IS HUMOR GOOD FOR YOUR HEALTH? EXAMINING THE ASSOCIATIONS OF HOSTILITY AND HUMOR STYLES TO RESTING BLOOD PRESSURE

A Thesis Submitted to the College of

Graduate Studies and Research

In Partial Fulfillment of the Requirements

For the Degree of Master of Arts

In the Department of Psychology

University of Saskatchewan

Saskatoon

By

Darryl James Quinlan

PERMISSION TO USE

In presenting this thesis in partial fulfillment of the requirements for a Postgraduate degree from the University of Saskatchewan, I agree that the Libraries of this University may make it freely available for inspection. I further agree that permission for copying of this thesis in any manner, in whole or in part, for scholarly purposes may be granted by the professor or professors who supervised my thesis work or, in their absence, by the Head of the Department or the Dean of the College in which my thesis work was done. It is understood that any copying or publication or use of this thesis or parts thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to the University of Saskatchewan in any scholarly use which may be made of any material in my thesis.

DISCLAIMER

Reference in this thesis to any specific commercial products, process, or service by trade name, trademark, manufacturer, or otherwise, does not constitute or imply its endorsement, recommendation, or favoring by the University of Saskatchewan. The views and opinions of the author expressed herein do not state or reflect those of the University of Saskatchewan, and shall not be used for advertising or product endorsement purposes.

Requests for permission to copy or to make other uses of materials in this thesis in whole or part should be addressed to:

Head of the Department of Psychology
University of Saskatchewan
Saskatoon, Saskatchewan S7N 5A5
Canada

OR

Dean
College of Graduate Studies and Research
University of Saskatchewan
107 Administration Place
Saskatoon, Saskatchewan S7N 5A2
Canada

ABSTRACT

Researchers have examined psychosocial risk variables (e.g., hostility) related to high resting blood pressure (BP), with the majority of findings suggesting that hostility is associated with increased resting BP. Additionally, it has been proposed that constructive verbal anger expression is a protective factor for hypertension (Davidson, MacGregor, Stuhr, Dixon, & MacLean, 2000; Davidson, MacGregor, Stuhr, & Gidron, 1999), while others have hypothesized that humor promotes physical health (i.e., the humor-health hypothesis) (Martin, Puhlik-Doris, Larsen, Gray, & Weir, 2003; McClelland & Cheriff, 1997). The primary purpose of the present study is to examine the relations between hostility, humor styles, constructive verbal anger, and resting BP, with an emphasis on the humor-health hypothesis.

One hundred and ninety nine undergraduate university participants had six resting blood pressure measurements taken at three-minute intervals. Participants then completed the following questionnaires online in a randomized order: Cook-Medley Hostility Scale (CMH), Constructive Anger Behaviour-Verbal Scale (CAV), Humor Styles Questionnaire (HSQ), and a health and demographic questionnaire.

A series of hierarchical regressions were conducted to test the hypotheses with resting systolic BP (SBP) and resting diastolic BP (DBP). Two health and demographic variables, age and body mass index (BMI), were entered into step 1 of all the regressions analyzed as covariates. In step 2 of each regression model, the respective psychosocial variables were independently entered. Comparisons were conducted between the various psychosocial variables entered into step 2 to determine which variable accounts for the most unique variance in resting SBP and DBP.

Small to moderate positive correlations were observed between age and resting BP, as well as BMI and resting BP. Regarding psychosocial variables, small positive correlations were observed between affiliative humor and resting SBP, and between self-enhancing humor and resting BP. Multiple regression analyses revealed that after controlling for age and BMI, adaptive humor styles uniquely predicted higher resting SBP, while no psychosocial variables predicted resting DBP. The present investigation provides evidence suggesting that psychosocial risk factors are not associated with resting BP while also contradicting the humor-health hypothesis, suggesting that adaptive humor is associated with increased resting BP.

ACKNOWLEDGEMENTS

I would sincerely like to thank everyone who made my thesis possible. Dr. Mark Olver's interest in my success combined with his insight and assistance have been instrumental in making this possible. I would like to thank my thesis committee, Dr. Jorden Cummings and Dr. Lachlan McWilliams for their continued guidance and support that helped me refine this document. I would like to thank Dr. Michael MacGregor for his assistance in starting and refining this research project and for the use of his laboratory space and equipment. Thanks to the Psychology Department at the University of Saskatchewan for providing the financial means to complete this project.

I owe thanks to Thomas Qiao for generously providing his time to assist with data collection and data entry. Jessica Campoli and Craig Moore also deserve recognition for reviewing and enhancing portions of this document and for their encouragement throughout the process of completing this thesis. Finally, I would like to express my deepest appreciations to Amber Quinlan, my parents, and my grandmother, for their ongoing support and commitment to helping me throughout my undergraduate and graduate education. Their generosity, encouragement, and belief in me have allowed me to pursue all of my interests and dreams. Their efforts will never be taken for granted or forgotten, and I hope that I am contributing likewise to their lives. To all my family and friends, thank you for sharing your joy and hope with me; you have inspired me to persevere through life's most difficult moments.

TABLE OF CONTENTS

LIST OF TABLES

Table Number page number

LIST OF ACRONYMS

Acronym page number

LIST OF APPENDICES

Chapter 1: INTRODUCTION

High blood pressure (i.e., hypertension) is a significant national and global health concern because of its high prevalence and substantial economic consequences. In particular, it is estimated that approximately 19% of Canadians (Wilkins et al., 2010) and globally, one billion people have the condition (World Health Organization [WHO], 2013). Even more concerning is the strong evidence indicating that the prevalence of hypertension is growing worldwide (Cutler et al., 2008; WHO, 2013). Further highlighting the significant impact of hypertension nationally and globally, the direct costs of hypertension in Canada are estimated to be $2.4 billion dollars annually (Patra et al., 2007). Furthermore, the global direct healthcare costs from hypertension in 2001 were approximately $372 billion dollars, which represented approximately 10% of all global healthcare expenditures (Gaziano, Bitton, Anand, & Weinstein, 2009). Despite greater awareness of hypertension in middle and high-income countries, it is estimated that over a 10-year time span, direct costs of hypertension worldwide will be approximately USD $1 trillion per year with indirect global costs approaching $3.6 trillion annually (Gaziano et al., 2009). For these reasons and others, the WHO (2013) has explicitly stated the dire need to invest in preventing and reducing the risk factors for hypertension. One step in attempting to accomplish this imperative task set forth by the WHO is that of gaining a better understanding of psychosocial factors affecting resting blood pressure (BP). It is therefore necessary to examine the influence of psychosocial risk factors (e.g., hostility and maladaptive humor[1] styles) and potential protective factors (e.g., constructive verbal anger and adaptive humor styles) for high blood pressure (BP), which is the purpose of the present study.

1.1 Blood Pressure and Hypertension

Prior to discussing the psychosocial variables literature, an explanation of BP and hypertension is warranted. Blood pressure is described as "…the pressure exerted by the circulating volume of blood on the walls of the arteries and veins and on the chambers of the heart" (Mosby, 2013, p.222). The first of two numbers communicated is systolic blood pressure (SBP), which is the pressure exerted on the arteries, veins, and chambers of the heart when the heart contracts. The second number communicated is diastolic blood pressure (DBP), which is

[1] To be consistent with the Humor Style Questionnaire's spelling of humor, the American English spelling of humor will be used throughout the present investigation.

the pressure in the arteries, veins and chambers of the heart when the heart rests. Optimal SBP for adults over the age of 18 is at or under 120 millimeters of mercury (mm Hg), and optimal DBP is at or under 80 mm Hg. As BP increases, the more the heart must contract to circulate blood throughout the arteries and veins (WHO, 2013), and researchers have established that *moderate* elevations in BP lead to greater risk for hypertension (Franco, Peeters, Bonneux, & de Laet, 2005; Kannel, Vasan, & Levy, 2003). However, even minimal elevations in BP (e.g., SBP/DBP in between 120-129/80-84 mm Hg) have been shown to significantly increase risk of developing hypertension, by as much as 40% (Kannel et al., 2003; Wright, Gregoski, Tingen, Barnes, & Treiber, 2011).

Hypertension is defined as a medical condition involving chronic elevation of resting SBP ≥ 140 mm Hg and/or DBP ≥ 90 mm Hg (Jorgensen, Johnson, Kolodziej, & Schreer, 1996). Researchers have developed various nomenclatures for describing elevated BP conditions. For example, the American Heart Association has developed a three level classification system (i.e., prehypertension, stage 1, and stage 2) for hypertension in order to prevent and detect heart disease early (Chobanian et al., 2003).

The present investigation's focus is on any elevated blood pressure in general; there is no focus on the stages listed above, given the anticipated sample characteristics (e.g., young, active, generally healthy). This classification system is important to describe because they are useful for determining which treatment modalities would be most effective for a hypertensive individual and what risk an individual might have of developing hypertension. Currently, when a person is diagnosed with hypertension, regardless of how hypertensive the person is, medical professionals and researchers use either primary (essential) hypertension or secondary hypertension to describe the hypertension and its cause(s).

Primary hypertension is diagnosed in situations where an individual has no known biomedical cause and this is the diagnosis for approximately 90% of all diagnosed cases of hypertension (Jorgensen et al., 1996). This large percentage of primary hypertension cases has resulted in some researchers examining psychological reasons to account for primary hypertension and efforts have focused primarily on hostility and anger (Rutledge & Hogan, 2002). Secondary hypertension denotes hypertension cases that have some underlying biomedical cause and these biomedical causes are commonly referred to as traditional risk factors for hypertension. The present investigation is focused on understanding more about

possible psychological factors associated with primary hypertension. A brief discussion of the traditional risk factors for hypertension is warranted before reviewing the psychosocial variable literature.

1.2 Traditional Risk Factors for Hypertension

Despite the significant number of primary hypertension cases, the majority of medical research in North America has focused on secondary hypertension and its respective traditional risk factors. In the literature, these traditional risk factors are often categorized as either modifiable (or behavioral) or non-modifiable causes (WHO, 2013). The primary modifiable causes of hypertension include diet (Pereira et al., 1999; Selem, de Castro, Cesar, Marchioni, & Fisberg, 2014), exercise (Hagberg, Park, & Brown, 2000; Parker, Schmitz, Jacobs, Dengel, & Schreiner, 2007), weight gain (Vasan, Larsen, Leip, Kannel, & Levy, 2001), obesity (Gelber, Gaziano, Manson, Buring, & Sesso, 2007) excessive alcohol intake (Sesso, Cook, Buring, Manson, & Gaziano, 2008), and tobacco use (Chobanian et al., 2003).

Diets rich in fruits, vegetables, low-fat dairy, and reduced fat can significantly lower BP (Appel et al., 1997) and even reduce the typical BP increases associated with the aging process (Dauchet et al., 2007). Greater physical activity is also associated with reductions in BP and reduced chances of hypertension development (Hagberg et al., 2000; Parker et al., 2007; Pereira et al., 1999), while inactivity is associated with increased risk for hypertension (Chobanian et al., 2003). In addition, alcohol intake moderation has been found to effectively lower BP (Chobanian, 2009). It is well known that men and women's body mass index (BMI) is strongly associated with hypertension with risk increasing for higher BMI (Gelber et al., 2007; Huang et al., 1998). Finally, there are many medical conditions that are considered hypertension risk factors, such as diabetes mellitus and chronic kidney disease (Chobanian et al., 2003). The review of these medical studies highlights that many modifiable physical variables impact the risk of hypertension development across adulthood and ethnicities, and this leads to the question, are there a similar number of psychosocial variables influencing hypertension development?

Amongst university samples in particular, researchers have theorized and consistently found that standard coronary heart disease risk factors, such as sex, age, BMI, alcohol and cigarette use, exercise, and parental hypertension status are significant predictors of increased resting BP (Davidson, Hall, & MacGregor, 1996; Hill, Kobayashi, & Hughes, 2007; Okasha, McCarron, McEwan, & Smith, 2000; Uehara et al., 1998). Naturally, lifestyle risk factors are

often the primary focus of health research and policies aimed at reducing prevalence rates of hypertension because they are amenable to change. Although many researchers (e.g., Chobanian et al., 2003; Dauchet et al., 2007; Gelber et al., 2007; Parker et al., 2007) have examined the traditional physical risk factors for developing hypertension, research on the relations between psychological factors, BP, and hypertension, have received much less attention in medicine and thus the onus seems to have fallen to psychologists to examine such associations. The two most commonly researched hypertension risk factors are hostility and anger (Chida & Steptoe, 2009), followed by anxiety and depression which have tended to be comparatively weaker predictors (Rutledge & Hogan, 2002). Since Alexander (1939) advanced his early hostility suppression theory more than 75 years ago, clinical health psychology researchers have examined the relations between various states of BP (resting, reactive, recovery), hostility, and trait anger.

Chapter 2: LITERATURE REVIEW

2.1 Hostility

2.1.1 A survey of empirical hostility-BP research. There is little agreement in the field about the conceptual definition of hostility given its multidimensional nature (Smith, 1992). A frequently used and helpful framework for understanding and differentiating between hostility, anger, and aggression is the cognitive/attitudinal, affective/emotional, and behavioural framework proposed and used by various researchers (Chida & Steptoe, 2009; Haukkala, Konttinen, Laatikainen, Kawachi, & Uutela, 2010; Smith, 1992; Spielberger et al., 1985). Within this framework, hostility is considered the cognitive/attitudinal component, whereas anger and aggression are respectively considered the affective/emotional and behavioural component. I will be working from this framework when discussing hostility and constructive anger. Hostility will also be operationalized as a stable personality trait that involves negative attitudes towards others, a wish to inflict harm on others, and hostile attributions (Cook & Medley, 1954; Linden et al., 2003; Smith, 1992).

Hostility is a significant predictor of BP and is associated with increases in BP and hypertension development across adulthood. Fredrickson et al. (2000) examined hostility, anger, and cardiovascular responses in 66 older community adults and found that high hostile participants displayed greater SBP and DBP reactivity during anger experiences as well as longer-lasting DBP responses post anger experiences. They also found that hostility predicted the magnitude and duration of BP responses to anger. These findings suggest that hostility has a

robust predictive quality concerning BP. Some researchers have found an association exclusively between hostility and SBP or exclusively between hostility and DBP. For example, in a meta-analysis of hostility and BP, Suls and Wan (1993) found hostility to be a predictor of DBP when controlling for laboratory stressors (e.g., cold presser task, mental arithmetic, the Structured Interview). A subsequent recent meta-analysis also found hostility to predict hypertension (Rutledge & Hogan, 2002). Miller, Smith, Turner, Guijarro, and Hallet (1996), in turn, examined the relations between hostility and cardiovascular responses in 69 male undergraduate men; high hostility participants who were in an interpersonal harassment intervention group had significantly higher SBP than the participants in other groups. This study's findings are important because they suggest that particular stressors (i.e., interpersonal) are more likely to elicit BP reactions than other types of stressors (e.g., mental arithmetic, cold-presser task). Mente and Helmers (1999) further studied associations between hostility and cardiovascular reactivity in 46 young men and found that high-hostile participants had higher resting SBP compared to the other participants.

In a much larger scale study, Vella, Kamarck, and Shiffman (2008) examined hostility and its role in moderating the positive effects of social interactions (e.g., intimacy ratings, instrumental support ratings) on BP in 341 healthy older adults. They found that hostility predicted DBP and those participants who scored high on hostility exhibited significant increases in DBP during social interactions. Other researchers have found certain components of hostility, namely hostility suppression, defensive hostility, and cynical hostility, to be related to BP and hypertension. Researchers examining hostility suppression, family history of hypertension, and cardiovascular reactivity in a university sample found DBP reactivity to be positively associated with hostility suppression (Jorgensen & Houston, 1988). Moreover, they found that parental history of hypertension moderated the relation between hostility suppression and SBP reactivity, being one of the first to suggest that hostility may have more than just a direct effect on BP. Similar results have been found in more recent studies. Researchers examined the prospective relations between hostility, suppression, and hypertension in 627 men longitudinally and found that hostility suppression significantly predicted hypertension with participants aged 60 years or less (Zhang et al., 2005). The Zhang et al. (2005) study is particularly significant given that: 1) it is one of the first longitudinal studies to examine hostility and suppression in relation to hypertension; 2) it is one of the largest studies in the literature; 3) it suggests a strong relation

between hostility suppression and hypertension amongst older and younger males; and 4) because it provides evidence for the hostility suppression hypothesis.

More recently, Guerrero and Palmero (2010) examined the relations between hostility, defensiveness, and cardiovascular reactivity in a sample of 130 female university students and found hostility to be positively associated with resting, reactive, and recovery BP. This study is particularly important and unique because the findings support the relation between hostility and all states of BP with an all-female sample. Although the hostility research findings reviewed are not entirely consistent, this body of research suggests that hostility is a predictor of BP and is associated with hypertension. These findings notwithstanding, the magnitude of, and the mechanisms underlying, the hostility-resting BP link is poorly understood and merits further research.

It is also important to bear in mind that many studies have failed to find a substantive relationship between hostility and BP; this is common in studies targeting variables often excluded in previously reviewed studies and have generally not been replicated. In a recent study, Versey and Kaplan (2012) examined the relation between hostility and resting BP as well as the role of abdominal obesity in low-income mothers transitioning from welfare to work. Although they found that hostility was positively correlated with SBP, this association was no longer significant when they factored in the waist-to-hip ratio of participants. In addition, the significant finding before the inclusion of the waist-to-hip ratio was found only amongst female participants with a high waist-to-hip ratio. This study highlights the importance of including more than traditional hypertension risk factors in analyses, although the study's generalizability is somewhat limited due to the sample's characteristics (e.g., low-income, high waist-to-hip ratio, mothers). Moreover, Trevino and Ernst (2012) examined hostility, racism, locus of control and skin tone, in relation to BP and found that all relations with BP were non-significant.

These two recent studies (Versey & Kaplan, 2012; Trevino & Ernst, 2012) would suggest that hostility is not associated with increased BP, seemingly in contradiction to earlier findings. One explanation for these non-significant findings could lie with the addition of variables (e.g., weight, BMI, waist-to-hip ratio) which were not included in previous hostility and BP studies. With additional variables being included in analyses, the magnitude or significance of hostility as a predictor may have been reduced. Another explanation could be the samples' characteristics; these two studies had samples that were quite different from the majority of the samples within

the literature (i.e., all male, predominantly White). Based on these recent findings it is apparent that researchers need to conduct more nuanced research with more heterogeneous samples.

Although the reviewed research findings are not unequivocal, the general trend within the literature is that hostility is positively associated with and predictive of BP, meaning higher scores on hostility measures are associated with higher resting, reactive, and recovery BP (Fredrickson et al., 2000; Guerero & Palmero, 2010; Mente & Helmers, 1999; Vella et al., 2008). Based on this trend, it is expected that hostility will be positively correlated with and predictive of resting BP.

2.1.2 Limitations of existing hostility-BP research. There are some limitations within the literature that merit discussion and attention, however. First, the overwhelming majority of studies in the literature use male only samples (e.g., Miller et al., 1996; Mente & Helmers, 1999; Rutledge & Hogan, 2002; Zhang et al., 2005). This obviously restricts the generalizability of the studies' results to males, as only a small proportion of studies include females in their sample. A second limitation is the trend of poor hostility conceptualization; a methodological problem that is only exacerbated by many researchers using anger and hostility interchangeably (Quinn, Rollock, & Vrana, 2014). These are conceptual and methodological issues that require redress for they lead to difficulties interpreting results and raise concerns about whether hostility researchers are making valid conclusions; counter arguments justifying these approaches are based on measures they claim to assess their understanding of the construct of hostility. A third limitation that convolutes hostility research is that approximately 63 different measures of hostility existed in 1996 (Miller et al., 1996), with a high probability of even more measures being developed since that time! This large diversity of hostility measures further contributes to the complexity and inconsistency found in hostility and cardiovascular health research findings (Haukkala et al., 2010; Smith, 1992) as each measure potentially assesses different components of hostility and to varying degrees.

