.21, p = .03), lower perceived stress (t (95) = -2.67, p < .01), and lower depression (t (95) = -2.25, p = .03), but didn't differ on impulsivity and heart failure knowledge. Group membership was associated with functional status (χ^2 (3) = 20, p < .001).

Demographic and clinical characteristics for the participants are summarized in Table 12. To test the moderated mediation relationship, perceived control was regressed onto impulsivity, perceived stress, heart failure knowledge, functional status, depression, and the interaction between impulsivity and perceived stress. This model explained 21% of the variance in perceived control (F (6, 53) = 2.37, p = .04). However, the only significant predictor in this model was functional status (Table 13).

In the next step, self-care management was regressed on impulsivity, perceived control, perceived stress, heart failure knowledge, functional status, depression, the interaction between impulsivity and perceived stress, and the interaction between perceived control and perceived stress (Table 13). In this model, the only significant effect was the interaction between perceived stress and perceived control. The direct and indirect relationships were tested at +/-1 *SD* and at the mean (Table 14). These categories were formulated to represent low (-1 *SD*), moderate (the mean), and high (+1 *SD*)

Table 13

Regression Results for Perceived Control and Self-care Management (n = 60)

Dependent variable	Predictor	*B*	SE	*t*	*p*
Perceived control	Constant	.68	2.55	.27	.79
	Impulsivity	-.03	.04	-.68	.50
	Perceived stress	-.14	.07	-1.93	.06
	Impulsivity X perceived stress	.00	.00	1.03	.31
	Heart failure knowledge	.09	.20	.46	.65
	Functional status	-.96	.40	-2.40	.02
	Depression	.08	.09	.85	.40
		B	SE	*z*	*p*
Self-care management	Constant	-1.48	2.30	-.64	.52
	Perceived control	.07	.13	.52	.60
	Impulsivity	-.03	.03	-.90	.37
	Perceived control X perceived stress	-.04	.02	-2.06	.04
	Perceived stress	-.01	.07	-.10	.92
	Impulsivity X perceived stress	.00	.00	-.03	.98
	Heart failure knowledge	.02	.18	.12	.91
	Functional status	.09	.36	.26	.80
	Depression	.09	.08	1.12	.26

Table 14

Regression Results for Conditional Direct and Indirect Effects of Impulsivity on Self-care Management (n = 60)

Conditional direct effect of impulsivity on self-care management at perceived stress score = +/-1 SD					
Perceived stress score	Effect	SE	z	p	95% CIs
-1 SD (-6.88)	-.03	.05	-.61	.54	-.1225, .0640
Mean (0.00)	-.03	.03	-.90	.37	-.0953, .0352
+1 SD (6.88)	-.03	.04	-.80	.43	-.1068, .0451

Conditional indirect effect of impulsivity on self-care management at perceived stress score = +/-1 SD			
Perceived stress score	Effect	Boot SE	Boot 95% CIs
-1 SD (-6.88)	-.02	.05	-.1638, .0400
Mean (0.00)	-.00	.01	-.0501, .0131
+1 SD (6.88)	.00	.02	-.0539, .0298

Notes: CIs, confidence intervals.

perceived stress levels. There were no significant direct or indirect relationships at any level of perceived stress.

Although the test did not show a moderation effect, the significance of the interaction between perceived stress and perceived control required more attention. Thus, the analysis was re-run assuming that the moderation effect was occurring between perceived control and self-care management only. The SPSS model that fits this assumption is model 14 (Figure 8). Consistent with the previous model analysis, the direct relationship was not significant (Table 15). Also, the indirect relationship was not significant at any level of perceived control (Table 16). Next, two logistic regression models were examined. In the first model, self-care management was regressed onto impulsivity, perceived control, perceived stress, and the interaction between perceived control and perceived stress. Although there were no significant main effects, the interaction between perceived control and perceived stress was significant (Table 17).

This model did not provide an answer concerning why the interaction effect was significant. Next, perceived stress was dichotomized into high and low perceived stress. The high stress group consisted of participants with scores above the mean. The low stress group consisted of those with perceived stress at or below the mean. Next, another model was formulated to answer this question. In this model, self-care management was regressed onto impulsivity and perceived control. However, this model was tested separately for the high and low perceived stress levels. The odd ratios were nonsignificant for perceived control in the high and low perceived stress groups (Table 18). Among low stress individuals, as perceived control increased, the odds of high self-care management increased by 1.5. In persons with high stress, high levels of perceived

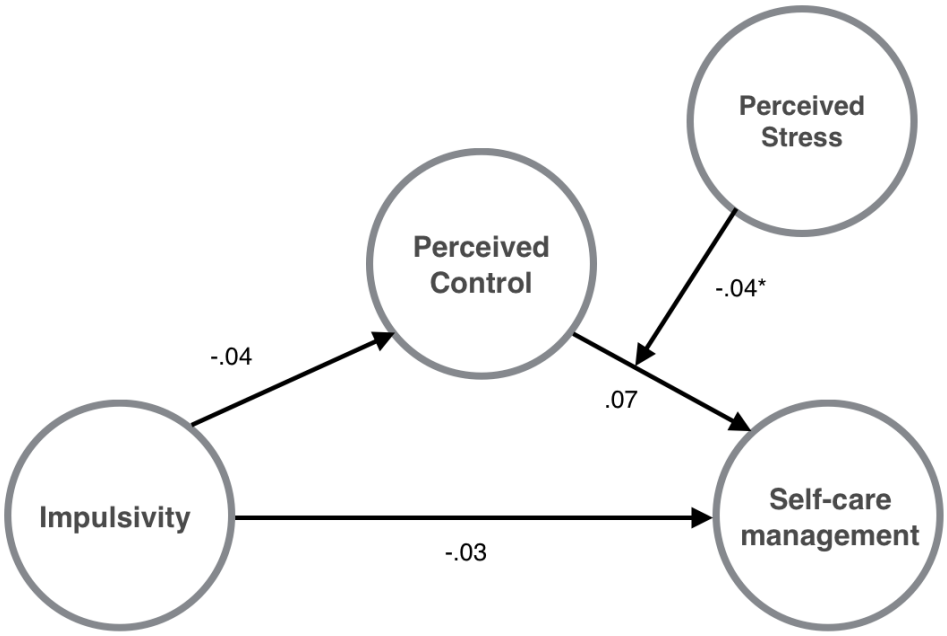

Figure 8. Regression Model for the Moderation Effect of Perceived Stress on the Relationship between Perceived Control and Self-care Management with Unstandardized Coefficients (*$p < .05$)

Table 15

Regression Results for Perceived Control and Self-care Management with Moderation Effect on the Relationship between Perceived Control and Self-care Management (n = 60)

Dependent variable	Predictor	*B*	SE	*t*	*p*
Perceived control	Constant	4.92	3.17	1.055	.13
	Impulsivity	-.04	.04	-1.17	.25
	Heart failure knowledge	.01	.20	.03	.97
	Functional status	-.95	.41	-2.33	.02
	Depression	.00	.08	-.00	.99
		B	SE	*z*	*p*
Self-care management	Constant	.26	3.02	.09	.93
	Perceived control	.07	.13	.52	.60
	Impulsivity	-.03	.03	-.93	.35
	Perceived control X perceived stress	-.04	.02	-2.09	.04
	Perceived stress	.00	.07	-.10	.92
	Heart failure knowledge	.02	.18	.13	.90
	Functional status	.09	.36	.26	.79
	Depression	.09	.78	7.16	.25

Table 16

Regression Results for Direct and Conditional Indirect Effects of Impulsivity on Self-care Management with Moderation Effect on the Relationship between Perceived Control and Self-care Management (n = 60)

Direct effect of impulsivity on self-care management				
Effect	SE	*z*	*p*	95% CIs
-.03	.03	-.93	.35	-.0940, .0336
Conditional indirect effect of impulsivity on self-care management at perceived stress score = +/-1 SD				
Perceived stress score	Effect	Boot SE	Boot 95% CIs	
-1 SD (-6.88)	-.01	.03	-.0900, .0204	
Mean (0.00)	.00	.01	-.0519, .0172	
+1 SD (6.88)	.01	.02	-.0137, .0642	

Notes: CIs, confidence intervals.

Table 17

Odds Ratios for Modeling High Self-care Management (n = 60)

Variable	Odds ratio	95% CIs
Constant	.72	
Impulsivity	.97	.920-1.040
Perceived control	1.14	.882-1.464
Perceived stress	1.02	.916-1.141
Perceived control X perceived stress	.96	.922- .997

Note: CIs, confidence intervals

Table 18

Odds Ratio for Modeling High Self-care Management for Low and High Perceived Stress Levels (n = 60)

Outcome	Variable	Odds ratio	95% CIs
Low perceived stress	Constant	.70	
	Impulsivity	.95	.846-1.057
	Perceived control	1.50	.962-2.325
High perceived stress	Constant	.74	
	Impulsivity	1.01	.935-1.081
	Perceived control	.78	.582-1.057

Notes: CIs, confidence intervals

control decreased the odds of high self-care management. Although these odds were not significant, they may explain why the interaction between perceived control and perceived stress was significant despite the absence of a significant moderation effect in the main model.

CHAPTER V

DISCUSSION

The purpose of this study was to evaluate the relationships of impulsivity, perceived stress, and perceived control with self-care behavior in persons with heart failure using the Hot/Cool System Model as a foundation (Metcalfe & Mischel 1999). The model explicated a number of testable hypotheses. First, impulsivity was postulated to be negatively correlated with self-care behavior, represented by self-care maintenance and self-care management. Second, perceived control was expected to be positively correlated with self-care behavior. Third, perceived control was hypothesized to mediate the relationship between impulsivity and self-care behavior. Fourth, it was hypothesized that the mediational effect of perceived control would be moderated by perceived stress. According to the model, the ability of perceived control to mediate the relationship between impulsivity and self-care behavior was expected to be strongest at lower levels of stress and weakest at the higher levels of stress.

The results of the current analysis supported most of these hypotheses in the case of self-care maintenance. For example, self-care maintenance was negatively correlated with impulsivity and positively correlated with perceived control. Perceived control partially mediated the relationship between impulsivity and self-care maintenance in the regression mediational model derived from the best fitting model. In the initial model, the indirect (mediational) path was only significant at lower levels of perceived stress. As the

level of perceived stress increased, the direct path between impulsivity and self-care maintenance was the only significant effect.

For self-care management, none of the hypotheses were supported. The only indicator of a weak moderated mediational effect was through testing the odds ratio of self-care management in relation to perceived control. In the low stress group, the odds of having high self-care management increased when perceived control increased. One potential reason for these results is the measure of self-care behavior. Cronbach's alphas for self-care maintenance and self-care management were low (Table 18). Although the self-care management subscale had a higher Cronbach's alpha compared to that of the self-care maintenance subscale, it was the more problematic subscale. The self-care management subscale is composed of six items; the participants' answers are scored only if they have coughing or swollen ankles during the last month. In addition, the participants received scores even if they answered only two questions about remedies used for their problems. That means a person would still get a self-care management score if he or she answered only two out of six items if these two items were about remedies (items 12-15).

According to the model, the hot and cool systems are composed of several nodes and spots within each system (Metcalfe & Mischel 1999). When the hot spot is activated, represented by impulsivity, it may activate other hot spots within the hot system. It also activates other nodes within the cool system. These nodes, represented by perceived control in the current study, and activated within the cool system, are the ones responsible to counter the effect of the hot system. Although the current study assumed that impulsivity and perceived control are representative of the hot and cool systems,

respectively, perceived control may not be the most appropriate cognitive process to counteract the effect of impulsivity. It may be better if a more general cognitive measure is used or if a composite variable is formulated using multiple cognitive measures.

Some of the current study findings were consistent with previous literature. For example, the standardized cutoff score for adequate self-care maintenance and management is 70 (Riegel et al., 2009). The current study sample had less than adequate self-care maintenance and management which is consistent with previous research findings that persons with heart failure tend to have inadequate self-care practices (Riegel et al., 2009).