A fourth and final limitation is that there are concerns about the number of BP readings taken during the procedure of studies, which impacts the reliability of BP measurement. It is common for some researchers to include only one or two BP readings for calculating participants' average BP (see Suls, Wan, & Costa, 1995). Assuming that one BP reading or the mean of two BP readings are representative of a participant's average resting BP is not an accurate assumption nor is it good practice in research. Best practice in BP research for

calculating mean resting BP is to include at least three to four BP readings. In addition, some researchers (e.g., Haukkala et al., 2010) have used the first BP reading taken to calculate the average BP used in their analyses. Using the first BP reading in calculating mean BP is a significant problem because it is well known that the first BP reading measured is often inaccurate, usually artificially elevated, and is generally excluded from the calculation of mean resting BP in research (Hackam et al., 2013; Oshtega et al., 2012; Quinn et al., 2010). In the present study, the first BP reading was excluded from calculating mean resting BP while the five remaining BP measurements were then averaged to calculated mean resting BP.

2.1.3 Models of hostility and linkages to BP. The majority of empirical studies examining hostility and BP have used the Cook-Medley Hostility Scale (CMH) (Liehr et al., 2000; Wright et al., 2011). To be consistent with previous research using this measure and to facilitate comparisons with existing findings, the CMH was used in the present study.

There are multiple hypothetical models that attempt to explain the underlying mechanisms between hostility and BP. The following models are not examined, due to the complexity and length of the present proposal, but are offered for the reader to have a more thorough understanding of the relations between hostility and BP. One of the more popular hypotheses is referred to as the hyper-reactivity hypothesis or psychophysiological reactivity model (Williams, Barefoot, & Shekelle, 1985). This model proposes that hostility contributes to cardiovascular disease (including hypertension) through their relations with recurrent exaggerated cardiovascular (e.g., BP, heart rate) reactivity that increases resting BP levels over time (Rutledge & Hogan, 2002). This means that when a hostile individual responds to a stressor, they are going to have larger increases in BP (i.e., BP reactivity) and other cardiovascular measurements. This model also suggests that hostile individuals are more prone to experiences of anger, and are likely more vigilant in scanning their environment for mistreatment relative to others. These two factors, frequent anger experiences and vigilance for mistreatment, also contribute to heightened psychophysiological reactivity. Although results from empirical studies testing this model have been somewhat inconsistent (Davis, Matthews, & McGrath, 2000; McCann & Matthews, 1988; Neumann, Waldstein, Sollers, Thayer, & Sorkin, 2004; Smith, 1992), some researchers have recently found support for this model in more methodologically stringent studies (Guerrero & Palmero, 2010; Holt-Lunstad, Smith, & Uchino, 2008).

The psychosocial vulnerability model is another mechanism that could possibly explain

the association between hostility and BP. This model states that hostile individuals may experience less social support that culminates in vulnerability to illnesses such as hypertension (Smith & Frohm, 1985). Researchers have found support for this model in various empirical studies, finding that high CMH scores are related to low or absent levels of social support (Angerer et al., 2000; Scherwitz, Perkins, Chesney, & Hughes, 1991; Smith & Frohm, 1985). Extending this model, some researchers have concluded that hostility may interfere with the normal health benefits (e.g., decreased stress, lower BP) that result from support transactions (i.e., receiving help or providing help) during stress (Holt-Lunstad et al., 2008).

Another model is the health behavior model which posits that hostile individuals are at greater risk for developing cardiovascular disease (including hypertension) due to poor health habits (Leiker & Hailey, 1988). There is substantial empirical support for this model as researchers have found associations between high CMH scores and less physical exercise, less self-care (Leiker & Hailey, 1988), greater alcohol use (Houston & Vavak, 1991; Koskenvuo et al., 1988; Shekelle, Gale, Ostfeld, & Oglesby, 1983), smoking (Koskenvuo et al., 1988; Siegler, Peterson, Barefoot, & Williams, 1992) and higher BMI (Houston & Vavak, 1991; Siegler et al., 1992). One limitation of studies examining this model is that they are descriptive and require further explanation of the association between hostility and health habits (Smith, 1992). Essentially, these studies reveal that health habits are mediators of the relation between hostility and BP leaving much to be explored between hostility, poor health habits, and resting BP. Moreover, these studies leave the underlying and direct mechanism(s) between hostility and BP relatively unexplored.

Therefore despite some empirical support and general acceptance in the literature of these various models, the mechanisms that link hostility and BP remain poorly understood (Gerin, Davidson, Christenfeld, Goyal, & Schwartz, 2006). Additional research on the direct and indirect relations between hostility and resting BP is needed. In the present study I explore the direct relations between hostility and resting BP within the context of other psychosocial factors associated with, and hypothesized to be associated with, resting BP. In addition, given the aforementioned methodological issues found within much of this literature, I have endeavored to use more rigorous methodology as follows: obtaining six resting BP measurements, exclusion of the first BP reading in mean calculations, having a sample comprised of males and females, and the acknowledgment that hostility is a multidimensional construct. Much of the literature

examining psychosocial factors related to BP, however, has focused on harmful psychosocial aspects in relation to BP and ignored protective or beneficial psychosocial constructs.

2.2 Constructive Verbal Anger

Seligman's observations about psychology research in the 20th century mostly focusing on psychopathology and rarely addressing components related to psychological flourishing was particularly descriptive of the psychology literature examining hostility and BP. Seligman's APA presidential address in 1998 officially inaugurated the positive psychology movement (Christopher, Richardson, & Slife, 2008). Another impetus for researchers to begin theorizing and examining protective factors for hypertension were the gaps and inconsistencies in the research literature regarding the relation between anger expression and BP, with some researchers proposing that there is a negative relation between constructive verbal anger expression and BP (Gidron, Davidson & Bata, 1999; Stoney & Engebretson, 1994).

As anger is a multidimensional construct, in the present research I chose to focus on one dimension of anger expression: constructive verbal anger. Constructive verbal anger is defined as a goal-oriented and problem-solving style of discussing anger (Davidson et al., 2000; Davidson et al., 1999). Constructive verbal anger is not only a predictor of resting BP but also a protective factor for hypertension. For example, in a patient sample with hypertension, decreases in hostility predicted increases in constructive verbal anger, which subsequently predicted clinically significant decreases in resting BP (Davidson et al., 1999). They also found that increases in Constructive Anger Behaviour-Verbal Scale (CAV) scores predicted decreases in resting DBP from post-treatment to follow-up, but not in resting SBP (Davidson et al., 1999). In a large population based sample, Davidson et al. (2000) found constructive verbal anger to be a significant predictor of lower resting BP when controlling for physical and psychosocial risk factors, and it remained significant after excluding participants with hypertension It is apparent from these two studies that constructive verbal anger is a predictor of resting BP and that these relations persist amongst individuals without hypertension. The reasons that CAV scores are related to lower resting BP remains to be explored, but some preliminary explanations have been proposed.

2.2.1 Limitations of existing constructive verbal anger-BP research. Despite the promising results found by Davidson and colleagues (1999, 2000) in these two studies, there are some noteworthy limitations regarding their research. First, no additional research has been

published in regards to constructive verbal anger and BP. As such, there is a paucity of research in this domain simply because no replications have been published. Second, regarding Davidson et al.'s (1999) study, there was an unequal amount of therapist time spent with the intervention patients versus control patients (i.e., significantly more time was spent with intervention patients), which may account for some of the significant findings. Third, they used a convenience sample, which included only coronary heart disease males, which limits their findings. Despite these limitations, their research findings are still relevant and the need to replicate and extend this area research remains.

One way in which constructive verbal anger may relate to resting BP pertains to the speed of BP recovery to baseline resting BP levels. Davidson et al. (1999, 2000) proposed that the more an individual discusses anger constructively relative to other forms of anger expressions, the more likely the person is going to have successful resolutions to anger-inciting provocations. These successful resolutions subsequently decrease the overall amount of time that is spent with unresolved conflict or time exposed to these provocations, potentially leading to a more complete recovery to baseline resting BP and thereby reducing prolonged increases in resting BP levels over time (Davidson et al., 1999). Furthermore, with less time spent in unresolved conflicts, there may be social support benefits as well; prolonged periods of time with unresolved conflicts likely undermine relationship stability. In this regard, another psychosocial factor that relates to BP and social support is humor.

2.3 Humor and Humor Styles

Humor is a common daily experience; an essential phenomenon experienced in conversations, imagination, and observations by people of all cultures and ages (Wyer & Collins, 1992; McGraw & Warren, 2010). However, humor is also generally considered a stable personality trait (Erickson & Feldstein, 2007) that is socially desirable. For example, researchers have found that humor is a highly valued trait in a potential romantic partner (Bressler & Balshine, 2006) and a desirable trait in friends (Sprecher & Regan, 2002). Within positive psychology, humor is considered a positive characteristic or an adaptive strength (Seligman & Csikszentmihalyi, 2000; Seligman, Steen, Park, & Peterson, 2005). It is apparent from this literature as well that humor is a multidimensional construct.

Regarding humor's relation with wellbeing, the adage "laughter is the best medicine", is often stated in the media and the idea that humor is beneficial for one's wellbeing is a common

belief in the general population (Leist & Muller, 2013; Martin, 2002; Martin, 2004). This idea that humor is beneficial for health and wellbeing is known as the humor-health hypothesis (Martin & Lefcourt, 2004). Although there is evidence in the literature that supports the humor-health hypothesis, there is little research examining the dimensions of humor and BP. My review of the extant literature indicated there to be currently no published empirical studies that have examined humor *styles* and resting BP.

Humor styles are best defined as habitual humor related patterns (i.e., how one generally uses humor), often used for coping, that are believed to be relatively stable traits across the lifespan (Leist & Muller, 2012; Martin, Puhlik-Doris, Larsen, Gray, & Weir, 2003). At least four distinct humor styles have been proposed: affiliative, self-enhancing, aggressive, and self-defeating. Affiliative humor is the benevolent use of humor to enhance one's relationships with others (e.g., telling others a joke or saying funny things). Self-enhancing humor is the benign use of humor to enhance the self and encompasses a humorous perspective of life (e.g., to perceive a personal accident as something funny). Aggressive humor is the use of humor to enhance the self with no regard for others and the negative impact this kind of humor can have (e.g., ridiculing or disparaging other people). Finally, self-defeating humor is the use of humor to enhance one's relationships with others at the expense of oneself (e.g., telling self-disparaging jokes, or laughing along with others when being ridiculed) (Martin et al., 2003). Researchers have grouped humor styles into adaptive or maladaptive humor styles based on their proposed and verified relations with psychosocial wellbeing and health (see Martin et al., 2003). Affiliative and self-enhancing humor styles are considered adaptive, due to their hypothesized and confirmed relations with psychosocial wellbeing and health (Dyck & Holtzman, 2013; Leist & Muller, 2013; Martin et al., 2003). Alternatively, aggressive and self-defeating humor styles are referred to as maladaptive due to their hypothesized and verified relations with poor psychosocial adjustment and health (Erickson & Feldstein, 2007; Martin et al., 2003).

2.3.1 A survey of empirical humor-health research. Some dimensions of humor have been found associated with psychosocial wellbeing across the life span. In one recent study, Dyck and Holtzman (2013) examined the association between humor styles and psychological wellbeing in a large undergraduate sample, finding that adaptive humor styles to be associated with greater life satisfaction and fewer depressive symptoms; the opposite was found for self-defeating humor. In addition they found that adaptive humor styles were associated with greater

perceived social support. Similar results have been found in an adolescent sample. For instance, Erickson and Feldstein (2007) found that adaptive humor styles are positively correlated with personal adjustment and negatively correlated with depressive symptoms. In contrast, maladaptive humor styles evinced an opposite pattern of results. The benefits of humor have also been found in an elderly sample. For instance, Marziali, McDonald, and Donahue (2008) found humor to be positively correlated with social support and self-efficacy and negatively correlated with depression and anxiety. Likewise, in a community sample, Leist and Muller (2013) examined humor's relation to quality of life and wellbeing and found that individuals with an adaptive humor style profile (high self-enhancing humor, average affiliative, low aggressive, and low self-defeating humor) had the strongest associations with quality of life and wellbeing measures.

These studies provide evidence across the lifespan that certain dimensions of humor are beneficial for psychosocial wellbeing and health whereas others are harmful. The review of these four studies also demonstrates humor to be a multidimensional construct having both negative and positive relations with psychosocial health. It is clear that some components of humor, particularly adaptive humor styles, are related to better psychological health and provide general support for the humor-health hypothesis. However, other aspects of humor, specifically maladaptive humor styles, are related to poorer psychological health. Given the relations between humor and psychosocial wellbeing, does a similar relation exist between humor and *physical* wellbeing? Based on these findings, the broader research on humor and physical health, and the humor-health hypothesis, it is anticipated that adaptive humor styles would be negatively correlated with resting BP whereas maladaptive humor styles would be positively correlated with resting BP.

In addition to being associated with psychosocial health and wellbeing, humor is also associated with various aspects of physical wellbeing. Some researchers have found that exposure to humorous stimuli resulted in significant increases of secretory IgA, a component of the immune system (Lefcourt, Davidson-Katz, & Kueneman, 1990; McClelland & Cheriff, 1997); however, these studies lacked control groups, making it difficult to ascertain what precisely caused the increases in secretory IgA. Other researchers have examined the impact of humor on pain. Using different film conditions, pain tolerance and pain threshold have been found to be significantly higher among participants in the humor conditions (Weisenberg, Raz, &

Hener, 1998; Weisenberg, Tepper, & Schwarzwald, 1995; Zillman, Rockwell, Schweitzer, & Sundar, 1993). Therefore humor appears to provide a buffer to handle more pain, suggesting some physiological changes are occurring in sequence or as a consequence of the experience of humor. These reviewed studies provide evidence of the objective health benefits of humor, albeit limited by methodological shortcomings; but what about humor's subjective health benefits?

Perhaps not surprisingly, humor has demonstrated salutary links with individuals' subjective experiences of health and wellbeing. For example, in an elderly assisted-living sample, researchers found humor to be positively correlated with self-reports of physical health and wellbeing (Celso, Ebener, & Burkhead, 2003)**.** Their findings are particularly interesting as they support the sensitive use of humor in therapy when clients experience negative events. In a small sample of female executives, Fry (1995) studied humor and self-reports of physical symptomatology and found significant correlations suggesting that humor is positively linked to self-reports of physical health. Similar results have been found by Simon (1990), who examined multiple measures of humor, life satisfaction, and morale in adults over age 55, and found a significant positive correlation between humor and perceived physical health.

The eight studies reviewed above provide empirical support for the humor-health hypothesis. However, it should be noted that there are some methodological problems (e.g., absence of assessing neuroticism in studies using self-report health measures, lack of control groups) with many of the humor and health studies, resulting in difficulties making clear conclusions from study findings (Martin, 2001). In addition to the aforementioned studies examining humor and various health variables, there are some studies that have specifically examined humor and BP.

2.3.2 A survey of empirical humor-BP research. Humor has been postulated to be a protective factor for hypertension given its associations with lower BP levels. Lefcourt, Davidson, Prkachin, and Mills (1997) examined the role of humor as a stress moderator in relation to BP during five stressful tasks in undergraduates. In females they found a negative relation between humor and BP, such that humor was consistently associated with lower BP levels. Moreover, they found that humor had a moderator effect in males, meaning that during stressful experiences, humor lessened or diminished the negative physiological impact of stress. Svebak, Martin, and Holmen (2004) studied the relations between sense of humor and numerous health indicators (including BP) in 65,000 adult Norwegian participants. They found a significant

negative correlation between sense of humor and SBP. Even though they had a significant result they concluded that this study provides little to no support for a direct relation between sense of humor and BP. Their conclusion must be considered within the context of their measure of humor, as it only contained three items, significantly reducing the proportion of humor being measured. Despite their conclusion, their finding still adds merit to the premise that humor is related to health as a protective factor for BP and consequently hypertension.

Based on the review of these two studies it appears that humor is negatively correlated with BP (Lefcourt et al., 1997; Svebak et al., 2004). These findings are tempered, however, by the existence of a few studies that have found contradictory and non-significant results regarding humor's role as a protective factor for elevated BP (Gelkopf, Kreitler, & Sigal, 1993; Harrison, et al., 2000; Lackner et al., 2013). For instance, Lackner et al. (2013) studied cardiovascular responses to the perception of humor and found significant differences in DBP between the cartoon and control trials, suggesting an effect of the perception of humor on BP. They concluded that the more humorous something is perceived to be, the more a person's cardiac output (including BP) will increase. Their finding is not entirely incongruent with the humor-health hypothesis. Humor's effect may be similar to the effect of exercise on BP; during or immediately after a stimulus BP naturally rises, but it is temporary and the effect results in a lower resting BP baseline. Harrison et al. (2000) examined the effects of humorous, exciting, and didactic film presentations on cardiovascular autonomic activity in undergraduate participants; paradoxically, however, they found significant increases in DBP in response to the exciting and humorous films. Elsewhere, examination of the effects of a laughter intervention have also failed to find any significant differences between laughter and control groups on pre- and post-session BP readings (White & Camarena, 1989).

Although these findings appear inconsistent with the humor-health hypothesis a few important clarifications can illustrate that their relevance may be limited. First, these studies were not assessing humor as a character trait or coping style, but rather humor/laughter as a response to a humorous stimuli. Second, the state of BP that was measured was typically reactive. Also, researchers did not assess hypertensive status of participants nor consider the BP recovery rate of participants in each group. Although initial reactions to humorous stimuli result in a physiological increase, the recovery to baseline resting BP afterwards may be more rapid and may result in a relatively lower baseline. Thus, these limitations must be considered when

reviewing the humor and BP literature as a whole.

Finally, Gelkopf et al. (1993) analyzed the therapeutic effects of humor across various health domains, including BP, with a small hospitalized sample diagnosed with schizophrenia. Although they found decreases in verbal hostility and observable psychiatric symptoms, they did not find any significant effects for BP. They concluded that this non-significant finding could be due to the relative insensitivity of individuals with schizophrenia to humor. This highlights that they did not consider the effect of the participants' psychopathology on humor perception a priori, negating any chance to control for this variable. Other concerns with the design of the study include the small and unique sample. Aside from this study's specific methodological problems, there are some general methodological problems and inconsistencies within the broader humor and BP literature which requires some elaboration.

2.3.3 Limitations of existing humor-health research. A key problem with the limited available research is that there are few, if any, similarities between researchers' operationalizations of humor. Examinations of humor have focused on different components of humor, such as laughter, perception of humor (e.g., Harrison et al., 2000; Lackner et al., 2013) and sense of humor (e.g., Svebak et al., 2004), and often used different measures of humor. Another critical methodological issue in this area is that nearly all researchers have focused on humor as a unidimensional construct, at the expense of overlooking maladaptive humor assessment. Measures of humor created before the Humor Styles Questionnaire (HSQ) did not examine maladaptive or unhealthy components of humor (Kuiper & Martin, 1998; Martin, 2001). Martin et al. (2003) described how this is a significant problem within the literature, and noted that this was a major impetus for their development of the HSQ, which measures both maladaptive and adaptive components of humor.