The current study showed that persons with heart failure had higher perceived stress compared to the normative value of their counterparts from the same age group, 65 and older (Grady, 2008; Salyer et al., 2012) which is consistent with previous research (Luskin et. al., 2002). Perceived control was positively correlated with self-care maintenance. Previous studies showed indication of such a relationship (Hwang et al., 2014), while others found a relationship in females but not in males (Heo et al., 2008).

The prevalence of depression was reported to be very high in persons with heart failure in prior research (Dimos et al, 2009.; Ege, Yilmaz, & Yilmaz, 2012). According to Kroenke, Spitzer, and Williams (2001), scores of 5, 10, 15, and 20 on the PHQ-9 represent mild, moderate, moderate to severe, and severe levels of depression, respectively. The PHQ-9 mean for the current sample was 6.08 (SD = 5.89). Examining the PHQ-9 score frequencies, half of the sample (n = 50) had scores of 5 and above indicating mild to severe depression. These results supported previous literature that

indicated a high prevalence of depression in persons with heart failure (Gnanasekaran, 2011).

On the other hand, current study findings are contrary to those of previous research. For example, depression was a signifcant predictor of self-care in person with heart failure (Holzapfel et al., 2009). The current study showed that depression was correlated with self-care maintenance but not self-care management. When depression was entered into the model, it was not a significant predictor for either self-care maintenance or self-care management. One explanation for these results could be the combination of the variables entered into the model masked the effect of depression on self-care maintenance in persons with heart failure. Again, this poses an empirical question that can be answered only by further examination of these relationship in a different sample of persons with heart failure.

New Insights

This study was unique mainly because of the introduction of impulsivity as a new predictor for self-care behavior in person with heart failure that has been overlooked in the literature. Stanford et al. (2009) categorized levels of impulsivity based on the BIS-11 scores; 72 or above as high impulsivity, 52-71 as normal impulsivity, and 51 and below as over-control. According to the Stanford et al. (2009) categorization, the largest category in the current sample was the normal impulsivity group (n = 66), followed by the over controlled group (n = 25), and finally followed by the high impulsivity group (n = 9). Since there were no previous studies about impulsivity in persons with heart failure, the results could not be compared with previous findings. Thus, more studies are required to get norms for persons with heart failure for future comparison.

Impulsivity was a significant predictor of self-care maintenance in persons with heart failure. Initially, impulsivity was correlated with self-care maintenance which meant that a higher level of impulsivity was related to poorer self-care maintenance. This is consistent with the nature and the direction of the relationships between impulsivity and various problematic behavior such as gambling, hazardous drinking, overeating, offending behavior, and aggressive behaviors in various populations (Auger, Lo, Cantinotti, & O'Loughlin, 2010; CDC, 2012a; CDC, 2012b; Grady, 2008; Derefinko, DeWall, Metze, Walsh, & Lynam, 2011). When it was entered into regression models, impulsivity was a significant predictor of self-care maintenance. It also was among those variables in the best fitting model along with functional status and perceived control. In contrary, impulsivity did not show the same significance in correlating with and predicting self-care management; however, no other variable did any better.

Impulsivity was significantly correlated with perceived control. This study proposed that perceived control would mediate the relationship between impulsivity and self-care behavior. This mediation was only significant with self-care maintenance at lower levels of perceived stress; however, this can be explained by the Hot/Cool System Model. According to the model when the stress level increases, the ability of cognitive processes to counter the effect of the hot system diminishes. This would eventually cause cognitive processes to lose their mediational effect between the hot system and behavioral outcomes.

In the current study, when stress level was low, the indirect effect of impulsivity on self-care maintenance mediated by perceived control was significant. When the level of perceived stress increased, the mediational effect of perceived control became

nonsignificant and the direct effect of impulsivity became significant which is consistent with the Hot/Cool System Model. The mediational effect of perceived control was not expected to disappear abruptly moving from low to moderate perceived stress levels. One explanation of that abrupt shift in significance from indirect to direct paths in the mediational model could be that categorizing perceived stress levels was relative in that the sample was divided into low, moderate, and high perceived stress groups based on +/- 1 SD cutoff points. Considering the group mean of perceived stress, it is apparent that the current sample had a high level of perceived stress compared to the normalized score, as discussed earlier. This means that the low perceived stress group is low relative to the rest of the sample, but they may not be considered a low stress group when compared with general population of the same age group. To make this even more complicated, the PSS-10 scale did not provide a way to categorize study participants based on their raw scores. However, even if the PSS-10 provided a method for such categorization, power would be a problem since the size of these sub-groups (low, moderate, and high stress perceived groups) would be very small.

The regression model for simple mediation was tested based on the results of the best fit model, the partial mediational effect of perceived control on the relationship between impulsivity and self-care maintenance was significant which also supports the Hot/Cool System Model. This significant mediation effect of perceived control was consistent with the only study that investigated the nature of the relationship between impulsivity and perceived control. In that study, perceived control mediated the relationship between impulsivity and alcohol use (Kabbani & Kambouropoulos, 2012).

The Hot/Cool System Model

Recently, many researchers claimed that studies of human behavior should focus on complex relationships among variables of interest (Hayes, 2013). Their argument was based on the innate complexity of human beings. The complexity of the human beings and the diverse ways they can interact with their environment necessitate the need for complex models and analysis to capture that complexity. In the current study, the Hot/Cool System Model showed great potential to capture such complexity. The new trend to study human behavior by analyzing moderation and mediation relationships and all possible combinations between them is consistent with the Hot/Cool System Model. The Hot/Cool System Model can be used to generate an endless list of propositions to study complex relationships and capture the complexity of individuals. Supplemented with appropriate statistical analysis and based on the findings of previous literature, the Hot/Cool System Model can be an invaluable asset in nursing for generating new knowledge and exploring the nature of the relationships among previously studied variables.

Implications for Nursing

The overarching goal of the current study was to identify means to improve self-care behavior in persons with heart failure. This study introduced impulsivity as a new predictor for self-care maintenance in persons with heart failure. It also provided a new insight into the nature of the relationships among impulsivity and previously reported predictors of self-care behavior in persons with heart failure. Although the implications of having impulsivity as a predictor for self-care maintenance are great, the implications for nursing will be limited to the current study findings.