In summary, there is empirical evidence for subjective and objective salutary benefits in accordance with the humor-health hypothesis regarding BP (Dyck & Holtzman, 2013; Erickson & Feldstein, 2007; Leist & Muller, 2013). As some components of humor (e.g., sense of humor) seem to act as protective factors for elevated BP (Lefcourt et al., 1997; Svebak et al., 2004) other components of humor (e.g., humor appreciation, laughter) may even promote elevated BP (Gelkopf et al., 1993; Harrison, et al., 2000; Lackner et al., 2013). It should be noted that the more recent studies supporting the humor-health hypothesis could be related to the use of the HSQ as the measure of humor in contrast to unidimensional measures of humor traditionally

employed in other studies (Martin et al., 2003). The use of humor measures that do not assess negative components of humor could also explain why some studies have found results contradicting the humor-health hypothesis. As previously stated, to the author's knowledge no researchers have examined humor styles and their relations to resting BP and thus an exploration into these relations is warranted.

In the present study I have sought to examine the humor-health hypothesis with a slightly more nuanced perspective of humor. As Martin et al. (2003) have described, there are harmful or maladaptive components within humor. Aligning with their perspective on humor having adaptive and maladaptive components, I propose a finer grained analysis of the humor-health hypothesis within the context of the present study. Specifically, I propose that adaptive humor styles are associated with lower, healthier, resting BP while maladaptive humor styles are related to higher, poorer, resting BP outcomes.

2.3.4 Models of humor and linkages to health. Various hypotheses have been propounded in the existing literature to explain the direct and indirect relations between humor and positive health outcomes. It has been proposed that humor, particularly laughter, creates physiological changes in the body (e.g., stimulates circulation and enhances immune system) (Martin & Lefcourt, 2004), which are believed to be beneficial for one's physical health (Martin & Lefcourt, 2004; McCreaddie & Wiggins, 2008). Another potential direct mechanism between humor and health is through positive emotional states (e.g., joy, happiness) that accompany humor; these emotional states are commonly believed to impart physical health benefits (Martin & Lefcourt, 2004). Additional empirical research is needed to test the validity of these proposed mechanisms but they are beyond the scope of this study.

Humor's indirect relations with health may occur through two additional mechanisms. Humor could moderate the negative impact of psychosocial stress on health by reducing the frequency and intensity of stress related symptoms (Martin & Lefcourt, 2004). This mechanism or perspective is referred to as the stress-moderator view and there is empirical support for this view (Dyck & Holtzman, 2013; Martin et al., 1993; Martin & Lefcourt, 1983; Tucker et al., 2013). Within this perspective, during stressful events that raise resting BP, a person can use humor to alleviate that stress and concurrently lower their BP. Humor may also indirectly impact health through the mediation of social support (Martin & Lefcourt, 2004). In this regard, humor can be used to reduce interpersonal conflicts and enhance positive affect in social situations.

These in turn may increase the chance of having more satisfying relationships and also increasing social support in general, which in turn has its own stress-buffering effects. Researchers have found empirical support for this mechanism's role in fostering more satisfying relationships (Campbell, Martin, & Ward, 2008; Hall, 2013). In summary, there is more empirical support for the indirect mechanisms relative to the direct mechanisms.

2.4 Purpose and Hypotheses of the Present Study

The present study's primary objective is to investigate the associations between resting BP, and hostility, constructive verbal anger, and humor styles. The secondary objective is to examine whether these variables still account for unique variance in resting BP after controlling for particular health variables (i.e., age, BMI) which are significant predictors of resting BP and are often used as control variables (Davidson et al., 1996; Hill et al., 2007; Okasha et al., 2000; Pointer, Livingston, Yancey, McClelland, & Bukoski, 2008; Uehara et al., 1998). In consideration of the aforementioned literature, the subsequent hypotheses were proposed:

1. That age and BMI will be positively correlated with resting BP.
2. That CMH will be positively correlated with resting BP.
3. That CAV will be negatively correlated with resting BP.
4. That adaptive humor styles will be negatively correlated with resting BP.
5. That maladaptive humor styles will be positively correlated with resting BP.
6. That CMH scores would incrementally predict resting BP after controlling for age and BMI.
7. That CAV scores would incrementally predict resting BP after controlling for age and BMI.
8. That adaptive humor style scores would incrementally predict resting BP after controlling for age and BMI.
9. That maladaptive humor style scores would incrementally predict resting BP after controlling for age and BMI.

Chapter 3: METHODOLOGY

3.1 Participants

A convenience sample of 199 undergraduate students, enrolled in an introductory psychology course, was obtained at the University of Saskatchewan. All students voluntarily participated for partial credit towards their introductory psychology course. Participants' ages

ranged from 17 to 58 with a mean age of 20.90 years (SD=5.364). As expected, the sample consisted of more females (n=148, 74.4%) than males (n=51, 25.6%).

3.2 Measures

3.2.1 Cook Medley Hostility Scale. Hostility was measured using the Cook Medley Hostility Scale (Cook & Medley, 1954). The CMH is a 50-item true-or-false item self-report measure from the Minnesota Multiphasic Personality Inventory (see Appendix A), with six subscales or subsets that have been labelled a priori: Cynicism, Hostile Attributions, Hostile Affect, Aggressive Responding, Social Avoidance, and Other (Barefoot, Dodge, Peterson, Dahlstrom, & Williams, 1989). Total CMH scores range from 0 to 50 and higher scores are indicative of higher levels of hostility (Scherwitz et al., 1991). A total hostility score was calculated by summing all items from the CMH and used in all analyses.

The CMH has been validated against other measures of hostility and anger measures. Researchers have found that the CMH has strong convergent validity with measures of anger and other measures of hostility (Smith & Frohm, 1985; Spielberger, Jacobs, Russell, & Crane, 1983). The discriminant validity of the CMH has also been established. For example, researchers have found low correlations between the CMH and anxiety and depression measures; these correlations were significantly smaller than the correlations between trait anger scores and CMH scores (Smith & Frohm, 1985). The CMH has satisfactory internal consistency with university students (Cook & Medley, 1954; Mwendwa et al., 2013; Shekelle et al., 1983) as researchers have found consistency coefficients of .84 (Shekelle et al., 1983), .85 (Barefoot, Dahlstrom, & Williams, 1983), and .86 (Cook & Medley, 1954).

3.2.2 Constructive Anger Behavior-Verbal Scale. The CAV (Davidson et al., 2000) was used to assess a goal-oriented and problem-solving style of discussing anger. The self-report CAV is a 12-item measure where items are rated on a four point Likert scale ranging from 1 (*almost never*) to 4 (*almost always*) (see Appendix B). The CAV is a subscale from the 23-item Anger Behavior-Verbal Scale. Higher scores on the CAV indicate a person who frequently uses constructive verbal methods to resolve their anger (i.e., a person who directly communicates with the person he/she is angry with, resolving the anger situation, partially by considering the other person's perspective, and communicating why he/she is upset; Davidson et al., 1999). Total CAV scores, calculated by summing all the items, were used in analyses.

The self-report CAV Scale has good construct validity (Chambers, 1999). Chambers (1999) found significant positive correlations among various rater types of the CAV Scale (i.e., three different versions of the CAV: self, friend, and observer). Convergent validity of the self-report CAV has been demonstrated through negative inter-correlations amongst the subscales (Destructive Anger Behavior-Verbal Justification, and Destructive Anger Behavior-Verbal Rumination) of the Anger Behavior-Verbal Scale (Chambers, 1999). The self-report CAV has strong convergent validity with measures of mood, anger, and hostility. Chambers (1999) found significant negative relations between the CAV, and the State Trait Anxiety Inventory, the Beck Depression Inventory (Beck, Rush, Shaw, & Emery, 1979), and the Multidimensional Anger Inventory (Siegel, 1986). The self-report CAV has high internal consistency. In three studies with Canadian and American undergraduate students Chambers (1999) found consistency coefficients ranging from .89 to .90.

3.2.3 Humor Styles Questionnaire. Coping through different styles of humor were assessed with the Humor Styles Questionnaire (Martin et al., 2003). The HSQ is a 32-item self-report measure where items are rated on a seven point Likert scale ranging from 1 (*totally disagree*) to 7 (*totally agree*) (see Appendix C). The HSQ consists of four scales, which assess four unique dimensions of humor: affiliative, self-enhancing, aggressive, and self-defeating (Martin et al., 2003). The affiliative humor scale assesses the tendency to use benevolent humor to enhance one's relationships with others (i.e., the use of humor to reduce conflict and strength ties between individuals). The self-enhancing humor scale measures the tendency to use benign humor to enhance the self and the maintenance of a humorous perspective about life (i.e., perceiving humor in life during stress or adversity). The aggressive humor scale assesses the tendency to use humor to enhance the self with no regard for the potential impact it can have on others (i.e., the use of humor to belittle others). The self-defeating humor scale measures the tendency to use humor at one's own personal expense, with the purpose of enhancing relationships with others (Martin et al., 2003). Higher scores on these four subscales indicates greater use of respective particular humor style or styles frequently whereas lower scores on these four subscales indicate less frequent use of humor style or styles often. Conventionally, researchers refer to affiliative and self-enhancing humor as adaptive humor styles, whereas aggressive and self-defeating humor styles are referred to as maladaptive humor styles.

The HSQ has moderately strong convergent validity (Erickson & Feldstein, 2007; Martin

et al., 2003). Martin et al. (2003) found that when comparing the HSQ to five previously existing measures of humor and one humor-related measure, that the multiple regression analyses were highly significant in predicting humor styles, with *R*'s ranging from .47 to .67 (all *p*'s < .001). In another study involving an adolescent sample, researchers found that all the HSQ scales, except aggressive humor, were all significantly associated with the humor subscale of the Response Evaluation Measure (Erickson & Feldstein, 2007). The lack of significant association between the aggressive humor scale and the REM-71 may be due to the REM-71 not purporting to measure this type of humor (Erickson & Feldstein, 2007). Furthermore, these investigators found evidence for the criterion-related validity of the HSQ in associations observed with coping and defense strategies, depressive symptoms, and adjustment. Elsewhere, evidence of criterion-related validity of the HSQ has been demonstrated through correlations with various measures of wellbeing, emotional distress, and psychosocial adjustment (Saroglou & Scariot, 2002).

The HSQ has adequate internal consistency amongst adolescent and adult populations (Erickson & Feldstein, 2007; Martin et al., 2003). Martin et al. (2003) found with undergraduate and adolescent samples that the HSQ scales had internal consistency coefficients of .80 (affiliative), .81 (self-enhancing), .77 (aggressive), and .80 (self-defeating). In an adolescent sample, researchers found internal consistency coefficients of: .81 (affiliative), .79 (self-enhancing), .65 (self-defeating), and .58 (aggressive) (Erickson & Feldstein, 2007). The test-retest reliability for the HSQ is moderate to high in university and community samples. Martin et al. (2003) found the following test-retest reliabilities of the humor scales: 0.85 (affiliative), 0.81 (self-enhancing), 0.80 (aggressive), and 0.82 (self-defeating; all *p*'s < .001).

3.2.4 Health and demographic questionnaire. Participants were asked a series of questions pertaining to health and demographic information (see Appendix D). Based on previous research findings, age and BMI were chosen as control variables to be entered into the first block of all the hierarchical regressions analyzed in the present investigation.

3.3 Procedure

The University of Saskatchewan Behavioural Research Ethics Board (Beh-REB) approved the study protocol on January 6, 2014 (Beh-REB #13-403). All participants were provided academic compensation for their participation. Prospective participants were recruited through an advertisement on SONA Systems, which is a participant recruitment and management software system used by the Department of Psychology at the University of Saskatchewan. Each

participant was compensated for his/her participation through the provision of partial credit towards his/her final grade in Introductory Psychology. Each session took approximately 45 minutes to complete.

When a participant arrived, the author (referred to as researcher 1), or the trained undergraduate research assistant (referred to as researcher 2), greeted the participant and led him/her to a comfortable quiet room. Once seated, each participant was provided a printed participant consent form (see Appendix E). The respective researcher ensured that each participant understood the below minimal risks involved with participation in the study before proceeding with the testing protocol.

After verbal and written consent were obtained, the respective researcher asked each participant if he/she had any additional questions. The standard protocol in resting BP research is to provide five minutes for a participant to relax before taking the first BP measurement (Pickering et al., 2005). During this resting period, the respective researcher left the room and emailed the participant the questionnaires (see Appendices C through F) through FluidSurveys. Upon returning, the respective researcher attached a BP cuff to the participants' non-dominant arm and began the first of six resting BP measurements. Blood pressure readings were measured at three-minute intervals (0, 3, 6, 9, 12, 15), for a total period of 15 minutes, using the SpaceLabs ambulatory BP monitor 90207 (Spacelabs Medical, Issequah, WA).

The SpaceLabs 90207 monitor is an efficient and accurate instrument for measuring resting SBP, DBP, MAP, and heart rate (O'Brien, Mee, Atkins, & O'Malley, 1991; O'Brien, Waeber, Parati Staessen, & Myers, 2001). In accordance with the purpose of the present study, only resting SBP and DBP were analyzed. Medical associations (e.g., British Hypertension Society) have developed specific criteria (e.g., the mean difference of both SBP and DBP and the comparison device must be within 5 mm Hg, with a standard deviation of 8 mm Hg or less) of accuracy for BP monitors which a BP monitor must satisfy or exceed to receive recommendations from such associations (O'Brien et al., 2001, White et al., 1993). The SpaceLabs 90207 ambulatory BP monitor passed the stringent accuracy criteria of the Association for the Advancement of Medical Instrumentation and the rigorous British Hypertension Society protocol (O'Brien et al., 1991; O'Brien et al., 2001).

In accordance with various organizations and research study protocols for measuring BP, participants were instructed to remain relatively still while the SpaceLabs monitor was taking

each BP reading and to avoid crossing their legs, making sudden movements, and talking during BP measurements (Frese, Fick, & Sadowsky, 2011; Pickering et al., 2005).

Upon completion of the six resting BP readings, each participant was then brought to the Personality and Health laboratory where computers were designated for participants to use. Each participant was then asked to sign into his/her online school account in order to open the email and access the link to FluidSurvey that was sent to the participant by researcher 1 or researcher 2. After entering his/her participant identification number, which was provided by one of the researchers, each participant was informed that he/she can ask for help if experiencing difficulties in understanding a question in the surveys and to inform the researcher once he/she finished. Finally, each participant was instructed to begin completing the questionnaires, which were presented to participants in a randomized order. After completing the questionnaires, each participant was verbally debriefed and given full information about the nature and purpose of the study. Participants were also provided a physical copy of the debriefing form, which included additional details about the study (see Appendix F).

As previously described, resting SBP for each participant was calculated by averaging the last five SBP readings, as the first BP reading of each participant was excluded in accordance with standard protocols. Resting DBP was calculated using the same methodology. In calculating means of resting BP, the first BP reading was discarded for all cases.

3.3.1 Data entry. Researcher 1 and researcher 2 independently measured participants resting BP readings with the SpaceLabs BP monitor. At the time of the BP data collection, researcher 1 or researcher 2 wrote all the resting SBP, DBP, and HR readings on paper (referred to as the initial researcher BP data sheet), which were observed on the BP monitor's screen immediately after each measurement. While each participant completed the questionnaires, researcher 1 or researcher 2 connected the SpaceLabs BP monitor to a lab computer that had the SpaceLabs BP computer program installed, and then uploaded the BP readings onto the SpaceLabs BP program. This program allows BP data to be uploaded electronically from the BP monitor so the readings are stored safely on the program's database and may be accessed on a computer. No data from this program could be transferred electronically to another program. Each time a participant's BP readings were uploaded, this program would display all the BP data, allowing the researchers to observe the readings again. As these readings were displayed, the researcher working with the participant would write these readings down on paper (referred

to as the BP program data sheet) so that a physical copy was available.

The initial researcher recording the BP readings on the BP data sheet independently and manually entered the data onto a Microsoft Excel spreadsheet, which is referred to as the initial researcher BP data file. The same procedure was followed for the BP program data sheet and this data sheet is referred to as the BP program data file. To ensure the accuracy of the initial researcher BP data sheet and file, each participants' BP data stored on the SpaceLabs BP program database were opened and then written down on paper by the researcher who had *not initially* collected the BP data. The other researcher independently wrote down these readings on another data sheet (referred to as the back-up BP data sheet). The applicable researcher then manually entered this written data into another Microsoft Excel spreadsheet (referred to as the back-up BP program data file). Therefore, a total of three BP data sheets and three corresponding data files were created. All three BP data files were then opened in SPSS and saved as SPSS files in order to run dataset comparisons.

3.3.2 Dataset comparisons. Multiple datasets comparisons were run to check for possible mismatches between the three data files. The first data set comparison was between the initial researcher BP data file and the back-up BP program data file, and the output was printed for visual inspection of errors by researcher 1. Mismatches were visually checked against the untouched SpaceLabs BP program database, which contained no BP reading errors, in order to determine what the correct readings were. These correct BP readings were written on the output and were also amended on the BP data sheet with the error(s). All mismatches were then corrected on the respective data files by researcher 1 and then these revised files were saved as new Excel spreadsheet files, keeping the original data files untouched.

The second dataset comparison involved the BP program data file and the back-up BP program data file. The same protocol for verifying and correcting mismatches described in the first comparison was followed for this comparison as well. The third dataset comparison involved the revised back-up BP program data file and the revised initial researcher BP data file. Similar to the other dataset comparison, the output printed from SPSS was again used to visually identify mismatches. However, unlike the first two-dataset comparisons, all mismatches were reviewed and revised by researcher 1 and researcher 2 jointly. All mismatches, from this comparison and the previous two comparisons, were visually inspected against the untouched SpaceLabs BP program database, which contained no BP reading errors, in order to determine

what the correct readings were. Each mismatch was visually examined on the BP program by both researchers, read aloud, and were then corrected or verified to be revised accurately on all the data sheets and the dataset comparison outputs. These revised data sheets were then visually compared with their respective revised BP data files and these files (including the revised BP program data file) were revised accordingly. The revised initial researcher BP data file and the revised BP back-up data file were then saved as cross-referenced files, having been compared and verified by both researchers for accuracy. In all cases of BP data file mismatches, only one of the data files would have a reading that differed from the SpaceLabs BP program database.

The fourth data set comparison analysis was between the cross-referenced back-up BP program data file and the cross-referenced initial researcher BP data file and no mismatches were found. One final data set comparison was made between the cross-referenced initial researcher BP data file and the revised BP program data file. No mismatches were found between these two data sets. The cross-referenced initial researcher BP data file was saved as a new file, which is referred to as the final BP data set.

It was necessary for three participants to fill out paper versions of the questionnaires due to FluidSurveys being inaccessible at the time of the scheduling testing. To ensure the accuracy of the entered questionnaire data on Statistical Package for the Social Sciences (SPSS), both researchers independently entered the participants' responses into SPSS in two separate data files (researcher 1's questionnaire entered data; researcher 2's questionnaire entered data). A dataset comparison was conducted between these two data files. For the few instances of mismatches, which occurred only with the demographic and health questionnaire, each discrepancy was reviewed jointly by both researchers. Consensus about the correct responses was determined on the basis of checking the respective participants' answers on the hard copy of the questionnaire. The majority of the few mismatches that were found were due to one researcher entering "0" while the other researcher entered nothing. Consensus about the correct responses (entering 0 or leaving the response blank) in these cases was determined by whether participants should have skipped the question altogether because it was not applicable to them. The online questionnaires were designed with branching protocols that prevented participants from answering non-applicable questions, but the paper versions did not have elaborate branching options. Therefore, if the answer was applicable to the participant, then "0" was entered into the incorrect data set. These corrected researcher datasets were saved as new revised data sets. A final comparison was

run between these two revised data and no errors were found. Researcher 1's revised final questionnaire data set was the data set used for all additional analyses. This questionnaire data set and the cross-referenced final BP data set were merged together based on each participant's pre-assigned number and was saved as a new data file that was used for all analyses.