Impulsivity can be used as a predictor of individual level of self-care maintenance. For patients with higher levels of impulsivity, we can expect that they will have poorer levels of self-care maintenance. Knowledge of the patients' level of impulsivity could be used to plan ahead of time by giving special attention to those individuals by providing healthcare services that aim at improving self-care maintenance in those individuals.

One way to improve self-care maintenance is to engage individuals in cognitive processes that will counter the effect of impulsivity. Improving perceived control is one way to do that; however, the current study indicated, at best, only a partial mediational role of perceived control which may mean that perceived control may not be enough to counter the effect of impulsivity in those individuals with very high levels of impulsivity. Only future research can find a more powerful cognitive process that has the ability to counter the effect of impulsivity.

The mediational effect of perceived control on the relationship between impulsivity and self-care maintenance was significant only at lower levels of perceived stress. This means to gain the maximum effect from any cognitive treatment to improve self-care maintenance, perceived stress must be minimized. Otherwise, the treatment efforts and resources will be wasted without any noticeable effect. Thus, one way to improve self-care maintenance and use healthcare resources wisely is to reduce the number of stressors in the lives of persons with heart failure or to modify their perception of stressors.

Future Research

Systematic replication of the current study

Since this was the first study to address the role of impulsivity in persons with heart failure, some issues need to be considered before replicating it with other samples of persons with heart failure. First, the BIS-11 must be examined and modified to fit all potential participants with heart failure. Heart failure usually affects those who are 65 year old and older which must be taken into consideration.

The current study showed that the measures of self-care maintenance, self-care management, and heart failure knowledge were questionable. Although internal consistencies reported in the literature were low for these measures,, their authors justified their low internal consistencies by the characteristics of their sample. This study may indicate that poor internal consistency for these measures might not be related to sample characteristics, but to something inherent within the measures. Thus, future research should consider using other measures with better psychometrics or new measures with better psychometric properties should be developed.

The current sample might have had special characteristics because of the unique study setting. There were no means to compare the findings with previous literature since no known similar studies had been reported in such setting. Thus, this issue can be answered only by future research designed solely for this purpose. One way to do that is by replicating this study in persons with heart failure in other settings such as cardiology clinics or hospitals.

Improving self-care in persons with heart failure

The next step of research will be putting the findings of this study and similar studies into use in clinical settings. However, this cannot be done without further research. Some potential interventions have been used to reduce impulsivity or minimize

its effect on the decision making process in pursuing certain behavioral outcomes. These interventions are numerous but two examples of them are brain training (Berkman, Graham, & Fisher, 2012) and contingency management interventions (McGovern & Carroll, 2003). Brain training is an intervention that makes use of active participation in mental processes that counter the effect of impulsivity on an intended behavioral outcome. Using the Hot/Cool System Model terminology, it uses the cool system mediational effect to counter the effect of the hot system. Contingency interventions is another class of interventions that adds artificial contingencies to a specific behavioral choice to make it less appealing. For example, every time a person with heart failure eats high salt diet, he or she would do an unpleasant home chore that suits his or her physical abilities. Such an intervention could reduce the emotional affinity toward that behavioral choice and thereby reduce impulsivity. These interventions and others need to be planned and tested in persons with heart failure to examine their effectiveness.

Replication with other chronic illnesses

The use of the Hot/Cool System Model should not be limited to self-care in persons with heart failure. It should be extended to include persons with other chronic illnesses. For example, 95% of diabetes treatment is the responsibility of the person with diabetes or their caregivers (Anderson, 1995). With complex treatment regimens for diabetes, using a complex model like the Hot/Cool System Model may assist in planning and guiding self-care studies to capture complexity.

In addition, future research can benefit from incorporating impulsivity to predict self-care behavior in various chronic illnesses. The current study showed that impulsivity was a significant predictor of self-care maintenance. In addition, incorporating

impulsivity with predictive models may lead to the development of new potential interventions to improve self-care behvaior in persons with chronic illnesses.

Strengths

The current study had a number of strengths. First, the study addressed a gap in the literature related to the role of impulsivity in self-care in persons with heart failure. Second, the study also addressed the relationships among impulsivity, perceived stress, and perceived control that were not addressed in previous literature. Third, the study went one step further and examined the nature of these relationships among the variables and how they interplay to predict self-care behavior in persons with heart failure. Fourth, the current study opened the door for new research ideas by introducing the Hot/Cool System Model and impulsivity to the nursing literature. Finally, these findings add to the body of knowledge in the areas of impulsivity, self-care behavior, perceived control, perceived stress, and depression in persons with heart failure.

Limitations

A number of limitations were identified. First, the use of the SCHFI V6 and the Dutch Heart Failure Knowledge Scale may be problematic, and using other methods should be considered in future research. Second, some findings indicated that the current sample may have special characteristics, i.e., the current sample may have underrepresented or overrepresented certain groups limits the generalizability of the findings. Third, the sample was collected from a single site which might also have led to underrepresentation or overrepresentation of certain groups of persons with heart failure.

Measures that were used in this study seemed to be easy to answer. No complaint was received from any participant about any difficulty responding to the measures. In only one instance did a patient ask about an item on the BIS-11. Generally, the measures had an acceptable internal consistencies except for self-care and heart failure knowledge measures.

The psychometrics of the SCHFI V6 require further examination. It could be concluded that the measure may not fit for all persons with heart failure. Although the current sample may have unique characteristics due to the special nature of the services this clinic provided, any self-care measure designed for persons with heart failure should work the same, but this might not be the case.

There were some issues with the Dutch Heart Failure Knowledge Scale. It had very poor internal consistency (Cronbach's alpha = .51). This scale is composed of 15 items. The number of participants who had any single item answered wrong varied from 3% to 33%, except for item 6 which stood out; 82% of the participants in this study gave a wrong answer to this question. The reason this item was problematic for participants is not clear.