Chapter 4: ANALYSES

This correlational study involves two dependent (i.e., criterion) variables: resting SBP and DBP, both of which are continuous. There were a total of eight predictors: age, BMI, hostility (CMH), constructive verbal anger (CAV), affiliative humor, self-enhancing humor, aggressive humor, and self-defeating humor. A series of hierarchical regressions were conducted to investigate the previously described hypotheses, with a primary focus on whether humor styles and constructive verbal anger are significant predictors of resting BP.

4.1 Data Cleaning

All variables were analyzed using frequency counts to identify any miscodes in the data sets. Precautionary steps were taken to reduce the possibility of miscodes by limiting item responses exclusively to an appropriate and reasonable scale range (e.g., height in feet and inches was restricted to maximum of 7 feet and 11 inches) or in the case of the psychosocial questionnaires, the responses were limited to the exact scale range of each psychosocial measure.

4.1.1 Missing data. Cases with missing data points on the CMH, CAV scale, and the HSQ were identified by visually reviewing frequency counts and also by creating a pivot table in Microsoft Excel that counted all data points for each case, variable by variable. For each case with one missing data point on the CAV scale and the HSQ, their respective means were calculated individually. For each individual case, this was done by summing the scores of answered items and dividing by the number of answered items for the respective scale (e.g., for the CAV, the eleven answered items were summed and then averaged). These individual case scale means were then substituted into the missing data point(s) in the data set for each respective case. No mean substitutions were completed for the CMH because it has a true-false response set. If a case had more than one missing data point (i.e., more than 5% of items missing) on the CAV or the HSQ then this case was excluded from analyses involving that scale. However, no cases had more than one missing data point on the CAV and only one case had more than one missing data point on the HSQ. It was also determined, a priori, that if a case had more than two missing data points (i.e., more than 5% of items missing) on the CMH, then that

case was excluded from analyses involving the CMH. However, no cases had more than two missing data points on the CMH.

There were a total of eight cases (4%) with missing data points on the CMH and none of the cases had more than two missing data points. There were six cases (3%) with missing data points on the CAV and all of these cases had only one missing data point. There were fifteen cases (7%) with missing data points on the HSQ and all of these cases had only one missing data point with one exception. Therefore, in the entire sample there were 29 cases (15%) with missing data on the personality questionnaires and only one case had to be excluded from analyses that included the HSQ, for exceeding the predetermined missing data limit of 5%.

After all mean substitutions, an additional pivot table in Microsoft Excel was used to count all data points for each case by each variable to ensure that no data points were overlooked or missed. Although total sample means could have been calculated and substituted for the missing data points, this total sample mean approach is the most conservative and as such, a significant amount of individual and group variance would have been lost with such a substitution. The next conservative substitution is the procedure I have described and followed. A dummy code variable (0=no estimated data point; 1=estimated data point) was used to identify which cases had estimated data points. Two independent samples t-tests were analyzed to determine if there were possible group differences, on resting SBP and DBP, between the cases with estimated data points and cases without estimated data points. Although there were unequal variances between the two groups, there were no statistically significant differences between both groups on each dependent variable mean.

Due to equipment malfunction fourteen of the participants had less than six resting BP readings completed: three participants had three resting BP readings measured, nine participants had four readings measured, and two participants had five resting BP readings measured. No substitutions or means were calculated because resting SBP and resting DBP are the criterion variables. A dummy code variable (1=six BP readings measured; 2=between three to five BP readings measured) was used to identify cases with six or less than six resting BP readings. A Mann-Whitney *U* test was completed because of the large difference in group size and that the less than six resting BP readings group had a non-normal distribution in resting BP. There was no statistically significant difference in mean resting SBP between the two groups. However, there were statistically significant differences in mean resting DBP between these two groups,

but given the significant difference in group size, it was decided to proceed with using participants with less than six resting BP readings for all further analyses.

4.2 Reliability Analysis

As previously noted, resting SBP means were calculated by averaging the latter five resting SBP measurements (items) for every case with BP readings, with the exception of cases without any BP readings and those cases (*n*=14) with means calculated based on between two to four BP readings. I calculated Cronbach's alphas for the remaining participants (*n*=173) to establish the internal consistency reliability of the five resting SBP readings. The same protocol was followed for calculating resting DBP. Both resting SBP and resting DBP had excellent Cronbach's alphas (.96 and .92 respectively), and were both comparable to, but slightly higher than, other researchers' BP item alpha coefficients (see Davidson et al., 2000).

4.3 Reliability of Scales

The reliability of all scales in the current study was also tested using Cronbach's alpha (Cronbach, 1951). Cronbach's alpha is a commonly used measure of internal consistency (Streiner, 2003), describing the degree to which items in a scale measure the same construct, and which has a range of .00 to 1.00 (Tavakol & Dennick, 2011). Alpha coefficients for each scale were examined to verify whether they were between the recommended range of .70 and .90, which is the recommended range for research purposes (Streiner, 2003). I examined the following scales using Cronbach's alpha: 1) the total score of the Cook Medley Hostility Scale (CMH); 2) the Constructive Anger Behaviour-Verbal Scale (CAV); and 3) the four humor style subscales separately (affiliative, self-enhancing, aggressive, and self-defeating).

The CAV's Cronbach alpha coefficient for the total sample (N=199) was excellent (.92), and was similar to the CAV's Cronbach alpha coefficients for the total sample (.93) and young adult (.93 men, .92 women) samples reported by Davidson et al. (2000). The CMH Cronbach's alpha coefficient was high (.81), and comparable to other researchers' reported coefficients (range =.76 to .89; Durel et al., 1989).

The Cronbach alphas for the four humor style subscales were between good and excellent (affiliative, .78; self-enhancing, .81; aggressive, .70; self-defeating, .81). These Cronbach alphas are comparable to other researchers' reported alpha coefficients with university students (range =.72 to .81; Dyck & Holtzman, 2013) and a community sample including university students (range=.77 to .81) (Martin et al., 2003). One participant was excluded from the Cronbach's alpha

coefficient calculations of the HSQ subscales for having more than 10% of the HSQ items missing.

Altogether, the alpha coefficients for all of the scales used in the present study are within Streiner's (2003) recommended alpha coefficient range for research, with the exception of the CAV, which was above the upper threshold. Nonetheless, and as previously described, the CAV Cronbach's alpha is comparable to Davidson et al.'s (2000) reported alpha coefficients. As such, this variable was included in additional analyses.

4.4 Assumption Testing

To test the assumption of normality, I examined the residuals scatterplot to determine whether the errors of prediction are normally distributed around every predicted DV score (i.e., resting BP) or not (Tabachnick & Fidell, 2013). To test the assumption that the relations among all variables in the model are linear, I examined the overall shape of the scatterplot to determine if there was any irregularity that suggested that the relations are nonlinear. To test the assumption of homoscedasticity I examined the standard deviations of errors of prediction to determine whether they are approximately equivalent for the predicted resting BP scores (Tabachnick & Fidell, 2013).

I screened the data for univariate outliers by checking the *Z* scores in the distribution of scores for each variable in the analysis and also by reviewing the histograms and box plots. I screened for multivariate outliers by computing and examining the Mahalanobis distance scores for each case using regression.

I also checked for specification errors, which are inaccuracies in specifying the regression model, by examining the distribution of standardized residuals histogram for centrality and symmetry. In other words, the residuals should be centered around zero, with the majority being between -0.1 and 0.1, and they should also be symmetrical (Tabachnick & Fidell, 2013). If the residuals meet these guidelines then the model does not likely contain a specification error. If however the residuals are not centered or not symmetrical, then there is likely a specification error. The two most concerning specification errors are when a variable is included in the model that does not belong and when a variable that should be in the model has been missed (Klem, 1995); no such errors were discovered.

To check for multicollinearity in the present study, I examined the correlations between the CMH, CAV, and the four humour styles to note if any correlations were at .90 or higher

(Tabachnick & Fidell, 2013). This cut-off is often used to determine if two variables are so highly correlated that they are likely representing the same construct. No correlations between the present study's psychosocial variables approached the cut-off, suggesting that multicollinearity is not a problem with the variables in the present study.

4.5 Descriptive Statistics

After the data was screened, and corrected when feasible and required, for accuracy, completeness, missing data, reliability, outliers, and assumptions, the online questionnaire data was examined through univariate descriptive statistics. I examined the mean, range, and SD for the scales or total score of the variables to be analyzed. I also inspected the mean, range, and SD for resting SBP and DBP readings from the cross-referenced and final BP data set. I also screened the data for skewness and kurtosis by examining the values printed in the output and by examining the histogram and plots. There was no evidence of kurtosis or skewness in the output.

4.6 Correlational Analyses

I computed zero-order correlations between all of the psychosocial variables and the criterion variables. To check the validity of the CMH, correlations were computed between various subscales of the State Trait Anger Expression Inventory-2 (STAXI-2); it was anticipated that there would be significant positive correlations between the subscales of the STAXI-2 (except anger control subscales) and the CMH based on validity studies cited by Spielberger (1999). Based on the literature review by the HSQ developers and their correlational findings (Martin et al., 2003), it was expected that CMH and the maladaptive humor styles would be highly positively correlated and also positively correlated with resting BP. Finally, it was expected that CAV and adaptive humor styles' scores would be positively correlated with one another, negatively correlated with CMH and the maladaptive humor styles, and negatively correlated with resting BP.

4.7 Hierarchical Multiple Regression Analyses

I conducted hierarchical multiple regression analyses of the eight predictor variables in the prediction of resting SBP and DBP. Based on the review of the literature previously described, it was expected that all predictor variables would predict a small but significant proportion of variance of the criterion variables. It was also anticipated that with each predictor variable, there may be some differences in the proportion of variance predicted in resting SBP and DBP. In particular, it was expected that age and BMI would account for more variance of

SBP and DBP compared to the psychosocial variables because they are traditional physical risk factors for hypertension.

Twelve hierarchical models, six for resting SBP and six for resting DBP, were conducted to determine whether the psychosocial variables predict variance in resting BP after controlling for age and BMI. Accordingly, age and BMI would be entered into step 1 of each model. Each of the CAV, CMH, and the four humor styles were then entered into step 2 of models 3, 4, 5, and 6, respectively. The same statistical procedure and steps were followed for the six models predicting resting DBP. Squared semi-partial correlations were computed to examine the unique amount of variance accounted for in the BP criteria by each predictor variable.

Chapter 5: RESULTS

5.1 Descriptive Statistics: Demographic and Health Variables

Means, standard deviations, and frequencies of demographic and health variables are presented in Table 1. Mean arterial pressure and heart rate were also included in this table. It is worth noting that the sample was predominantly White and female. The mean BMI of the present sample is within the normal BMI range (WHO, 1998) and is equivalent to the mean BMI reported in other studies with undergraduate university samples (Boyce & Kuijer, 2015; Gillen & Lefkowitz, 2012).

The resting SBP mean of the present sample was 120 mm Hg (SD=10.5), which is at the ceiling of the optimal range for resting SBP. Other researchers have found similar resting SBP means in undergraduate samples. For example, Kupper, Pelle, and Denollet (2013)'s sample was comprised of 101 undergraduates (84% female) and the entire sample's mean resting SBP was 116.1 mm Hg (SD=9.0); the lower resting SBP may be attributed to the higher proportion of females than males. In another study, comprised of 109 undergraduates (42% female), the mean resting SBP was calculated prior to five different tasks and these means for males ranged between 123 and 126 mm Hg (Lefcourt et al., 1997). In the same study, mean resting SBP for females, prior to the same tasks as the males, ranged between 115 and 117 mm Hg.

The resting DBP mean of the present sample was 73.5 mm Hg (SD=7.6), which is well within the optimal range for resting DBP. Resting DBP readings ranged from 42.6 to 91. This sample's mean is comparable to the resting DBP means reported in studies with undergraduate

Table 5.1

Means, Standard Deviations, and Frequencies of Demographic and Health Variables

Measure	N	Mean	SD	%
Age	-	20.9	5.4	-
Gender	-	-	-	-
Female	148	-	-	74.4
Male	51	-	-	25.6
Race/ethnicity	-	-	-	-
White	129	-	-	64.8
Other/non-White	70	-	-	35.2
Weight (kg)	180	67.8	18.8	-
Height (m)	182	1.7	.1	-
Body Mass Index	180	23.6	4.9	-
Regular exercise	-	-	-	-
Yes	148	-	-	74.4
No	49	-	-	24.6
Alcohol ever	-	-	-	-
Yes	168	-	-	84.4
No	30	-	-	15.1
Alcohol per sitting	-	2.21	1.5	-
Smoker	-	-	-	-
Never smoker	145	-	-	72.9
Former smoker	37	-	-	18.6
Current smoker	16	-	-	8.0
Caffeine consumed	-	-	-	-
Yes	158	-	-	79.4
No	41	-	-	20.6
Hypertensive parent	-	-	-	-
Neither	153	-	-	76.9
One	39	-	-	19.6
Both	7	-	-	3.5
Hypertensive	-	-	-	-
Yes	33	-	-	16.6
No	166	-	-	83.4
Health problems	-	-	-	-
Yes	33	-	-	16.6
No	166	-	-	83.4
Systolic blood pressure	-	120	10.5	-
Diastolic blood pressure	-	73.5	7.6	-

samples. For example, Kupper et al. (2013)'s sample resting DBP mean was 70.7 (SD=7.7). As previously stated, one reason the DBP mean in Kupper et al.'s (2013) study was lower may be due to the higher proportion of females to males, compared to the proportion in the present study. In Lefcourt et al.'s (1997) study, the resting DBP mean range for males was 67 to 69 mm Hg. The resting DBP mean range for females was 65 to 67 mm Hg. Overall, the entire sample's resting SBP mean is within the typical range for an undergraduate sample.

5.2 Descriptive Statistics: Psychosocial Predictor Variables

The mean, standard deviation, and range of the psychosocial predictor variables are presented in Table 2.

5.2.1 Hostility. The sample mean CMH score was 22.1 (SD= 7.4). The sample was a moderately hostile group of undergraduate students. Previous researchers have observed mean CMH scores of 23.9 (Neumann et al., 2011) and 20.8 (Neumann et al., 2004) in university samples. Regarding validity of the CMH, the correlation between the CMH and the trait anger scale of the STAXI-2 was statistically significant, positively correlated, and equivalent to the correlations found by the developers of the STAXI-2. They found highly significant positive correlations between the trait anger scale from the STAXI-2 and the CMH in a university sample (*r*`s = .48 to .58) and a navy sample (*r*`s =.47 to .49) (Spielberger, 1999). In the present study, the correlation between CMH and trait anger was highly positively correlated ($r = .56$, $p < .001$). Furthermore, correlations between CMH and the other subscales of the STAXI-2 were all positive, with the exception of the anger control subscales. These findings provide support for the validity of CMH scores with this sample, as the two scales are measuring a similar and highly related construct.

5.2.2 Constructive verbal anger. The mean CAV total score was 32.1 (SD= 8.1). This sample endorsed high average constructive verbal anger expression compared to other samples. Previous researchers have observed mean observer CAV scores of 22 with high hostile male patients (Davidson et al., 1999) and between 25.1 and 27.4 with a population-based sample (Davidson et al., 2000).

5.2.3 Adaptive humor styles. The affiliative humor style mean was 46.6 (SD= 6.7). The sample endorsed a high average affiliative humor style. The self-enhancing humor style mean was 38.6 (SD= 8.6). The sample endorsed an average level of self-enhancing humor.

Table 5.2

Descriptive Statistics of Psychosocial Predictor Variables

Measure	Mean	SD	Range
Cook Medley Hostility	-	-	-
Cynical hostility	6.8	2.8	13 (0 to 13)
Hostile emotions	2.3	1.3	5 (0 to 5)
Hostile aggression	3.8	1.8	8 (10 to 18)
Hostile attributions	4.5	2.3	10 (0 to 10)
Total	22.1	7.4	36 (3 to 39)
Constructive anger verbal expression	32.1	8.1	36 (12 to 48)
Humor Styles Questionnaire	-	-	-
Affiliative	46.6	6.7	35 (21 to 56)
Self-enhancing	38.6	8.6	41 (15 to 56)
Aggressive	28.7	7.9	43 (11 to 54)
Self-defeating	30	9.2	41 (11 to 52)

5.2.4 Maladaptive humor styles. The aggressive humor style mean score was 28.7 (SD= 7.9). The sample endorsed an average aggressive humor style score. The self-defeating humor style mean score was 30.2 (SD= 9.2). The present sample endorsed a higher average self-defeating humor style, indicating that his sample uses self-defeating more frequently than the HSQ validation samples. Overall, the means of the four HSQ scales with this sample were equivalent to the means and standard deviations reported in the HSQ validation study, with the exception of the self-defeating humor scale (Martin et al., 2003).

5.3 Bivariate Correlational Analyses

The results of the zero-order correlations between the demographic and health variables and resting BP are presented below in Table 3. As hypothesized, age was positively correlated with both SBP and DBP, although the association was somewhat greater in magnitude with DBP. Also consistent with hypothesis one, BMI was positively correlated with SBP and DBP, although its relation with SBP was the largest association observed in the entire set of analyses. Gender was negatively correlated with SBP, indicating that females have lower resting SBP, and weight (in kg) was positively correlated with SBP. Whether a participant had ever consumed alcohol was also positively correlated with DBP. As would be expected, SBP and DBP had a strong positive correlation. All remaining correlations between the demographic and health variables and resting BP were non-significant.

The results of the zero-order correlations between the psychosocial predictors and resting BP criteria are presented in Table 4. No evidence was found to support the majority of the psychosocial correlational hypotheses, as the majority of the correlations were non-significant. Contrary to hypothesis four, the adaptive humor styles had significant positive correlations with resting BP. More specifically, affiliative humor was positively correlated with SBP, whereas self-enhancing humor was positively correlated with both SBP and DBP. The most substantive association of these three correlations was between self-enhancing humor and SBP.

Table 5.3

Bivariate Correlations between Demographic and Health Variables and Resting Blood Pressure Criterion Variables

Demographic/health variable	Systolic	Diastolic
Age	.22**	.25***
Gender	-.18*	.08
Ethnicity	-.13	-.04
Weight (kg)	.25***	.04
Height (m)	.02	-.03
BMI	.32***	.20*
Regular exercise	-.06	.06
Alcohol ever	.02	.17*
Alcohol per sitting	-.07	-.10
Smoker	.08	.03
Caffeine consumed	.09	.12
Hypertensive parent	.12	.10
Hypertensive	-.07	.01
Health problems	-.08	-.07
Systolic	-	.70***

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

Table 5.4

Bivariate Correlations between Psychosocial Predictors and Resting Blood Pressure Criterion Variables

Psychosocial measure	Systolic	Diastolic
Constructive anger verbal expression	.07	.03
Cook Medley Hostility	-	-
Cynical hostility	.03	.03
Hostile emotions	-.01	-.07
Hostile aggression	.07	.00
Hostile attributions	.01	-.05
CMH Total	.03	-.03
Humor Styles Questionnaire	-	-
Affiliative	.16*	.00
Self-enhancing	.19**	.15*
Aggressive	.07	-.09
Self-defeating	.12	.05

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

5.4 Hierarchical Multiple Regression Analyses

Hierarchical multiple regressions were conducted to predict resting SBP and DBP with the following six psychosocial predictors (presented first) and two health criteria: 1) constructive verbal anger expression (CAV); 2) hostility (CMH); 3) affiliative humor; 4) self-enhancing humor; 5) aggressive humor; 6) self-defeating humor; and 7) age; and 8) BMI. Given the aforementioned research (Davidson et al., 1996; Hill et al., 2007; Uehara et al., 1998), which has demonstrated that age and BMI are significant predictors of BP, it was determined that these two variables would be entered on the first step of all the hierarchical regression, as covariates. As can be seen in Table 5, there are six regression models predicting resting SBP. To determine whether these psychosocial variables predicted resting BP independently from the other psychosocial variables, each psychosocial variable was separately entered into six hierarchical regressions, one for each psychosocial variable. The same procedure and order of analyses was followed for predicting resting DBP.

In all six models with resting SBP as the criterion variable, BMI was a significant unique predictor at each step of the analyses. Hostility, constructive verbal anger, and the maladaptive humor styles did not incrementally predict resting SBP, after controlling for age and BMI. As such, hypotheses six, seven, and nine were not supported. However, in model three, affiliative humor incrementally predicted resting SBP, after controlling for the health variables. Age and BMI accounted for 12% of the overall variance in resting SBP while the addition of affiliative humor on step two significantly improved the fit of the model accounting for an additional 2.2% of the variance in resting SBP, F (3, 167) = 9.06, p = <.001. In model four, self-enhancing humor did incrementally predict resting SBP over the health variables. Age and BMI accounted for 12% of the overall variance in resting SBP while the addition of self-enhancing humor on step two significantly improved the fit of the model accounting for an additional 2.7% of the variance in resting SBP, F (3, 167) = 9.46 , p = <.001.

Similarly, as can be seen in Table 6, none of the psychosocial variables incrementally predicted resting DBP over age and BMI. Age was the only unique predictor in each model, and at each step, predicting resting DBP. BMI was trending towards significance at p = .05. As such, hypotheses six through nine were not supported by these findings.

Table 5.5

Hierarchical Regressions: Examining Association of Psychosocial Predictors to Resting Systolic Blood Pressure Controlling for Health/Demographic Predictors

Regression model (1-6)		*Beta*	*SE*	*β*	*p*	r_{sp2}
1	Block 1 (all remaining analyses)					
	Age	.25	.15	.13	.086	.016
	BMI	.60	.17	.27	.001	.067
	Block 2					
	Age	.24	.15	.13	.108	.014
	BMI	.61	.17	.28	<.001	.069
	CAV	.07	.10	.05	.478	.003
	F (3, 164) = 7.41, p < .001 , R = .35, R^2 = .12					
2	Block 2					
	Age	.25	.15	.13	.083	.016
	BMI	.61	.17	.28	<.001	.068
	CMH	.04	.10	.03	.702	.001
	F (3, 167) = 7.52 , p =<.001 , R = .35 , R^2 = .12					
3	Block 2					
	Age	.25	.14	.13	.084	.016
	BMI	.56	.17	.26	.001	.057
	HSQ Affiliative	.26	.13	.15	.041	.022
	F (3, 167) = 9.06, p = <.001, R =.37 , R^2 =.14					
4	Block 2					
	Age	.24	.14	.13	.100	.014
	BMI	.57	.17	.26	.001	.059
	HSQ Self-enhancing	.21	.09	.17	.023	.027
	F (3, 167) = 9.46 , p = <.001 , R = .38 , R^2 =.15					
5	Block 2					
	Age	.28	.15	.15	.060	.019
	BMI	.59	.17	.27	.001	.065
	HSQ Aggressive	.11	.10	.08	.272	.006
	F (3, 167) = 7.92, p = <.001 , R = .35 , R^2 = .13					
6	Block 2					
	Age	.24	.14	.13	.100	.014
	BMI	.60	.17	.28	<.001	.068
	HSQ Self-defeating	.11	.08	.10	.185	.009
	F (3, 167) = 8.13 , p = <.001 , R = .36 , R^2 =.13					

Note: r_{sp}^2 = squared semi-partial correlation

Table 5.6

Hierarchical Regressions: Examining Association of Psychosocial Predictors to Resting Diastolic Blood Pressure Controlling for Health/Demographic Predictors

Regression model (1-6)		*Beta*	*SE*	*β*	*p*	r_{sp2}
1	Block 1 (all remaining analyses)					
	Age	.27	.11	.20	.011	.036
	BMI	.21	.12	.13	.091	.016
	Block 2					
	Age	.28	.11	.21	.010	.037
	BMI	.21	.12	.13	.096	.015
	CAV	-.02	.07	-.02	.749	.001
	F (3, 167) = 4.62, p = .004, R = .28 , R^2 = .08					
2	Block 2					
	Age	.27	.11	.20	.011	.036
	BMI	.21	.12	.133	.093	.016
	CMH	-7.04	.08	<-.01	.999	<.001
	F (3, 167) = 4.59, p = .004 , R = .28, R^2 = .08					
3	Block 2					
	Age	.27	.11	.20	.011	.036
	BMI	.23	.13	.14	.071	.018
	HSQ Affiliative	-.09	.09	-.07	.344	.005
	F (3, 167) = 4.91 , p = .003 , R = .29 , R^2 = .08					
4	Block 2					
	Age	.27	.11	.20	.012	.035
	BMI	.19	.12	.12	.123	.013
	HSQ Self-enhancing	.08	.07	.09	.231	.007
	F (3, 167) = 5.11 , p = .002 , R = .29 , R^2 = .08					
5	Block 2					
	Age	.25	.11	.18	.024	.029
	BMI	.22	.12	.14	.071	.018
	HSQ Aggressive	-.10	.07	-.11	.158	.011
	F (3, 167) = 5.31 , p = .002 , R = .30 , R^2 =.09					
6	Block 2					
	Age	.28	.11	.20	.011	.037
	BMI	.21	.12	.13	.092	.016
	HSQ Self-defeating	-.01	.06	-.01	.887	<.001
	F (3, 167) = 4.59 , p = .004, R = .28, R^2 =.08					

Note: r_{sp}^2 = squared semi-partial correlation

Chapter 6: DISCUSSION

6.1 Review of Findings

The present study investigated the associations between resting BP and hostility, constructive verbal anger, and humor styles in a Canadian undergraduate university sample. The preliminary correlational analyses between the study variables revealed no significant correlations between the psychosocial variables and resting BP, with the exception of adaptive humor styles. Furthermore, the significant positive correlations between affiliative humor, self-enhancing humor, and resting BP are contrary to predictions. Martin (2001) stated that, "…despite the popularity of the idea that humor and laughter have significant health benefits, the current empirical evidence is generally weak and inconclusive." This idea has been the primary focus of the present investigation; to examine the humor-health hypothesis, focusing specifically on resting BP. These findings suggest that humor is not associated with health benefits, and paradoxically, adaptive humor styles were inversely associated with an index of physical health, at least amongst undergraduate university students. The findings are contrary to my hypotheses and the putative humor-health hypothesis. It seems questionable that adaptive humor is somehow associated with harmful, as opposed to salubrious, effects and it is very possible that the observed association is either spurious, unique to this sample, or explainable by another unmeasured variable that covaries with SBP and humor styles. Suffice it to say, the present study further supports Martin's (2001, 2002) call for more theoretically based and rigorous research that addresses the question of whether humor is beneficial for physical health.

The results of the hierarchical regressions were varied based on which type of resting BP (i.e., SBP or DBP) was the criterion variable. BMI was a significant predictor of resting SBP in each step in each model, but not with resting DBP. This is consistent with findings of other researchers (Davidson et al., 1996; Hill et al., 2007; Okasha et al., 2000; Uehara et al., 1998) and indicates that BMI is a robust predictor of higher resting SBP regardless of age or BMI category that a person fits within. After controlling for age and BMI, affiliative humor and self-enhancing humor uniquely predicted elevated resting SBP. These findings suggest that humor does play a minor, but important role in the physical responses we have to stress. Broadly speaking, our personalities are related to our physical health and at a level that is generally unnoticed by many individuals. They also indicate that psychological factors can uniquely predict physical criterion variables, helping to account for some of the unexplained variance in resting BP.

The present results have implications for treating hypertension and for understanding the interdependence of our psychological and physical health characteristics. As BMI is a robust predictor of elevated resting BP in a young and healthy sample, it is critical for treatment providers to assist persons at risk of hypertension in lowering their BMI, regardless of age. An additional implication is that given the observed association between adaptive humor styles and resting SBP, it is possible that other psychosocial variables have gone unexamined, which could help explain more of the variance of resting BP.

Psychosocial variables such as worry and rumination have been linked with delayed BP recovery and other negative cardiovascular outcomes (Gerin et al., 2006; Glynn, Christenfeld, & Gerin, 2002; Vella & Friedman, 2009). Others have examined dimensions of religiosity in relation to BP and found positive correlations (Buck, Williams, Musick, & Sternthal, 2009). Examinations into these and other psychosocial variables relations with resting BP may provide additional information about the unexplained variance in resting BP and most importantly they may provide additional insight into the role of psychosocial factors in hypertension development.

The observed positive correlations between adaptive humor styles and resting BP do not make intuitive sense. As such, I am reluctant to assume this is an accurate finding; it is more likely that these associations are a type 1 error when considered in the context of all the bivariate correlations conducted. However, there may also be unmeasured variables impacting the relations between adaptive humor styles and resting BP, such as stress. It is plausible that stress is a moderator between adaptive humor styles and resting BP impacting the strength and direction of their associations. For example, stress may be a factor leading a person to use affiliative humor to minimize their stress, and it is known that stress is associated with increased resting BP (Lefcourt et al., 1997; Matthews, Woodall, & Allen, 1993; Wiernik et al., 2013). This is further supported by randomized clinical trials in which BP was significantly lowered as a result of stress reduction (Hughes et al., 2013).

An additional unmeasured variable that may be causing or be associated with increases in resting BP and adaptive humor is social support. This is particularly relevant with affiliative humor given that it is an adaptive socially based humor style. Social support is known to provide stress-buffering effects (Bowen et al., 2014; Stein & Smith, 2015), which in turn equates with lower resting BP, among other direct and indirect salubrious associations with other measures of health. For illustration purposes, imagine a person is using affiliative humor to bond within his

social support network, and his attempts fail, this may lead to an increase in social anxiety or at the very least, the feeling of discomfort. The failed attempts of using affiliative humor would likely lead to physiological arousal, including an increase in resting BP, despite the person utilizing an adaptive style of humor. Thus it is apparent that social support is a variable worth further investigation in research examining resting BP and psychosocial factors.

Another possible explanation for the adaptive humor style and resting BP associations may be related to the limitations of the HSQ. Contextual factors may be a significant factor impacting the use, and outcome, of humor styles. For example, depending on the social network, culture, and setting, aggressive humor may be a common and adaptive component in the relationships, being a frequent way of bonding with others. When examining and scrutinizing the affiliative humor scale items, it could be argued that the positive correlation observed between affiliative humor and resting SBP is not spurious. Stress related to a need to perform in social situations through the use of affiliative humor may cause heightened physiological reactivity that leads to elevated baseline resting BP readings. This could possibly explain the positive correlation between affiliative humor and resting SBP.

Another factor that may be impacting the present findings is the study sample characteristics. First, as the sample is generally healthy, based on the sample's optimum resting BP means and a lack of other harmful biological markers, this may be contributing to a lack of total sample variance. A broader community based sample would have generated more variance on the predictor and outcome variables. Perhaps such a sample would have resulted in findings that are more closely aligned with my hypotheses and expectations. In addition, the sample being predominantly young White females also could have impacted findings. This argument is supported by past research involving female participants, as researchers have observed lower resting BP compared to males (Pointer et al., 2008; Taylor et al., 2014), and so lack of variance in the outcome variables could have impacted the present investigation's findings.

Although numerous items addressing conventional predictors of hypertension (e.g., diet, alcohol consumption, etc.) were included in the health and demographic questionnaire, the focus in the present investigation in regards to covariates was restricted to age and BMI for specific reasons. First, as previously noted, past research established that age and BMI are significant predictors of resting BP in university-aged samples and are frequently used as covariates (Davidson et al., 1996; Hill et al., 2007; Okasha et al., 2000; Pointer et al., 2008; Uehara et al.,

1998), making them logical choices for inclusion in the analyses as covariates. Second, preliminary correlational analyses between many of the health variables and resting BP (see Table 5.3) were non-significant. Finally, weight and height are practical, non-invasive, and simple measurements to acquire for the purpose of calculating BMI.

It bears noting that within the literature, researchers have fairly consistently observed significant associations between most of the health variables listed in Table 5.3 and resting BP (e.g., Davidson et al., 1996; Jorgensen & Maisto, 2008; Okasha et al., 2000; Sesso et al., 2008), raising the question of why they were non-significant in the present study? The answer may again be related to the sample's characteristics. Perhaps in an older more diversified sample from the general population variables such as exercise and alcohol consumption would become increasingly salient. Explained differently, a less healthy sample, relative to the sample in the present study, could have more robust associations between the variables examined. Relatedly, there is of course greater variance in a more heterogeneous sample. Another possible explanation for the non-significant findings amongst the health variables and resting BP may be that some of the items used to operationalize the variables were not nuanced enough. Weaker operationalizations of these variables may be why significant findings were not generated. More fine-grained measurements and stronger operationalizations of the health variables could result in more significant associations with resting BP and other physical health variables.

Although BMI was significantly correlated with resting BP in the present study, researchers have found significant limitations with BMI as a measure of physical health, particularly as an indicator of excess body fat. By being a surrogate measure of body fat, BMI does not measure body fat, but rather excess weight. The following are a few limitations that must be considered when interpreting the present BMI findings: 1) BMI fails to quantify body composition (Nevill, Stewart, Olds, & Holder, 2006), including differentiating between excess fat, muscle, lean or bone mass (Dalton et al., 2003; Romero-Corral et al., 2008), which can have significant health implications; 2) the BMI classification system is ethnically biased, failing to consider ethnic differences in percentage of body fat (Prentice & Jebb, 2001); and 3) has low sensitivity in identifying persons with obesity (Romero-Corral et al., 2008). Researchers have proposed alternative inexpensive, and arguably more sensitive, measures of body fat, such as the skinfold caliper test (Nevill et al., 2006), waist circumference (Camhi et al., 2011), and waist-hip ratio (Dalton et al., 2003).

6.2 Limitations of the Present Study

The current investigation has some limitations, however, that merit discussion and which may have implications for future research. First, by sampling from only university students enrolled in introductory psychology classes limited the generalizability of findings due to this population's characteristics. The key limitations with this population are their age, gender, ethnicity, and level of education. As the majority of the sample was under the age of 25 this limits the generalizability of the relations between these study variables beyond young adulthood. The young age of the present sample may account for the very small number of significant correlations found between resting BP and the psychosocial variables; indeed it is well established that aging is associated with increases in resting BP (Burt et al., 1995; Kelley & Kelley, 2001; Rodriguez, Labarthe, Huang, Lopez-Gomez, 1994). A further limitation related to the sample composition is that the majority of the participants were female, although this is not typical for gender compositions in hostility and BP research samples.

Second, the present study design could have been enhanced through inclusion of reactive and recovery BP measurement. Research in this area suggests that the key difference between individuals who score high versus those who score lower on these psychosocial traits lies not in their baseline resting BP, but rather in how quickly (or slowly) someone returns to their baseline resting BP. Reactive and recovery BP were not assessed in the present study given that the relations of these psychosocial variable relations with resting BP had not been examined in the extant research literature. Accordingly, a baseline study was needed prior to examining reactive and recovery BP's relations with hostility, constructive verbal anger, and humor styles. It seems likely that the associations between reactive and recovery BP with the psychosocial variables examined here may be more significant. Indeed, researchers have found empirical evidence to support this claim with hostility and anger (Anderson, Linden, & Habra, 2005; Fredrickson et al., 2000). Thus, the present findings and implications are restricted to resting BP, and an examination of reactive and recovery BP with hostility, constructive verbal anger, and humor styles, may be a fruitful avenue for future research.

Third, as this study is a correlational design (i.e., given that there was no manipulation of IVs), causal inferences cannot be drawn between the predictors and outcome criteria. A future viable avenue of research would be to manipulate the design, for instance, examining the comparative magnitudes of associations between psychosocial variables and reactive/recovery

BP vs. resting BP. Such a design, while outside the scope of the present study, would permit direct comparisons of how different BP states could be differentially impacted by psychosocial phenomena.

A final limitation is that the present study includes only quantitative measures, which obviously says little about potential qualitative differences between participants scoring along the continuum of the examined psychosocial variables. These differences could significantly augment our understanding of the interrelations between the variables examined in the present study. For instance, it is possible that self-perception about one's humor and its role in one's well-being (i.e., the humor-health hypothesis) is a placebo that in and of itself provides physical benefits, apart from the person's humor.

6.3 Strengths of the Present Study

These limitations aside, there are at least three important study strengths that have implications for the impact and contribution of this body of work to the extant hostility-humor-BP literature. One such strength is the number of resting BP readings measured. Taking six BP measurements allowed for a greater number of readings to be used in the calculation of mean resting BP. Although the time commitment to take six readings resulted in the overall study protocol exceeding 30 minutes, which consequently extended the overall period of data collection, the numerous BP readings allowed for a more reliable and accurate mean BP calculation. This is an enhancement on past research given that the majority of studies examining BP in relation to psychosocial variables involved two to four BP measurements, arguably resulting in less representative resting BP means.

A second strength of the present study concerns aspects of the design features in the administration of the self-report personality measures as well as the measures themselves. The inclusion of multiple meaningful psychosocial variables theorized to be predictors of resting BP through regression analyses, enabled the examination of key hypotheses in the prediction of resting BP. Importantly, although self-report inventories can be impacted by response bias (e.g., social desirability), the nature of the study measures offset this concern. For instance, Martin et al. (2003) took steps to measure social desirability bias when developing the HSQ, and found that the affiliative, self-enhancing, and self-defeating humor scales were unrelated to the measure of social desirability they used. They also found that the aggressive humor scale was significantly negatively correlated with social desirability, suggesting that social desirability is

not a concern with persons who endorse aggressive humor. With regards to the CMH and social desirability, the majority of researchers examining hostility and BP over the past 15 years have not expressed concerns with social desirability. This, coupled with the fact that the psychosocial measures were procedurally administered in a randomized order, helped possible concerns regarding method variance.

A third strength of the present investigation is that the data were collected over one calendar year. Due to resting BP being influenced by external stressors, to varying degrees, certain periods of data collection (e.g., during mid-term exams) may have had participants with resting BP readings higher than their normal resting BP readings. By collecting data throughout the calendar year that concern is minimized. Furthermore, participants were examined in the morning and afternoon, which then takes into account various bio-behavioural effects on resting BP (e.g., individuals drinking coffee in the morning to be alert for the day).

6.4 Conclusions and Directions for Future Research

Future research should attempt to replicate the present study with a community sample in order to determine if the same relations exist within a more diverse and older population. Given the relative good health and healthy resting BP readings of the present sample, it is possible that the relations between hostility, humor styles, constructive anger, and resting BP could become more significant within an older sample. This is highly plausible considering that researchers have consistently found that high BP prevalence increases with age (Pleis & Lethbridge-Cejku, 2006; Pleis, Lucas, & Ward, 2009; Robitaille et al., 2012). In addition, having a sample that is more heterogeneous would likely result in findings that differ from the present study.

It would also be beneficial to examine the same variables included in the present study using multiple methods; for instance, including the observer report for the CAV to examine whether there are significant differences between the self-report and observer report versions of the CAV. Such a design feature would facilitate an extension of the present study's hypotheses to examine whether the method used (i.e., self-report vs. observer rating) has an impact on findings. This is highly plausible given that the present study's self-report CAV findings significantly differ from the findings of Davidson et al. (1999) and Davidson et al. (2000), which both used the observer report CAV.

As alluded to above, a further potentially promising avenue of research would be to create an experimental design that involves the presentation of stressful stimuli, in order to

measure not only resting BP, but also reactive and recovery BP. One effective approach to do this would be to involve an interpersonal stressor such as the Expanded Structured Interview (Hall, Davidson, MacGregor, & MacLean, 1998), which provides an opportunity for participants to express anger or hostility. Although hostility or anger can be elicited in various experimental conditions, it is interpersonal stressors, like the condition of the ESI, that are most likely to elicit physiological reactivity associated with hostility and anger (Smith & Pope, 1990).