The BIS-11 was used with persons with heart failure for the first time in this study. It had a very good internal consistency in this sample. However, the measure was not free from issues. The problem was specific to items 13 and 16. Item 13 asked about planning for job security, and item 16 asked about changing jobs. Item 13 had 13 missing values and item 16 had 18 missing values. The problem was that these values were not missing at random. Most of the participants who did not answer these items wrote side notes next to them to indicate that they were not applicable to them. Another problem

with these items was that they were stated in the present tense. Considering that the current sample was composed mainly from those who were retired (n = 81), these items were not applicable to these persons. This problem necessitates a careful examination of the measure to make sure that all items included are relevant to all participants. Considering the age group that is mostly affected by heart failure, those items need to be restated in the past tense, dropped out, or replaced by other items that are relevant to persons with heart failure. Whatever option is selected to fix these items, it must not negatively affect the psychometrics of the measure.

A sample of 100 participants was recruited from the heart failure clinic affiliated with Norton Hospital in Louisville, KY. The clinic mainly provides teaching services for persons with heart failure. This clinic was different from other clinics for persons with chronic illnesses. The persons with heart failure keep visiting the clinic to a point where they received all possible resources, knowledge, and capacities to manage their illness. During data collection, it was apparent that not all persons with heart failure who were visiting the clinic showed strong commitment to receive such supportive services in a timely manner for a definite period of time. Although no systematic data were collected about that, it was clear by the very high "no show" rate in the clinic. Participants who missed their appointments did not face any consequences for not showing up without prior notification. They simply were called to reschedule. Those who kept their appointment might have had a different attitude and commitment toward managing their illness. Thus, the study sample may have different characteristics compared to those who frequently missed their appointments, which may have affected the variability within the

study sample in terms of the study variables. However, this is only posed as empirical question that is amenable to the future research.

Conclusion

The purpose of this study was to evaluate the relationships of impulsivity, perceived stress, and perceived control with self-care behavior in persons with heart failure using the Hot/Cool System Model as a foundation. The findings supported the proposed relationships to great extent with self-care maintenance, but failed to support any of them with self-care management. These results could be due to the measures used and the special characteristics of the study sample. Despite these inconsistencies, the current study opened the door for new research by introducing the Hot/Cool System Model and impulsivity to the nursing field.

In summary, the results supported some previous research findings. Inconsistent findings may be explained, in part, by special characteristics of the current sample. Thus, further investigation of the relationship between impulsivity and self-care behavior is warranted.

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APPENDIX A

Literature Search Results of Various Combinations of Main Study Variables.

Database	Keyword(s) combination			Number of articles	Relevant
	Keyword 1	Keyword 2	Keyword 3		
PsychINFO	Perceived Control	Self-care	Heart Failure	3	3
PsychINFO	Perceived Control	Impulsivity	-	27	1
PsychINFO	Perceived Control	Impulsivity	Heart Failure	0	0
PsychINFO	-	Impulsivity	Heart Failure	1	0
PsychINFO	-	Impulsivity	Self-care	5	0
PsychINFO	Heart Failure	Impulsivity	Salt diet	0	0
PsychINFO	Heart Failure	Impulsivity	Medication	0	0
PsychINFO	Perceived Control	Heart Failure	Salt Diet	0	0
PsychINFO	Perceived Control	Heart Failure	Medication	2	0
CINHAL	Perceived Control	Self-care	Heart Failure	0	0
CINHAL	Perceived Control	Impulsivity	-	0	0

CINHAL	Perceived Control	Impulsivity	Heart Failure	0	0
CINHAL	-	Impulsivity	Heart Failure	0	0
CINHAL	-	Impulsivity	Self-care	0	0
CINHAL	Heart Failure	Impulsivity	Salt Diet	0	0
CINHAL	Heart Failure	Impulsivity	Medication	0	0
CINHAL	Perceived Control	Heart Failure	Salt Diet	0	0
CINHAL	Perceived control	Heart Failure	Medication	0	0
PubMed	Perceived Control	Self-care	Heart Failure	40	3 (2 in common with previous combinations)
PubMed	Perceived Control	Impulsivity		423	(First 40 searched) 0 related
PubMed	Perceived Control	Impulsivity	Heart Failure	0	0
PubMed	-	Impulsivity	heart Failure	2	0
PubMed	-	Impulsivity	Self-care	776	(First 40 searched) 0 related
PubMed	Heart Failure	Impulsivity	Salt Diet	0	0
PubMed	Heart Failure	Impulsivity	Medication	1	0
PubMed	Perceived Control	Heart Failure	Salt Diet	0	0

PubMed	Perceived Control	Heart Failure	Medication	14	1 (1 in common with previous combinations)

APPENDIX B

Study Measures

Self-Care of Heart Failure Index Version 6 (SCHFI-V6)

All answers are confidential.

Think about how you have been feeling in the last month or since we last spoke as you complete these items.

SECTION A:

Listed below are common instructions given to persons with heart failure. How routinely do you do the following?

Questions	Never or rarely	Sometimes	Frequently	Always or daily
1.Weigh yourself?	**1**	**2**	**3**	**4**
2.Check your ankles for swelling?	**1**	**2**	**3**	**4**
3.Try to avoid getting sick (e.g., flu shot, avoid ill people)?	**1**	**2**	**3**	**4**
4.Do some physical activity?	**1**	**2**	**3**	**4**
5.Keep doctor or nurse appointments?	**1**	**2**	**3**	**4**
6.Eat a low salt diet?	**1**	**2**	**3**	**4**
7.Exercise for 30 minutes?	**1**	**2**	**3**	**4**
8.Forget to take one of your medicines?	**1**	**2**	**3**	**4**
9.Ask for low salt items when eating out or visiting others?	**1**	**2**	**3**	**4**
10.Use a system (pill box, reminders) to help you remember your medicines?	**1**	**2**	**3**	**4**

SECTION B:

Many patients have symptoms due to their heart failure. Trouble breathing and ankle swelling are common symptoms of heart failure.

In the past month, have you had trouble breathing or ankle swelling? Circle one.

1) No
2) Yes

11. If you had trouble breathing or ankle swelling in the past month…

(circle **one** number)

Question	Have not had these	I did not recognize it	Not Quickly	Somewhat Quickly	Quickly	Very Quickly
How quickly did you recognize it as a symptom of heart failure?	N/A	0	1	2	3	4

Listed below are remedies that people with heart failure use. If you have trouble breathing or ankle swelling, how likely are you to try one of these remedies?

(circle **one** number for each remedy)

Remedies	Not Likely	Somewhat Likely	Likely	Very Likely
12. Reduce the salt in your diet	**1**	**2**	**3**	**4**
13. Reduce your fluid intake	**1**	**2**	**3**	**4**
14. Take an extra water pill	**1**	**2**	**3**	**4**
15. Call your doctor or nurse for guidance	**1**	**2**	**3**	**4**

16. Think of a remedy you tried the last time you had trouble breathing or ankle swelling,

(circle **one** number)

Question	I did not try anything	Not Sure	Somewhat Sure	Sure	Very Sure
How sure were you that the remedy helped or did not help?	0	1	2	3	4

SECTION C:

In general, how confident are you that you can:

Items	Not Confident	Somewhat Confident	Very Confident	Extremely Confident
17. Keep yourself free of heart failure symptoms?	**1**	**2**	**3**	**4**
18. Follow the treatment advice you have been given?	**1**	**2**	**3**	**4**
19. Evaluate the importance of your symptoms?	**1**	**2**	**3**	**4**
3. Recognize changes in your health if they occur?	**1**	**2**	**3**	**4**
21. Do something that will relieve your symptoms?	**1**	**2**	**3**	**4**
22. Evaluate how well a remedy works?	**1**	**2**	**3**	**4**

Barret Impulsiveness Scale-11 (BIS-11)

DIRECTIONS: People differ in the ways they act and think in different situations. This is a test to measure some of the ways in which you act and think. Read each statement and put an X on the appropriate circle on the right side of this page. Do not spend too much time on any statement. Answer quickly and honestly.

		Rarely/Never	Occasionally	Often	Almost always
1.	I plan tasks carefully.	**1**	**2**	**3**	**4**
2.	I do things without thinking.	**1**	**2**	**3**	**4**
3.	I make-up my mind quickly.	**1**	**2**	**3**	**4**
4.	I am happy-go-lucky.	**1**	**2**	**3**	**4**
5.	I don't "pay attention."	**1**	**2**	**3**	**4**
6.	I have “racing” thoughts.	**1**	**2**	**3**	**4**
7.	I plan trips well ahead of time.	**1**	**2**	**3**	**4**
8.	I am self controlled.	**1**	**2**	**3**	**4**
9.	I concentrate easily.	**1**	**2**	**3**	**4**
10.	I save regular.	**1**	**2**	**3**	**4**
11.	I “squirm” at plays or lectures.	**1**	**2**	**3**	**4**
12.	I am a careful thinker.	**1**	**2**	**3**	**4**
13.	I plan for job security.	**1**	**2**	**3**	**4**
14.	I say things without thinking.	**1**	**2**	**3**	**4**
16.	I change jobs.	**1**	**2**	**3**	**4**
17.	I act "on impulse."	**1**	**2**	**3**	**4**

BIS-11

	Rarely/Never	Occasionally	Often	Almost always
18. I get easily bored when solving thought problems.	**1**	**2**	**3**	**4**
19. I act on the spur of the moment.	**1**	**2**	**3**	**4**
20. I am a steady thinker.	**1**	**2**	**3**	**4**
21. I change residences.	**1**	**2**	**3**	**4**
22. I buy things on impulse.	**1**	**2**	**3**	**4**
23. I can only think about one thing at a time.	**1**	**2**	**3**	**4**
24. I change hobbies.	**1**	**2**	**3**	**4**
25. I spend or charge more than I earn.	**1**	**2**	**3**	**4**
26. I often have extraneous thoughts when thinking.	**1**	**2**	**3**	**4**
27. I am more interested in the present than the future.	**1**	**2**	**3**	**4**
28. I am restless at the theater or lectures.	**1**	**2**	**3**	**4**
29. I like puzzles.	**1**	**2**	**3**	**4**
30. I am future oriented.	**1**	**2**	**3**	**4**

Control Attitude Scale-Revised (CAS-R)

What is the number that most closely measures how you feel about your heart?

		Strongly Disagree	Disagree	Do Not Agree or Disagree	Agree	Strongly Agree
1.	If I do all the right things, I can successfully manage my heart condition	**1**	**2**	**3**	**4**	**5**
2.	I can do a lot of things myself to cope with my heart condition.	**1**	**2**	**3**	**4**	**5**
3.	When I manage my personal life well, my heart condition does not bother me as much.	**1**	**2**	**3**	**4**	**5**
4.	I have considerable ability to control my symptoms.	**1**	**2**	**3**	**4**	**5**
5.	No matter what I do, or how hard I try, I just can't seem to get relief from my symptoms.	**1**	**2**	**3**	**4**	**5**
6.	I am coping effectively with my heart condition.	**1**	**2**	**3**	**4**	**5**
7.	Regarding my heart problems, I feel in control.	**1**	**2**	**3**	**4**	**5**
8.	Regarding my heart problems, I feel helpless.	**1**	**2**	**3**	**4**	**5**

Perceived Stress Scale-10 (PSS-10)

The questions in this scale ask you about your feelings and thoughts during the **last month**. In each case, you will be asked to indicate by **circling** how often you felt or thought a certain way.

	Never	Almost Never	Sometimes	Fairly Often	Very Often
1. In the last month, how often have you been upset because of something that happened unexpectedly?	**0**	**1**	**2**	**3**	**4**
2. In the last month, how often have you felt that you were unable to control the important things in your life?	**0**	**1**	**2**	**3**	**4**
3. In the last month, how often have you felt nervous and "stressed"?	**0**	**1**	**2**	**3**	**4**
4. In the last month, how often have you felt confident about your ability to handle your personal problems?	**0**	**1**	**2**	**3**	**4**
5. In the last month, how often have you felt that things were going your way?	**0**	**1**	**2**	**3**	**4**
6. In the last month, how often have you found that you could not cope with all the things that you had to do?	**0**	**1**	**2**	**3**	**4**
7. In the last month, how often have you been able to control irritations in your life?	**0**	**1**	**2**	**3**	**4**

8. In the last month, how often have you felt that you were on top of things?	**0**	**1**	**2**	**3**	**4**
9. In the last month, how often have you been angered because of things that were outside of your control?	**0**	**1**	**2**	**3**	**4**
10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	**0**	**1**	**2**	**3**	**4**

Patient Health Questionnaire-9 (PHQ-9)

Over the **last 2 weeks,** how often have you been bothered by any of the following problems?