Statistically significant differences were observed between males and females, such that males had higher resting BP, significantly higher hostility, and significantly higher humor style scores, with the exception of affiliative humor. Due to these significant differences between males and females, future researchers should consider including biological sex as a moderator in the relations between the psychosocial variables and outcome variables examined in the present study. By including biological sex as a moderator in future studies, observed results could be significantly different from the present study, which could help account for the particular findings of the present study.

It would also be valuable to investigate the relations between resting BP and humor clusters. Understanding that the context in which a person is in will influence his/her humor style helps provide a more accurate and stable depiction of a person's use of humor styles. Examining humor style clusters is one avenue of research that warrants further exploration. The present study, in some aspects, is a preliminary exploration of the relations between the examined psychosocial factors theorized to be associated with resting BP. Future researchers may significantly benefit from taking a more nuanced approach in measuring humor's relation to BP and any other health variables.

Another valuable avenue of research would be to examine more nuanced dimensions of personality, such as conscientiousness and neuroticism of the five-factor model. Based on the conceptual explanations of conscientiousness and research that has found conscientiousness related traits to be negatively associated with risk taking behaviours (Bogg & Roberts, 2004; MacLaren, Best, Dixon, & Harrigan, 2011; Merritt & Tharp, 2013) and positively associated with all salubrious health related behaviors (Bogg & Roberts, 2004), I would anticipate that conscientiousness would be associated with lower resting BP. Conversely, based on conceptual definitions of neuroticism being associated with negative emotionality, such as anger and hostility, and research findings that suggest neuroticism is associated with more risk-taking

behaviors (MacLaren et al., 2011; Merritt & Tharp, 2013; Terracciano & Costa, 2004), I would anticipate that neuroticism would likely be associated with higher resting BP. Broad personality dimensions such as neuroticism and conscientiousness, as opposed to the more narrow personality traits examined in the present study, may have more significant associations with resting BP.

While the findings between adaptive humor styles and resting BP may be modest, they provide insight into the inter-dependence between psychosocial factors and resting BP. In light of hypertension's rising prevalence rates mixed with its substantial health care costs and high proportion of diagnosed cases being primary hypertension, a greater understanding of psychosocial factors related to hypertension still remains paramount. This study is one step in systematically examining the complex relations between psychosocial factors and resting BP. Taken together, the current findings highlight the importance of future examinations of psychosocial factors that may be related to hypertension development. Understanding how psychosocial variables work either in isolation or in tandem to influence health variables may lead to comprehensive knowledge applications to prevent hypertension.

REFERENCES

Alexander, F. (1939). Emotional factors in essential hypertension. *Psychosomatic Medicine, 1,* 173-179. Retrieved from http://www.psychosomaticmedicine.org

Anderson, J. C., Linden, W., & Habra, M. E. (2005). The importance of examining blood pressure reactivity and recovery in anger provocation research. *International Journal of Psychophysiology, 57,* 159-163. doi: 10.1016/j.ijpsycho.2004.12.011

Angerer, P., Siebert, U., Kothny, W., Muhlbauer, D., Mudra, H., & von Schacky, C. (2000). Impact of social support, cynical hostility and anger expression on progression of coronary atherosclerosis. *Journal of the American College of Cardiology, 36,* 1781-1788. doi: 10.1016/S0735-1097(00)00944-X

Appel, L. J., Moore, T. J., Obarzanek, E., Vollmer, W. M., Svetkey, L. P., Sacks, F. M., . . . Harsha, D. W. (1997). A clinical trial of the effects of dietary patterns on blood pressure. *The New England Journal of Medicine, 336,* 1117-1124. doi: 10.10156/NEJM199704173361601

Barefoot, J. C., Dahlstrom, G. W., & Williams, R. B., Jr. (1983). Hostility, CHD incidence, and total mortality: A 25-year follow-up study of 255 physicians. *Psychosomatic Medicine, 45,* 59-63. Retrieved from http://www.psychosomaticmedicine.org

Barefoot, J. C., Dodge, K. A., Peterson, B. L., Dahlstrom, G., & Williams, R. B., Jr. (1989). The Cook-Medley Hostility Scale: Item content and ability to predict survival. *Psychosomatic Medicine, 51,* 46-57. Retrieved from http://www.psychosomaticmedicine.org

Beck, A. T., Rush, A. J., Shaw, B. F., & Emery, G. (1979). Cognitive therapy of depression. New York, NY: Guilford Press.

Bogg, T., & Roberts, B. W. (2004). Conscientiousness and health-related behaviors: A meta-analysis of the leading behavioral contributors to mortality. *Psychological Bulletin, 130,* 887-919. doi: 10.1037/0033-2909.130.6.887

Bowen, K. S., Uchino, B. N., Birmingham, W., Carlisle, W., Smith, T. W., & Light, K. C. (2014). The stress-buffering effects of functional support on ambulatory blood pressure. *Health Psychology, 33,* 1440-1443. doi: 10.1037/hea0000005

Boyce, J. A., & Kuijer, R. G. (2015). Perceived stress and freshman weight change: The moderating role of baseline body mass index. *Physiology & Behavior, 139,* 491-496. doi: 10.1016/j.physbeh.2014.12.011

Bressler, E. R., & Balshine, S. (2006). The influence of humor on desirability. *Evolution and Human Behavior*, *27*, 29-39. doi: 10.1016/j.evolhumbehav.2005.06.002

Buck, A., Williams, D. R., Musick, M. A., & Sternthal, M. J. (2009). An examination of the relationship between multiple dimensions of religiosity, blood pressure, and hypertension. *Social Science and Medicine*, *68*, 314-322. doi: 10.1016/j.socscimed.2008.10.010.

Burt, V. L., Whelton, P., Roccella, E. J., Brown, C., Cutler, J. A., Higgins, M., . . . Labarthe, D. (1995). Prevalence of hypertension in the US adult population results from the Third National Health and Nutrition Examination Survey, 1988-1991. *Hypertension*, *25*(3), 305-313. doi: 10.1161/01.HYP.25.3.305

Cami, S. M., Bray, G. A., Bouchard, C., Greenway, F. L., Johnson, W. D., Newton, R. L., . . . Katzmarzyk, P. T. (2011). The relationship of waist circumference and BMI to visceral, subcutaneous, and total body fat: Sex and race differences. *Obesity*, *19*, 402-408. doi: 10.1038/oby.2010.248

Campbell, L., Martin, R. A., & Ward, J. R. (2008). An observational study of humor use while resolving conflict in dating couples. *Personal Relationships*, *15*, 41-55. doi: 10.1111/j.1475-6811.2007.00183.x

Celso, B. G., Ebener, D. J., & Burkhead, E. J. (2003). Humor coping, health status, and life satisfaction among older adults residing in assisted living facilities. *Aging & Mental Health*, *7*(6), 438-445. doi: 10.1080/13607860310001594691

Chambers, L. A. (1999). *The relation among self-reported constructive and destructive anger, verbal behaviour and resting blood pressure* (Doctoral Dissertation). Retrieved from ProQuest Dissertations & Theses Full Text. (Access No. NQ57361)

Chida, Y., & Steptoe, A. (2009). The association of anger and hostility with future coronary heart disease: A meta-analytic review of prospective evidence. *Journal of the American College of Cardiology*, *53*, 936-946. doi: 10.1016/j.jacc.2008.11.044

Chobanian, A. V. (2009). The hypertension paradox—more uncontrolled disease despite improved therapy. *The New England Journal of Medicine, 361*, 878-887. doi: 10.1056/NEJMsa0903829

Chobanian, A. V., Bakris, G. L., Black, H. R., Cushman, W. C., Green, L. A., Izzo, J. I., . . . National High Blood Pressure Education Program Coordinating Committee. (2003).

Seventh report of the Joint National Committee on prevention, detection, evaluation, and treatment of high blood pressure. *Hypertension*, *42*, 1206-1252. doi: 10.1161/01.HYP.0000107251.49515.c2

Christopher, J. C., Richardson, F. C., & Slife, B. D. (2008). Thinking through positive psychology. *Theory and Psychology*, *18*(5), 555-561. doi: 10.1177/0959354308093395

Cook, W. W., & Medley, D. M. (1954). Proposed hostility and pharisaic-virtue scales for the MMPI. *The Journal of Applied Psychology*, *38*, 414-418. doi: 10.1037/h0060667

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*. *16*, 297-334. doi: 10.1007/BF02310555

Cutler, J. A., Sorlie, P. D., Wolz, M., Thom, T., Fields, L. E., & Rocella, E. J. (2008). Trends in hypertension prevalence, awareness, treatment, and control rates in United States adults between 1988-1994 and 1999-2004. *Hypertension*, *52*, 818-827. doi: 10.1161/HYPERTENSIONAHA.108.113357

Dalton, M., Cameron, A. J., Zimmet, P. Z., Shaw, J. E., Jolley, D., Dunstan, D. W., & Welborn, T. A. (2003). Waist circumference, waist-hip ratio and body mass index and their correlation with cardiovascular disease risk factors in Australian adults. *Journal of Internal Medicine*, *254*, 555-563. doi: 10.1111/j.1365-2796.2003.01229.x

Dauchet, L., Kesse-Guyot, E., Czernichow, S., Bertrais, S., Estaquio, C., Peneau, S., . . . Hercberg, S. (2007). Dietary patterns and blood pressure change over 5-yr follow-up in the SU.VI.MAX cohort. *American Journal of Clinical Nutrition*, *85*, 1650-1656. Retrieved from http://www.ajcn.nutrition.org

Davidson, K., Hall, P., & MacGregor, M. (1996). Gender differences in the relation between interview-derived hostility scores and resting blood pressure. *Journal of Behavioral Medicine*, *19*(2), 185-201. doi: 10.1007/BF01857606

Davidson, K., MacGregor, M. Wm., Stuhr, J., Dixon, K., & MacLean, D. (2000). Constructive anger verbal behavior predicts blood pressure in a population-based sample. *Health Psychology*, *19*, 55-64. doi: 10.1037/0278-6133.19.1.55

Davidson, K., MacGregor, M. Wm., Stuhr, J., & Gidron, Y. (1999). Increasing constructive anger verbal behavior decreases resting blood pressure: A secondary analysis of a randomized controlled hostility intervention. *International Journal of Behavioral Medicine*, *6*(3), 268-278. doi: 10.1207/s15327558ijbm0603_5

Davis, M. C., Matthews, K. A., & McGrath, C. E. (2000). Hostile attitudes predict elevated vascular resistance during interpersonal stress in men and women. *Psychosomatic Medicine*, *62*, 17–25. Retrieved from http://www.psychosomaticmedicine.com

Dyck, K. T. H., & Holtzman, S. (2013). Understanding humor styles and well-being: The importance of social relationships and gender. *Personality and Individual Differences*. *55*, 53-58. doi: 10.1016/j.paid.2013.01.023

Erickson, S. J., & Feldstein, S. W. (2007). Adolescent humor and its relationships to coping, defense strategies, psychological distress, and well-being. *Child Psychiatry Human Development*, *37*, 255-271. doi: 10.1007/s10578-006-0034-5

Franco, O. H., Peeters, A., Bonneux, L., & de Laet, C. (2005). Blood pressure in adulthood and life expectancy with cardiovascular disease in men and women: Life course analysis. *Hypertension*, *46*(2), 280-286. doi: 10.1161/01.HYP.0000173433.67426.9b

Fredrickson, B. L., Maynard, K. E., Helms, M. J., Haney, T. L., Siegler, I. C., & Barefoot, J. C. (2000). Hostility predicts magnitude and duration of blood pressure response to anger. *Journal of Behavioral Medicine*, *23*(3), 229-243. doi: 10.1023/A:1005596208324

Frese, E. M., Fick, A., & Sadowsky, H. S. (2011). Blood pressure measurement guidelines for physical therapists. *Cardiopulmonary Physical Therapy Journal*, *22*, 5-12. Retrieved from http://www.cpptjournal.org

Fry, P. (1995). Perfectionism, humor, and optimism as moderators of health outcomes and determinants of coping styles of women executives. *Genetic, Social, and General Psychology Monographs*, *121*(2), 211-245. Retrieved from http://www.tandfonline.com

Gaziano, T. A., Bitton, A., Anand, S., & Weinstein, M. C. (2009). The global cost of nonoptimal blood pressure. *Journal of Hypertension*, *27*, 1472-1477. doi: 10.1097/HJH.0b013e32832a9ba3

Gelber, R. P., Gaziano, J. M., Manson, J. E., Buring, J. E., & Sesso, H. D. (2007). A prospective study of body mass index and the risk of developing hypertension in men. *American Journal of Hypertension*, *20*, 370-377. doi: 10.1016/j.amjhyper.2006.10.011

Gelkopf, M., Kreitler, S., & Sigal, M. (1993). Laughter in a psychiatric ward: Somatic, emotional, social, and clinical influences on schizophrenic patients. *The Journal of Nervous and Mental Disease*, *181*(5), 283-289. Retrieved from http://journals.lww.com/jonmd/pages/default.aspx

Gerin, W., Davidson, K. W., Christenfeld, N. J. S., Goyal, T., & Schwartz, J. E. (2006). The role of angry rumination and distraction in blood pressure recovery from emotional arousal. *Psychosomatic Medicine, 68*, 64-72. doi: 10.1097/01.psy.0000195747.12404.aa

Gidron, Y., Davidson, K., & Bata, I. (1999). The short-term effects of a hostility-reduction intervention on male coronary heart disease patients. *Health Psychology*, *18*(4), 416-420. doi: 10.1037/0278-6133.18.4.416

Gillen, M. M., & Lefkowitz, E. S. (2012). Gender and racial/ethnic differences in body image development among college students. *Body Image*, *9*(1), 126-130. doi: 10.1016/j.bodyim.2011.09.004

Glynn, L. M., Christenfeld, N., & Gerin, W. (2002). The role of rumination in recovery from reactivity: Cardiovascular consequences of emotional states. *Psychosomatic Medicine*, *63*, 714–726. doi: 10.1097/01.PSY.0000031574.42041.23

Guerrero, C., & Palmero, F. (2010). Impact of defensive hostility in cardiovascular disease. *Behavioral Medicine, 36*, 77-84. doi: 10.1080/08964280903521289

Hackam, D. G., Quinn, R. R., Ravani, P., Rabi, D. M., Dasgupta, K., Daskalopoulou, S. S., . . . Canadian Hypertension Education Program. (2013). The 2013 Canadian Hypertension Education Program recommendations for blood pressure measurement, diagnosis, assessment of risk, prevention, and treatment of hypertension. *The Canadian Journal of Cardiology*, *29*, 528-542. doi: 10.1016/j.cjca.2013.01.005

Hagberg, J. M., Park, J.-J., & Brown, M. D. (2000). The role of exercise training in the treatment of hypertension: An update. *Sports Medicine, 30*, 193-206. doi: 10.2165/00007256-200030030-00004

Hall, J. A. (2013). Humor in long-term romantic relationships: The association of general humor styles and relationship-specific functions with relationship satisfaction. *Western Journal of Communication*, *77*, 272-292. doi: 10.1080/10570314.2012.757796

Hall, P., Davidson, K., MacGregor, M., & MacLean, D. (1998). *Expanded Structured Interview administration manual: Nova Scotia Health Survey 1995 (NSHS-95;* Tech. Rep. No. 1). Halifax, Nova Scotia: Dalhousie University, Heart Health Nova Scotia.

Haukkala, A., Konttinen, H., Laatikainen, T., Kawachi, I., & Uutela, A. (2010). Hostility, anger control, and anger expression as predictors of cardiovascular disease. *Psychosomatic Medicine, 72*, 556-562. doi: 10.1097/PSY.0b013e3181dbab87

Hill, L. K., Kobayashi, I., & Hughes, J. W. (2007). Perceived racism and ambulatory blood pressure in African American college students. *Journal of Black Psychology*, *33*(4), 404-421. doi: 10.1177/0095798407307042

Holt-Lunstad, J., Smith, T. W., & Uchino, B. N. (2008). Can hostility interfere with the health benefits of giving and receiving social support? *Annals of Behavioral Medicine*, *35*, 319-330. doi: 10.1007/s12160-008-9041-z

Houston, B. K., & Vavak, C. R. (1991). Cynical hostility: Developmental factors, psychosocial correlates, and health behaviors. *Health Psychology*, *10*, 9-17. doi: 10.1037/0278-6133.101.9

Hughes, J. W., Fresco, D. M., Myerscough, R., van Dulmen, M. H., Carlson, L. E., & Josephson, R. (2013). Randomized controlled trial of mindfulness-based stress reduction for prehypertension. *Psychosomatic Medicine*, *75*(8), 721-728. doi: 10.1097/PSY.0b013e3182a3e4e5

Huang, Z., Willett, W. C., Manson, J. E., Rosner, B., Stampfer, M. J., Speizer, F. E., & Colditz, G. A. (1998). Body weight, weight change, and risk for hypertension in women. *Annals of Internal Medicine*, *128*, 81-88. doi:10.7326/0003-4819-128-2-199801150-00001

Jorgensen, R. S., & Houston, B. K. (1988). Cardiovascular reactivity, hostility, and family history of hypertension. *Psychotherapy and Psychosomatics*, *50*, 216–222. doi: 10.1159/000288123.

Jorgensen, R. S., Johnson, B. T., Kolodziej, M. E., & Schreer, G. E. (1996). Elevated blood pressure and personality: A meta-analytic review. *Psychological Bulletin*, *120*, 293-320. doi: 10.1037/0033-2909.120.2.293

Jorgensen, R. S., & Maisto, S. A. (2008). Alcohol consumption and prehypertension: An investigation of university youth. *Behavioral Medicine*, *34*, 21-28. doi: 10.3200/BMED.34.1.21-28

Kannel, W. B., Vasan, R. S., & Levy, D. (2003). Is the relation of systolic blood pressure to risk of cardiovascular disease continuous and graded, or are there critical levels? *Hypertension*, *42*, 453-456. doi: 10.1161/01.HYP.0000093382.69464.C4

Kelley, G. A., & Kelley, K. S. (2001). Aerobic exercise and resting blood pressure in older adults A meta-analytic review of randomized controlled trials. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, *56*(5), M298-M303.

doi: 10.1093/gerona/56.5.M298

Klem, L. (1995). In L. G. Grimm & P. R. Yarnold (Eds.). *Reading and understanding multivariate statistics* (pp. 65-97.). Washington, DC: American Psychological Association.