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	**0**	**1**	**2**	**3**
2. Feeling down, depressed, or hopeless	**0**	**1**	**2**	**3**
3. Trouble falling or staying asleep, or sleeping too much	**0**	**1**	**2**	**3**
4. Feeling tired or having little energy	**0**	**1**	**2**	**3**
5. Poor appetite or overeating	**0**	**1**	**2**	**3**
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down	**0**	**1**	**2**	**3**
7. Trouble concentrating on things, such as reading the newspaper or watching television	**0**	**1**	**2**	**3**
8. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	**0**	**1**	**2**	**3**
9. Thoughts that you would be better off dead or of hurting yourself in some way	**0**	**1**	**2**	**3**

Dutch Heart Failure Knowledge Scale (DHFKS)

This list contains a number of questions and statements about heart failure. For each item, **circle** the number that you think is the right answer.

1. How often should patients with severe heart failure weigh themselves? *CIRCLE ONE.*

A. Every week B. Now and then C. Every day

2. Why is it important for patients with heart failure weigh themselves regularly? *CIRCLE ONE.*

A. Because many patients with heart failure heave poor appetite

B. To check whether their body is retaining fluid

C. To assess the right dose of medicines

3. How much fluid are you allowed to take at home each day? *CIRCLE ONE.*

A. 2 quarts or 8 cups at the most B. As little fluid as possible C. As much fluid as possible

4. Which of these statements is true? *CIRCLE ONE.*

A. When I cough a lot, it is better not to take my heart failure medication.

B. When I am feeling better, I can stop taking my medication for heart failure.

C. It is important that I take my heart failure medication regularly.

5. What is the best thing to do in case of increased shortness of breath or swollen legs? *CIRCLE ONE.*

A. Call the doctor or nurse B. Wait until the next check-up C. Take less medication

6. What can cause a rapid worsening of heart failure symptoms? *CIRCLE ONE.*

A. A high-fat diet B. A cold or the flu C. Lack of exercise

7. What does heart failure mean? *CIRCLE ONE.*

A. That the heart is unable to pump enough blood around the body.

B. That someone is not getting enough exercise and is in poor condition.

C. That there is a blood clot in the blood vessels of the heart.

8. Why can the legs swell up when you have heart failure? *CIRCLE ONE.*

A. Because the valves in the blood vessels in the legs do not function properly

B. Because the muscles in the legs are not getting enough oxygen

C. Because of accumulation of fluid in the legs

9. What is the function of the heart? *CIRCLE ONE.*

A. To absorb nutrients from the blood

B. To pump blood around the body

C. To provide the blood with oxygen

10. What should someone with heart failure follow a low salt diet? *CIRCLE ONE.*

A. Salt promotes fluid retention

B. Salt causes constriction of the blood vessels

C. Salt increases the heart rate

11. What are the main causes of heart failure? *CIRCLE ONE.*

A. A myocardial infarction and high blood pressure

B. Lung problems and allergy

C. Obesity and diabetes

12. Which statement about exercise for people with heart failure is true? *CIRCLE ONE.*

A. It is important to exercise as little as possible at home in order to relieve the heart

B. It is important to exercise at home and to rest regularly in between

C. It is important to exercise as much as possible at home

13. Why are water pills prescribed to someone with heart failure? *CIRCLE ONE.*

A. To lower the blood pressure

B. To prevent fluid retention in the body

C. Because then they can drink more

14. Which statement about weight increase and heart failure is true? *CIRCLE ONE.*

A. An increase of over 5 pounds in 2 or 3 days should be reported to the doctor at the next checkup.

B. In case of an increase of over 5 pounds in 2 or 3 days, you should contact your doctor or nurse.

C. In case of an increase of over 5 pounds in 2 or 3 days, you should eat less.

15. What is the best thing to do when you are thirsty? *CIRCLE ONE.*

A. Suck an ice cube

B. Suck a lozenge

C. Drink a lot

New York Heart Association Class (NYHAC)

Put (X) in front of the statement that best describes the way your heart condition affects your daily physical activities.	
	No limitation of physical activity. Ordinary physical activity does not cause undue fatigue, palpitation, or dyspnea (shortness of breath).
	Slight limitation of physical activity. Comfortable at rest, but ordinary physical activity results in fatigue, palpitation, or dyspnea.
	Marked limitation of physical activity. Comfortable at rest, but less than ordinary activity causes fatigue, palpitation, or dyspnea.
	Unable to carry out any physical activity without discomfort. Symptoms of cardiac insufficiency at rest. If any physical activity is undertaken, discomfort is increased.

Sociodemographic and Clinical Characteristics Questionnaire

A. What is your sex?

___ Male ____ Female

B. What is your race? **Put (X)** in front of your answer:

___ White

___ Black or African American

___ American Indian or Alaska Native

___ Asian

___ Other

C. What is your age? _____ years

D. When were you diagnosed with heart failure?

_____/_____/_____ (mm/dd/year)

E. Do you have any other illnesses? **Put (X)** in front of your answer:

___ Yes ___ No

If Yes, LIST:

_____

_____

F. Are you employed? **Put (X)** in front of your answer:

___ Yes ___ No

If Yes,

___Part Time ___Full Time

G. What is the total yearly income for your household? **Put (X)** in front of your answer:

___ 0 to $20,000

___ $20,001 to $40,000

___ $40,001 to $60,000

___ $60,001 to 80,000

___ $80,001 or more

H. What is the highest level of education you received? **Put (X)** in front of your answer:

___ Did not complete high school

___ High school diploma

___ Vocational or some college

___ College degree

I. How many people live in your household? _____

J. Have you ever hospitalized as a result of heart failure or its complications? **Put (X)** in front of your answer:

___ Yes ___ No

If Yes,

How many times have you been hospitalized as a result of heart failure or its complications? _____