Koskenvuo, M., Kaprio, J., Rose, R. J., Kesaniemi, A., Sarna, S., Heikkila, K., & Langinvainio, H. (1988). Hostility as a risk factor for mortality and ischemic heart disease in men. *Psychosomatic Medicine, 50*, 330-340. Retrieved from http://www.psychosomaticmedicine.com

Kuiper, N. A., & Martin, R. A. (1998). Laughter and stress in daily life: Relation to positive and negative affect. *Motivation and Emotion, 22*, 133-153. doi: 10.1023/A:1021392305352

Kupper, N., Pelle, A., & Denollet, J. (2013). Association of Type D personality with the autonomic and hemodynamic response to the cold pressor test. *Psychophysiology*, *50*(12), 1194-1201. doi: 10.1111/psyp.12133

Lackner, H. K., Weiss, E. M., Schulter, G., Hinghofer-Szalkay, H., Samson, A. C., & Papousek, I. (2013). I got it! Transient cardiovascular response to the perception of humor. *Biological Psychology, 93*, 33-40. doi: 10.1016/j.biopsycho.2013.01.014

Lefcourt, H. M., Davidson, K., Prkachin, K. M., & Mills, D. E. (1997). Humor as a stress moderator in the prediction of blood pressure obtained during five stressful tasks. *Journal of Research in Personality*, *31*, 523-542. doi: 10.1006/jrpe.1997.2191

Lefcourt, H. M., Davidson-Katz, K., & Kueneman, K. (1990). Humor and immune-system functioning. *Humor: International Journal of Humor Research*, *3*(3), 305-321. doi: 10.15 15/humr.1990.3.3.305

Leiker, M., & Hailey, B. J. (1988). A link between hostility and disease: Poor health habits? *Behavioral Medicine*, *14*(3), 129-133. doi: 10.1080/08964289.1988.9935136

Leist, A. K., & Muller, D. (2013). Humor types show different patterns of self-regulation, self-esteem, and well-being. *Journal of Happiness Studies*, *14*, 551-569. doi:10.1007/s10902-012-9342-6

Liehr, P., Meininger, J. C., Mueller, W. H., Chan, W., Frazier, L., & Reyes, L. R. (2000). Psychometric testing of the adolescent version of the Cook Medley Hostility Scale. *Issues in Comprehensive Pediatric Nursing*, *23*(2), 103-116. doi:10.1080/01460860050121420

Linden, W., Hogan, B. E., Rutledge, T., Chawla, A., Lenz, J. W., & Leung, D. (2003). There is more to anger coping than “in” or “out”. *Emotion*, *3*(1), 12-29. doi: 10.1037/1528-3542.31.12

MacLaren, V. V., Best, L. A., Dixon, M. J., & Harrigan, K. A. (2011). Problem gambling and the five factor model in university students. *Personality and Individual Differences*, *50*, 335-338. doi: 10.1016/j.paid.2010.10.011

Martin, R. A. (2001). Humor, laughter, and physical health: Methodological issues and research findings. *Psychological Bulletin*, *127*, 504-519. doi: 10.1037/0033-2909.127.4.504

Martin, R. A., (2002). Is laughter the best medicine? Humor, laughter, and physical health. *Current Directions in Psychological Science*, *11*(6), 216-220. doi: 10.1111/1467-8721.00204

Martin, R. A., & Lefcourt, H. M. (2004). Sense of humor and physical health: Theoretical issues, recent findings, and future directions. *Humor*, *17*(1/2), 1-20. doi: 10.1515/humr.2004.005

Martin, R. A., Puhlik-Doris, P., Larsen, G., Gray, J., & Weir, K. (2003). Individual differences in uses of humor and their relation to psychological well-being: Development of the Humor Styles Questionnaire. *Journal of Research in Personality*, *37*, 48-75. doi: 10.1016/S0092-6566(02)00534-2

Marziali, E., McDonald, L., & Donahue, P. (2008). The role of coping humor in the physical and mental health of older adults. *Aging and Mental Health*. *12*(6), 713-718. doi: 10.1080/13607860802154374

Matthews, K. A., Woodall, K. L., & Allen, M. T. (1993). Cardiovascular reactivity to stress predicts future blood pressure status. Hypertension, 22, 479-485. Retrieved from http://hyper.ahajournals.org

McCann, B. S., & Matthews, K. A. (1988). Influences of potential for hostility, Type A behavior, and parental history of hypertension on adolescents' cardiovascular responses during stress. *Psychophysiology,* 25,503-511. doi: 10.1111/j.1469-8986.1988.tb01885.x

McClelland, D. C., & Cheriff, A. D. (1997). The immunoenhancing effects of humor on secretory IgA and resistance to respiratory infections. *Psychology and Health*, *12*(3), 329-344. doi: 10.1080/08870449708406711

McCreaddie, M., & Wiggins, S. (2008). The purpose and function of humor in health, health care and nursing: A narrative review. *Journal of Advanced Nursing*, *61*(6), 584-595.

doi: 10.1111/j.1365-2648.2007.04548.x

McGraw, A. P., & Warren, C. (2010). Benign violations: Making immoral behavior funny. *Psychological Science*, *21*(8), 1141-1149. doi: 10.1177/0956797610376073

Mente, A., & Helmers, K. F. (1999). Defensive hostility and cardiovascular responses to stress in young men. *Personality and Individual Differences*, *27*, 683-694. doi: 10.1016/S0191-8869(98)00268-2

Merritt, C. J., & Tharp, I. J. (2013). Personality, self-efficacy and risk-taking in parkour (free-running). *Psychology of Sport and Exercise, 14*, 608-611. doi: 10.1016/j.psychsport.2013.03.001

Miller, T. Q., Smith, T. W., Turner, C. W., Guijarro, M. L., & Hallet, A. J. (1996). Meta-analytic review of research on hostility and physical health. *Psychological Bulletin, 119*, 322-348. doi: 10.1037/0033-2909.119.2.322

Mosby, Inc. (2013). Mosby's dictionary of medicine, nursing, & health professions (9th Ed). St. Louis, Missouri: Elsevier.

Mwendwa, D. T., Ali, M. K., Sims, R. C., Madhere, S., Levy, S.-A., Callender, C. O, & Campbell, A. L. (2013). Psychometric properties of the Cook Medley Hostility Scale and its association with inflammatory markers in African Americans. *Psychology, Health & Medicine, 18*, 431-444. doi: 10.1080/13548506.2012.736623

Neumann, S. A., Maier, K. J., Brown, J. P., Giggey, P. P., Cooper, D. C., Synowski, S. J., . . . Waldstein, S. R. (2011). Cardiovascular and psychological reactivity and recovery from harassment in a biracial sample of high and low hostile men and women. *International Journal of Behavioral Medicine*, *18*(1), 52-64. doi: 10.1007/s12529-010-9110-0

Neumann, S. A., Waldstein, S. R., Sellers, J. J., III, Thayer, J. F., & Sorkin, J. D. (2004). Hostility and distraction have differential influences on cardiovascular recovery from anger recall in women. *Health Psychology, 23*(6), 631-640. doi: 10.1037/0278-6133.23.6.631

Nevill, A. M., Stewart, A. D., Olds, T., & Holder, R. (2006). Relationship between adiposity and body size reveals limitations of BMI. *American Journal of Physical Anthropology*, *129*, 151-156. doi: 10.1002/ajpa.20262

O'Brien, E., Mee, F., Atkins, N., & O'Malley, K. (1991). Accuracy of the SpaceLabs 90207 determined by the British Hypertension Society Protocol. *Journal of Hypertension*, *9*(suppl 5), S25-S31. Retrieved from http://journals.lww.com

O'Brien, E., Waeber, B., Parati, G., Staessen, J., & Myers, M. G. (2001). Blood pressure measuring devices: Recommendations of the European Society of Hypertension. *British Medical Journal*, *322*, 531-536. Retrieved from http://www.bmj.com

Okasha, M., McCarron, P., McEwen, J., & Smith, G. D. (2000). Determinants of adolescent blood pressure: Findings from the Glasgow University student cohort. *Journal of Human Hypertension 14*, 117–124. Retrieved from http://www.nature.com/jhh

Oshtega, Y., Zhang, G., Sorlie, P., Hughes, J. P., Reed-Gillette, D. S., Nwankwo, T., …U.S. Department of Health and Human Services (2012). *Blood pressure randomized methodology study comparing automatic oscillometric and mercury sphygmomanometer devices: National health and nutrition examination survey, 2009-2010* (Report No. 59). Retrieved from www.cdc.gov

Parker, E. D., Schmitz, K. H., Jacobs, D. R., Dengel, D. R., & Schreiner, P. J. (2007). Physical activity in young adults and incident hypertension over 15 years of follow-up: The CARDIA Study. *American Journal of Public Health*, *97*, 703–709. doi: 10.2105/AJPH.2004.055889

Patra, J., Popova, S., Rehm, J., Bondy, S., Flint, R., & Giesbrecht, N. (2007). Economic Cost of Chronic Disease in Canada (1995-2003). *Ontario Chronic Disease Prevention Alliance and the Ontario Public Health Association*. Retrieved from http://www.ocdpa.on.ca

Pereira, M. A., Folsom, A. R., McGovern, P. G., Carpenter, M., Arnett, D. K., Liao, D., . . . Hutchinson, R. G. (1999). Physical activity and incident hypertension in Black and White adults: The Atherosclerosis Risk in Communities Study. *Preventive Medicine*, *28*, 304-312. doi: 10.1006/pmed.1998.0431

Pickering, T. G., Hall, J. E., Appel, L. J., Falkner, B. E., Graves, J., Hill, M. N., . . . American Heart Association Council (2005). Recommendations for blood pressure measurement in humans and experimental animals: Part 1: Blood pressure measurement in humans: A statement for professionals from the subcommittee of Professional and Public Education of the American Heart Association Council on high blood pressure research. *Hypertension*, *45*(1), 142-161. doi: 10.1161/01.HYP.0000150859.47929.8[e]

Pleis, J. R., & Lethbridge-Cejku, M. (2006). Summary health statistics for U.S. adults: National Health interview survey, 2005 (Series 10(232)). Vital and Health Statistics. Retrieved from the National Center for Health Statistics: http://europepmc.org

Pleis J. R., Lucas, J. W., &, Ward, B. W. (2009). Summary health statistics for U.S. adults: National Health Interview Survey, 2008 (Series 10(242)). Vital and Health Statistics. Retrieved from the National Center for Health Statistics: http://europepmc.org

Pointer, M. A., Livingston, J. N., Yancey, S., McClelland, M. K., & Bukoski, R. D. (2008). Psychosocial factors contribute to resting blood pressure in African Americans. *Ethnicity & Disease, 18,* 289-293. Retrieved from http://www.ncbi.nlm.nih.gov

Prentice, A. M., & Jebb, S. A. (2001). Beyond body mass index. *Obesity Reviews, 2,* 141-147. Retrieved from http://onlinelibrary.wiley.com

Quinn, R. R., Hemmelgarn, B. R., Padwal, R. S., Myers, M. G., Cloutier, L., Bolli, P., . . . Canadian Hypertension Education Program. (2010). The 2010 Canadian Hypertension Education Program recommendations for the management of hypertension: Part I—Blood pressure measurement diagnosis and assessment of risk. *The Canadian Journal of Cardiology, 26* (5), 241-248. Retrieved from http://www.cardiologyacademicpress.com

Quinn, C. A., Rollock, D., & Vrana, S. R. (2014). A test of Spielberger's state-trait theory of anger with adolescents: Five hypotheses. *Emotion, 14*, 74-84. doi: 10.1037/a0034031

Robitaille, C., Dai, S., Waters, C., Loukine, L., Bancej, C., Quach, S., . . . Quan, H. (2012). Diagnosed hypertension in Canada: incidence, prevalence and associated mortality. *Canadian Medical Association Journal, 184*(1), E49–E56. doi: 10.1503/cmaj.101863

Rodriguez, B. L., Labarthe, D. R., Huang, B., & Lopez-Gomez, J. (1994). Rise of blood pressure with age. New evidence of population differences. *Hypertension, 24*(6), 779-785. doi: 10.1161/01.HYP.24.6.779

Romero-Corral, A., Somers, V. K., Sierra-Johnson, J., Thomas, R. J., Collazo-Clavell, M. L., Korinek, J., . . . Lopez-Jimenez, F. (2008). Accuracy of body mass index in diagnosing obesity in the adult general population. *International Journal of Obesity, 32*, 959-966. doi: 10.1038/ijo.2008.11

Rutledge, T., & Hogan, B. E. (2002). A quantitative review of prospective evidence linking psychological factors with hypertension development. *Psychosomatic Medicine, 64*, 758-766. doi: 10.1097/01.PSY.0000031578.42041.1

Saroglou, V., & Scariot, C. (2002). Humor Styles Questionnaire: Personality and educational correlates in Belgian high school and college students. *European Journal of Personality*, *16*, 43-54. doi: 10.1002/per.430

Scherwitz, L., Perkins, L, Chesney, M., & Hughes, G. (1991). Cook-Medley Hostility scale and subsets: Relationship to demographic and psychosocial characteristics in young adults in the CARDIA study. *Psychosomatic Medicine, 53,* 36-49. Retrieved from http://www.psychosomaticmedicine.org

Selem, S. de C., de Castro, M. A., Cesar, C. L. G., Marchioni, D. M. L., & Fisberg, R. M. (2014). Associations between dietary patterns and self-reported hypertension among Brazilian adults: A cross-sectional population-based study. *Journal of the Academy of Nutrition and Dietetics*, *114*(8), 1216-1222. doi: 10.1016/j.jand.2014.01.007

Seligman, M. E. P., & Csikszentmihalyi, M. (2000). Positive psychology: An introduction. *American Psychologist*, *55*(1), 5-14. doi: 10.1037//0003-066X.55.1.5

Seligman, M. E. P., Steen, T. A., Park, N., & Peterson, C. (2005). Positive psychology progress: Empirical validation of interventions. *American Psychologist*, *60*(5), 410-421. doi: 10.1037/0003-066X.60.5.410

Sesso, H. D., Cook, N. R., Buring, J. E., Manson, J. E., & Gaziano, J. M. (2008). Dietary factors, exercise, and cardiovascular risk: Alcohol consumption and the risk of hypertension in women and men. *Hypertension*, *51,* 1080-1087. doi:10.1161/HYPERTENSIONAHA.107.104968

Shekelle, R. B., Gale, M., Ostfeld, A. M., & Oglesby, P. (1983). Hostility, risk of coronary heart disease, and mortality. *Psychosomatic Medicine, 45*, 109-114. Retrieved from http://www .psychosomaticmedicine.org

Siegel, J. M. (1986). The Multidimensional Anger Inventory. *Journal of Personality and Social Psychology*. *51*, 191-200. doi: 10.1037/0022-3514.51.1.191

Siegler, I. C., Peterson, B. L., Barefoot, J. C., & Williams, R. B. (1992). Hostility during late adolescence predicts coronary risk factors at mid-life. *American Journal of Epidemiology*, *136*(2), 146-154. Retrieved from http://www.aje.oxfordjournals.org

Simon, J. M. (1990). Humor and its relationship to perceived health, life satisfaction, and morale in older adults. *Issues in Mental Health Nursing*, *11*(1), 17-31. Retrieved from http://www.informahealthcare.com

Smith, T. W. (1992). Hostility and health: Current status of a psychosomatic hypothesis. *Health Psychology*, *11*(3), 139-150. doi: 10.1037/0278-6133.11.3.139

Smith, T. W., & Frohm, K. D. (1985). What's so unhealthy about hostility? Construct validity and psychosocial correlates of the Cook and Medley Ho Scale. *Health Psychology*, *4*, 503-520. doi: 10.1037/0278-6133.4.6.503

Smith, T. W., & Pope, M. K. (1990). Cynical hostility as a health risk: Current status and future directions. *Journal of Social Behavior & Personality*, *5*(1), 77-88. Retrieved from http://www.sbp-journal.com

Spielberger, C. D. (1999). *State-Trait Anger Expression Inventory-2: Professional Manual*. Odessa, FL: Psychological Assessment Resources, Inc.

Spielberger, C. D., Jacobs, G. A., Russell, S., & Crane, R. S. (1983). Assessment of anger: The State-Trait Anger Scale. In J. N. Butcher & C. D. Spielberger (Eds.), *Advances in personality assessment* (Vol. 2, pp. 52-76). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Spielberger, C. D., Johnson, E. H., Russell, S. F., Crane, R. J., Jacobs, G. A., & Worden, T. J. (1985). The experience and expression of anger: Construction and validation of an anger expression scale. In M. A. Chesney & R. H. Rosenman (Eds.), *Anger and hostility in cardiovascular and behavioral medicine* (pp. 5-30). Washington, DC: Hemisphere Publishing.

Sprecher, S., & Regan, P. C. (2002). Liking some things (in some people) more than others: Partner preferences in romantic relationships and friendships. *Journal of Social and Personal Relationships*, *19*, 463-481. doi: 10.1177/0265407502019004048

Stein, E. R., & Smith, B. W. (2015). Social support attenuates the harmful effects of stress in healthy adult women. *Social Science & Medicine*, *146*, 129-136. doi: 10.1016/j.socscimed.2015.10.038

Stoney, C. M., & Engebretson, T. O. (1994). Anger and hostility: Potential mediators of the gender difference in coronary heart disease. In A. W. Siegman & T. W. Smith (Eds.), *Anger, hostility, and the heart*. Hillsdale, NJ: Erlbaum.

Streiner, D. L. (2003). Starting at the beginning: An introduction to coefficient alpha and internal consistency. *Journal of Personality Assessment*, *80*(1), 99-103. doi: 10.1207/S15327752JPA8001_18

Suls, J., & Wan, C. K. (1993). The relationship between trait hostility and cardiovascular reactivity: A quantitative review and analysis. *Psychophysiology, 30,* 615-626. doi: 10.1111/j.1469-8986.1993.tb02087.x

Suls, J., Wan, C. K., & Costa, P. T., Jr. (1995). Relationship of trait anger to resting blood pressure: A meta-analysis. *Health Psychology, 14,* 444-456. doi: 10.1037/0278-6133.14.5.444

Svebak, S., Martin, R. A., & Holmen, J. (2004). The prevalence of sense of humor in a large, unselected county population in Norway: Relations with age, sex, and some health indicators. *Humor, 17,* 121-134. doi: 10.1515/humr.2004.001

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education, 2,* 53-55. doi: 10.5116/ijme.4dfb.8dfd

Taylor, M. K., Larson, G. E., Lauby, M. D. H., Padilla, G. A., Wilson, I. E., Schmied, E. A., . . . Morgan, C. A., III. (2014). Sex differences in cardiovascular and subjective stress reactions: Prospective evidence in a realistic military setting. *Stress, 17,* 70-78. doi: 10.3109/10253890.2013.869208

Terracciano, A., & Costa, P. T., Jr. (2004). Smoking and the five-factor model of personality. *Addiction, 99,* 472-481. doi: 10.1111/j.1360-0443.2004.00687.x

Trevino, B., & Ernst, F.A. (2012). Skin tone, racism, locus of control, hostility, and blood pressure in Hispanic college students. *Hispanic Journal of Behavioral Sciences*, *34*(2), 340-348. doi: 10.1177/0739986311435900

Tucker, R. P., Wingate, L. R., O'Keefe, V. M., Slish, M. L., Judah, M. R., & Rhoades-Kerswill, S. (2013). The moderating effect of humor style on the relationship between interpersonal predictors of suicide and suicidal ideation. *Personality and Individual Differences, 54,* 610-615. doi: 1016/j.paid.2012.11.023

Uehara, Y., Shin, W. S., Watanabe, T., Osanai, T., Miyazaki, M., Kanase, H., . . . Toyo-Oka, T. (1998). A hypertensive father, but not hypertensive mother, determines blood pressure in normotensive male offspring through body mass index. *Journal of Human Hypertension, 12*(7), 441-445. doi: 10.1038/sj.jhh.1000646

Vasan, R. S., Larsen, M. G., Leip, E. P., Kannel, W. B., & Levy, D. (2001). Assessment of frequency of progression to hypertension in non-hypertensive participants in the Framingham Heart Study: A cohort study. *The Lancet, 358,* 1682–1686.

doi: 10.1016/S0140-6736(01)06710-1

Vella, E. J., Kamarck, T. W., & Shiffman, S. (2008). Hostility moderates the effects of social support and intimacy on blood pressure in daily social interactions. *Health Psychology*, *27*(2), 155-162. doi: 10.1037/0278-6133.27.2(Suppl.).S155

Versey, H. S., & Kaplan, G. A. (2012). Mediation and moderation of the association between cynical hostility and systolic blood pressure in low-income women. *Health Education and Behavior*, *39*(2), 219-228. doi: 10.1177/1090198111414884

Weisenberg, M., Raz, T., & Hener, T. (1998). Effect of humor and tragedy on discomfort tolerance. *Perceptual and Motor Skills*, *78*, 632-634. doi: 10.2466/pms.1994.78.2.632

Weisenberg, M., Tepper, I., & Schwarzwald, J. (1995). Humor as a cognitive technique for increasing pain tolerance. *Pain*, *63*, 207-212. doi: 10.1016/0304-3959(95)00046-U

White, S., & Camarena, P. (1989). Laughter as a stress reducer in small groups. *Humor: International Journal of Humor Research*, *2*, 73-79. doi: 10.1515/humr.1989.2.1.73

Wiernik, E., Pannier, B., Czernichow, S., Nabi, H., Hanon, O., Simon, T., . . . Lemogne, C. (2013). Occupational status moderates the association between current perceived stress and high blood pressure: Evidence from the IPC Cohort study. *Hypertension*, *61*, 571-577. doi: 10.1161/HYPERTENSIONAHA.111.00302

Wilkins, K., Campbell, N.R.C., Joffres, M. R., McAlister, F. A., Nichol, M., Quach, S., . . .Tremblay, M. S. (2010). Blood pressure in Canadian adults. *Health Reports*, *21*, 1-10. Retrieved from http://www.statcan.gc.ca

Williams, R. B., Barefoot, J. C., & Shekelle, R. B. (1985). The health consequences of hostility. In M. A. Chesney, & R. H. Rosenman (Eds.), *Anger and hostility in cardiovascular and behavioral disorders* (pp. 173-185). Washington, DC: Hemisphere.