APPENDIX C

Study Approvals

FROM:	The University of Louisville Institutional Review Board
IRB#:	15.1027
STUDY TITLE:	**Factors Associated with Self-care Behavior in Persons with Heart Failure**
REFERENCE #:	473300
DATE OF REVIEW:	02/01/2016
IRB STAFF CONTACT:	Name: Jacqueline S. Powell, CIP Phone: 852-4101 Email: jspowe01@Louisville.edu

This study was reviewed on 02/01/2016 and determined by a designated member of the Institutional Review Board that the study is exempt according to 45 CFR 46.101(b) under category 2: Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:

(i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and

(ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

This study was also approved through 45 CFR 46.117(c), which means that an IRB may waive the requirement for the investigator to obtain a signed informed consent form for some or all subjects if it finds either:

•That the only record linking the subject and the research would be the consent document and the principal risk would be potential harm resulting from a breach of confidentiality. Each subject will be asked whether the subject wants documentation linking the subject with the research, and the subject's wishes will govern; or

•That the research presents no more than minimal risk of harm to subjects and involves no procedures for which written consent is normally required outside of the research context.

Documents/Attachments reviewed and approved:

Submission Components			
Approval Letter from study site	Version 1.0	01/28/2016	Approved
Recruitment Flyer	Version 1.0	01/28/2016	Approved
Study Kit - Preamble and questionnaire	Version 1.1	01/28/2016	Approved
Proposal	Version 1.1	01/28/2016	Approved
Preamble Letter	Version 1.0	01/11/2016	Approved

Please be advised that any study documents submitted with this protocol should be used in the form in which they were approved. Since this study is Exempt, the documents do not contain the IRB approval stamp.

Since this study has been approved under the exempt category indicated above, no additional reporting, such as submission of Progress Reports for continuation reviews, is needed. If your research focus or activities change, please submit an Amendment to the IRB for review to ensure that the indicated exempt category still applies. Best wishes for a successful study. Please send all inquiries to our office email address at hsppofc@louisville.edu Thank you for your submission.

Sincerely,

S. Lee Ridner, PhD

Social/Behavioral/Education Institutional Review Board Member

SLR/isp

February 26, 2016

Lynne Hall
University of Louisville
School of Nursing
555 S. Floyd St.
Louisville, KY 40292

NHORA#16-N0038 / IRB# 15.1027/ Factors Associated with Self-care Behavior in Persons with Heart Failure

Dear PI:

The Norton Healthcare Office of Research Administration (NHORA) is pleased to notify you that your application to conduct the above-mentioned research study in the following Norton Healthcare (NHC) facility has been approved.

- **Norton Heart Failure Clinic**

Please note: NHORA approval reflects permission to conduct the study within a Norton Healthcare facility from a regulatory and contractual perspective, and is independent of approval by the sponsor for initiation of the study. The sponsor or site may have additional requirements to address before the study can begin.

Research billing procedures are still applicable to exempt research if there is any billing involved. If applicable, the Research Patient ID form must be submitted to NHORA Billing daily with reportable activity. Please email the form to NHORABilling@nortonhealthcare.org. Please contact Regina Schaefer at 502-629-3560 for specific instructions regarding the notification of your subject enrollment at NHC.

Please also notify the NHORA if the exempt status of your study changes.

We look forward to the successful completion of your study. If you have any further questions or need assistance, please contact the NHORA at 502-629-3501.

Please let us know how we are doing. Follow the link https://www.surveymonkey.com/s/NHORAsatisfaction to complete the NHORA Satisfaction Survey in less than two minutes. Your feedback helps NHORA improve the services we provide and meet the needs of the research community.

Sincerely,

Rhonda Hoffman

System Director Research

CURRICULUM VITA

Mohammed Al-Hammouri, MA, RN, PhD Candidate
7813 Oxted Lane
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Phone: (502) 852-4562
Fax: (502) 852-0704
mmalha01@louisville.edu

A. Education

August, 2011-present PhD student and Graduate Assistant, Nursing School University of Louisville.
2008-2011 Master's Degree in Psychology, Behavior Analysis Track, West Virginia University.
2002-2006 B.Sc. Degree in Nursing, Jordan University of Science & Technology.
1998-2002 B.Sc. Degree in Agriculture, Jordan University of Science & Technology.

B. Academic Appointments

2011-present Graduate Research Assistant, School of Nursing, University of Louisville, August
September 2006-August 2008 Clinical Instructor, Jordan University of Science and Technology; nursing faculty in both laboratory and hospital settings.

C. Other Employment

Behavioral Therapist, Center of Excellence in Disabilities at West Virginia University, August 2010- May 2011; used scientifically based treatment to improve the quality of life of children with Autism.
Clinical Coordinator, King Hussien Cancer Center, March 2006-September 2006; responsible for coordinating treatment, follow-up, and support for cancer patient.

D. National Board Certification(s) and state RN Licensure(s)

Jordanian Board of Nursing, March 2006

E. Teaching

Introduction to Nursing Clinical
Adult Health Nursing Clinical
Nursing Health Assessment Clinical
Advanced Adult Health Nursing Clinical
Clinical Training

F. Presentations

Holtyn A.F., Cancado C., Al-Hammouri M. M., & Perone M. (2009, March)**.** *Developing a Practical and Effective Method of Human Operant Reinforcement: A Preliminary Investigation*. Poster presented at the meeting of the Southeastern Association for Behavior Analysis, Asheville, NC.

Al-Hammouri, M. M., & Hall, L. A. (2013, February). *A Critical Review of the State of Measurement of Impulsivity*. Poster presented at the 27th Annual Conference of the Southern Nursing Research Society, Little Rock, AR.

Al-Hammouri, M. M. (2013, February). *Measuring Self-care Behavior in Patients with Heart Failure: A Critical Review*. Poster presented at the 29th Annual Conference of the Southern Nursing Research Society, Tampa, FL.

G. Professional Memberships and Activities

Jordan Nurses and Midwives Council
Iota Zeta Chapter of STTI
Southern Nursing Research Society