World Health Organization (1998): *Obesity, preventing and managing the global epidemic. Report of a WHO Consultation on Obesity*. Retrieved from http://www.who.int

World Health Organization. (2013). *A global brief on hypertension: Silent killer, global public health crisis* (WHO Reference NO: WHO/DCO/WHD/2013.2). Retrieved from http://www.who.int

Wright, L. B., Gregoski, M. J., Tingen, M. S., Barnes, V. A., & Treiber, F. A. (2011). Impact of stress reduction interventions on hostility and ambulatory systolic blood pressure in African American adolescents. *Journal of Black Psychology*, *37*, 210-233.

doi: 10.1177/0095798410380203

Wyer, R. S., & Collins, J. E. (1992). A theory of humor elicitation. *Psychological Review*, *99*(4), 663-688. doi: 10.1037//0033-295X.99.4.663

Zhang, J., Niaura, R., Todaro, J. F., McCaffery, J. M., Shen, B.-J., Spiro, A., III., & Ward, K. D. (2005). Suppressed hostility predicted hypertension incidence among middle-aged men: The Normative Aging Study. *Journal of Behavioral Medicine*, *28*(5), 443-454. doi: 10.1007/s10865-005-9016-5

Zillman, D., Rockwell, S. Schweitzer, K., & Sundar, S. S. (1993). Does humor facilitate coping with physical discomfort. *Motivation and Emotion*, *17*(1), 1-21. doi: 10.10007/BF00995204

APPENDICES

Appendix A

Cook-Medley Hostility Scale

This inventory consists of a number of statements. Read each statement and decide whether it is true or false as applied to you. If a statement is true or mostly true as applied to you, select "TRUE". If a statement is false or mostly false as applied to you, select "FALSE". If the item does not apply to you or if it is something that you don't know about respond false. Remember to give **your own** opinion of yourself.

A = True

B = False

1. I prefer to pass by school friends, or people I know but have not seen for a long time, unless they speak to me first.
2. I am likely not to speak to until spoken to.
3. I have sometimes stayed away from another person because I feared doing or saying something that I might regret afterwards.
4. I am quite often not in on the gossip and talk of the group I belong to.
5. When I take a new job, I like to be tipped off on who should be gotten next to.
6. I am against giving money to beggars.
7. I like to keep people guessing what I'm going to do next.
8. I frequently ask people for advice.
9. It makes me feel like a failure when I hear of the success of someone I know well.
10. When a man is with a woman he is usually thinking about things related to her sex.
11. People can pretty easily change me even though I thought that my mind was already made up on a subject.
12. Someone has it in for me.
13. I commonly wonder what hidden reason another person may have for doing something nice for me.
14. I feel that I have often been punished without cause.
15. My relatives are nearly all in sympathy with me.

16. My ways of doing things are apt to be misunderstood by others.
17. I have often felt that strangers were looking at me critically.
18. I am sure I am being talked about.
19. I tend to be on my guard with people who are somewhat more friendly than I had expected.
20. The man who had most to do with me when I was a child (such as my father, stepfather, etc.) was very strict with me.
21. I have often found people jealous of my good ideas, just because they had not thought of them first.
22. I have frequently worked under people who seem to have things arranged so that they get credit for good work but are able to pass off mistakes onto those under them.
23. Sometimes I am sure that other people can tell what I am thinking.
24. It makes me impatient to have people ask for my advice or otherwise interrupt me when I am working on something important.
25. Some of my family have habits that bother and annoy me very much.
26. People often disappoint me.
27. I am not easily angered.
28. There are certain people whom I dislike very much and I am inwardly pleased when they are catching it for something they have done.
29. When someone does me a wrong, I feel I should pay him back if I can, just for the principle of the thing.
30. I don't blame anyone for trying to grab everything he can get in this world.
31. I can be friendly with people who do things which I consider wrong.
32. I do not blame a person for taking advantage of someone who lays himself open to it.
33. I would certainly enjoy beating a crook at his own game.
34. I have at times had to be rough with people who were rude or annoying.
35. I am often inclined to go out of my way to win a point with someone who has opposed me.
36. I do not try to cover up my poor opinion or pity of a person so that he won't know how I feel.
37. I strongly defend my own opinions as a rule.
38. I have often had to take orders from someone who did not know as much as I did.
39. I think a great many people exaggerate their misfortunes in order to gain the sympathy and help of others.

40. It takes a lot of argument to convince most people of the truth.
41. I think most people would lie to get ahead.
42. Most people are honest chiefly through fear of being caught.
43. Most people will use somewhat unfair means to gain profit or advantage rather than lose it.
44. No one cares much what happens to you.
45. It is safer to trust nobody.
46. Most people make friends because friends are likely to be useful to them.
47. Most people inwardly dislike putting themselves out to help other people.
48. I have often met people who were supposed to be experts who were no better than I.
49. People generally demand more respect for their own rights than they are willing to allow for others.
50. A large number of people are guilty of bad sexual conduct.

Appendix B

Constructive Verbal Anger Scale

A number of statements that people use to describe the reasons for, and consequences of, discussing their anger are given below. Read each statement and then, using the scale that follows, select the option that corresponds to how often you feel or act in the manner described. There are no right or wrong answers. Do not spend too much time on any one statement. Use the following scale to record your answers:

1 2 3 4

Almost Never Sometimes Often Almost Always

I DISCUSS MY ANGER ...

1. to solve problems
2. to see if others can help me come up with constructive solutions
3. to see if a resolution to the situation can be found
4. to try and understand the point of view of the other person
5. to better understand the other person's possible role in the situation
6. to minimise future conflict
7. to deal with the situation more constructively next time
8. so that both sides come out feeling good

AFTER DISCUSSING MY ANGER …

9. I have a better understanding of the person I am angry with
10. I feel better about the other person
11. I feel closer to a resolution
12. things don't look as bad as I thought they did

Appendix C

Humor Styles Questionnaire

People experience and express humor in many different ways. Below is a list of statements describing different ways in which humor might be experienced. Please read each statement carefully, and indicate the degree to which you agree or disagree with it. Please respond as honestly and objectively as you can. Use the following scale:

Totally Disagree	Moderately Disagree	Slightly Disagree	Neither Agree nor Disagree	Slightly Agree	Moderately Agree	Totally Agree
1	2	3	4	5	6	7

1. I usually don't laugh or joke around much with other people. 1 2 3 4 5 6 7
2. If I am feeling depressed, I can usually cheer myself up with humor. 1 2 3 4 5 6 7
3. If someone makes a mistake, I will often tease them about it. 1 2 3 4 5 6 7
4. I let people laugh at me or make fun at my expense more than I should. 1 2 3 4 5 6 7
5. I don't have to work very hard at making other people laugh -- I seem to be a naturally humorous person. 1 2 3 4 5 6 7
6. Even when I'm by myself, I'm often amused by the absurdities of life. 1 2 3 4 5 6 7
7. People are never offended or hurt by my sense of humor. 1 2 3 4 5 6 7
8. I will often get carried away in putting myself down if it makes my family or friends laugh. 1 2 3 4 5 6 7
9. I rarely make other people laugh by telling funny stories about myself. 1 2 3 4 5 6 7
10. If I am feeling upset or unhappy I usually try to think of something funny about the situation to make myself feel better. 1 2 3 4 5 6 7
11. When telling jokes or saying funny things, I am usually not very concerned about how other people are taking it. 1 2 3 4 5 6 7
12. I often try to make people like or accept me more by saying something funny about my own weaknesses, blunders, or faults. 1 2 3 4 5 6 7
13. I laugh and joke a lot with my closest friends. 1 2 3 4 5 6 7

14. My humorous outlook on life keeps me from getting overly upset or depressed about things.
1 2 3 4 5 6 7

15. I do not like it when people use humor as a way of criticizing or putting someone down.
1 2 3 4 5 6 7

16. I don't often say funny things to put myself down. 1 2 3 4 5 6 7

17. I usually don't like to tell jokes or amuse people. 1 2 3 4 5 6 7

18. If I'm by myself and I'm feeling unhappy, I make an effort to think of something funny to cheer myself up. 1 2 3 4 5 6 7

19. Sometimes I think of something that is so funny that I can't stop myself from saying it, even if it is not appropriate for the situation. 1 2 3 4 5 6 7

20. I often go overboard in putting myself down when I am making jokes or trying to be funny.
1 2 3 4 5 6 7

21. I enjoy making people laugh. 1 2 3 4 5 6 7

22. If I am feeling sad or upset, I usually lose my sense of humor. 1 2 3 4 5 6 7

23. I never participate in laughing at others even if all my friends are doing it.
1 2 3 4 5 6 7

24. When I am with friends or family, I often seem to be the one that other people make fun of or joke about. 1 2 3 4 5 6 7

25. I don't often joke around with my friends. 1 2 3 4 5 6 7

26. It is my experience that thinking about some amusing aspect of a situation is often a very effective way of coping with problems. 1 2 3 4 5 6 7

27. If I don't like someone, I often use humor or teasing to put them down. 1 2 3 4 5 6 7

28. If I am having problems or feeling unhappy, I often cover it up by joking around, so that even my closest friends don't know how I really feel. 1 2 3 4 5 6 7

29. I usually can't think of witty things to say when I'm with other people. 1 2 3 4 5 6 7

30. I don't need to be with other people to feel amused -- I can usually find things to laugh about even when I'm by myself. 1 2 3 4 5 6 7

31. Even if something is really funny to me, I will not laugh or joke about it if someone will be offended. 1 2 3 4 5 6 7

32. Letting others laugh at me is my way of keeping my friends and family in good spirits.
1 2 3 4 5 6 7

Appendix D

Health and Demographic Questionnaire

1. ID #: _____
2. Place of Birth: _____

   city province country
3. Age: _____
4. Sex: M F
5. Ethnicity: 1st Nations ___ African-Canadian ___ Asian ___ Hispanic ___ Inuit ___ Metis ___ White ___ Other _____
6. Are you currently in a romantic relationship? YES ___ NO ___
7. What is your current marital status?

   a. Single

   b. Married or living with a partner

   If so, how long? _____ years _____ months

   c. Separated

   d. Divorced

   e. Widowed
8. How much do you weigh? _____ lbs or _____ kg
9. How tall are you? _____ ft ____ inches or _____ cm

PHYSICAL ACTIVITY

10. Have you had any regular physical exercise (e.g. walking, cycling, dancing, etc.) in the past week? YES____ NO ___
11. Have you had any regular physical exercise in the last month?

    YES___ NO ___ DON'T KNOW ___
12. How many hours have you engaged in light exercise (e.g. aerobics, walking, etc.) in the past week?

    _____ (please provide a number)
13. How many hours have you engaged in heavy exercise (e.g. heavy weight training, running, etc.) in the past week?

    _____ (please provide a number)

14. On average, how many hours of light sports (e.g. bowling, golf, dancing) have you played in the past week?

    _____ (please provide a number)

15. On average, how many hours of strenuous sports (e.g. basketball, skiing, football, etc.) have you played in the past week?

    _____ (please provide a number)

ALCOHOL HISTORY

16. Have you ever had a drink of any alcoholic beverage (e.g. wine, beer, liquor, etc.)?

    NO ___ YES ___ If NO, go to question #23.

17. In the past 12 months, have you consumed any alcoholic beverage?

    NO ___ YES ___

18. In the past 12 months, how often did you drink alcoholic beverages?

    a. Every day

    b. 4-6 days a week

    c. 2-3 days a week

    d. Once a week

    e. Once or twice a month

    f. Less than once a month

19. In the past month, how often did you drink alcoholic beverages?

    a. Every day

    b. 4-6 days a week

    c. 2-3 days a week

    d. Once a week

    e. Once or twice a month

    f. Less than once a month

20. In the past week, how often did you drink alcoholic beverages?

    a. Every day

    b. 4-6 days a week

    c. 2-3 days a week

    d. Once a week or none

21. What type of alcohol do you usually drink?

    Beer ___ Liquor ___ Spirit ___ Wine ___ Other ___

22. When you drink alcoholic beverages, how many drinks (one drink being 1 bottle of beer, or one 1 small glass of wine or 1 oz. of hard liquor) do you have on average per sitting?

    a. 5 + drinks

    b. 3 – 4 drinks

    c. 2 – 3 drinks

    d. 1 drink

    e. None

TOBACCO HISTORY

23. Have you ever used tobacco? YES ___ NO ___ If NO, go to question #35
24. Have you ever used tobacco daily? YES ___ NO ___
25. For how long did you use tobacco? _____ years and/or _____ months
26. When did you stop using tobacco? _____ years and/or _____ months
27. Are you currently taking medication to help you quit using tobacco? YES ___ NO ___
28. Do you currently use tobacco? YES ___ NO ___ If NO, go question #35
29. What kind of tobacco do you use? Cigarettes ___ Cigars ___ Pipes ___ Smokeless ___
30. How many cigarettes do you smoke PER DAY? (There are 20 cigarettes in a pack)

    NONE _____ or _____ per day or _____ packs per day

    How many cigars do you smoke PER DAY?

    NONE _____ or _____ per day

    How many full pipes do you smoke PER DAY?

    NONE _____ or _____ per day

31. How many years have you smoked? _____ years
32. When did you last smoke? _____ hours and/or _____ minutes ago
33. How many packs of tobacco do you chew PER DAY?

    NONE _____ or _____ per day

34. How many years have you used smokeless tobacco? _____ years

DIETARY HISTORY

35. Have you ever been on a diet? YES___ NO ___ If NO, go to question #39

36. In the past 12 months, how often have you dieted?
    a. Once
    b. 2 – 3 times
    c. 4 – 5 times
    d. Once every two months
    e. Once a month
    f. More than once a month
37. When you are on a diet, how long do you usually diet for?
    ____ Days or _____ Weeks or _____ Months
38. Are you currently on a diet? YES ___ NO ___
39. Do you drink coffee and/or other drinks containing caffeine? NO ___ YES ___
    If yes, how much do you drink daily? _____ or weekly? _____
40. Do you limit your salt intake? YES ___ NO ___
41. Do you avoid any foods for health reasons? NO ___ YES ___
    If YES, what are they?
    _____ _____
42. _____ _____

MEDICAL HISTORY

43. Does anyone in your family (e.g. grandparents, siblings, children, parents) have hypertension? NO ___ YES ___ DON'T KNOW ___ If NO or DON'T KNOW go to question #44
44. Who is this person, or persons in relation to yourself (e.g. parent(s), grandparent(s), sibling(s), child(ren)? _____
45. Do you have hypertension? NO ___ YES ___ DON'T KNOW ___
46. Does anyone in your family (e.g. grandparents, siblings, children, parents) have cardiovascular disease? NO ___ YES ___ DON'T KNOW ___ If NO or DON'T KNOW go to question #47
47. Who is this person, or persons, in relation to yourself (e.g. parent(s), grandparent(s), sibling(s), child(ren)? _____
48. Do you have cardiovascular disease? NO ___ YES ___ DON'T KNOW ___

49. Do you have any current medical or health problems? YES ___ NO ___

    If YES, please list the problem(s):

    _____ _____

MEDICATION HISTORY

50. Are you currently taking any medications? YES ___ NO ___
51. If YES, what are the names of the medications you take?

    _____ _____

Appendix E

Consent Form

Project Title: The relations between hostility, humor, and blood pressure (REB #13-403)

Researcher:
Darryl Quinlan
Graduate Student
Clinical Psychology
University of Saskatchewan
306-291-3544, darryl.quinlan@usask.ca

Supervisor:
Dr. Michael MacGregor
Psychology Department
306-966-2525
Michael.macgregor@usask.ca

Purpose(s) and Objective(s) of the Research:

The purpose of this study is to address the associations between the psychological variables of hostility and humor and blood pressure. Objectives of the research are to elaborate upon the relations between hostility and humor and blood pressure, and to provide the framework for future research in this area.

Procedures:

First you will have six resting blood pressure readings measured, each separated by three minute intervals, by an ambulatory blood pressure monitor that will be attached to your non-dominant arm. Then you will complete four self-report measures that will be used to assess hostility and humor as well as a demographic and health questionnaire. It should take approximately 40-45 minutes to complete the study. Please feel free to ask any questions regarding the procedures and purpose of the study or your role.

Potential Risks:

There are no foreseeable harms or risks to you by participating in this research**.** Should there be

any unanticipated effects, and you require some assistance, please contact the University of Saskatchewan's Student Counselling Services at 306-966-4920, located on the 3rd floor of Place Riel, which is free to students.

Potential Benefits:

The results of this study will further add to, and clarify, the current state of knowledge related to these psychological variables and blood pressure. There are no anticipated personal benefits other than contribution to research, although participants may come to understand themselves better through these measures.

Compensation:

Partial credit will be awarded towards your introductory psychology 120 or 121 class.

Confidentiality:

To safeguard the confidentiality of all participants, all data will be kept confidential by keeping the consent form separate from the data. When the data is collected, identification numbers will be assigned, and no link can be established between the consent form and data. All physical data will be kept in a locked filing cabinet inside of a secured and locked laboratory space belonging to the supervisor at the University of Saskatchewan. All data will be kept for a minimum of 5 years. When the data is no longer required, physical data will be disposed of using shredding and electronic data will be deleted beyond recovery.

Right to Withdraw:

Your participation is voluntary and you are free to only answer those questions that you are comfortable with. You may withdraw from the research project for any reason, at any time, without explanation, loss of research credit, or penalty of any sort. Whether you choose to participate or not will have no effect on your academic standing or how you will be treated. If you decide to withdraw, any data that you have contributed will be destroyed beyond recovery. Your right to withdraw will apply until the study is completed. After this date, it is possible that some form of research dissemination will have already occurred and it may not be possible to withdraw your data.

Follow up:

To obtain results from the study, please contact the primary contact person, Darryl Quinlan, at darryl.quinlan@usask.ca, or 306-291-3544. If and when you contact this person, you will be sent a summary of the results via email when available.

Questions or Concerns:

Should you have any additional concerns or questions, you can contact the primary contact person or principal investigator using the information listed on page 1. This research project has been approved on ethical grounds by the University of Saskatchewan Research Ethics Board (REB# 13-403) on January 6, 2014. Any questions regarding your rights as a participant may be addressed to that committee through the Research Ethics Office ethics.office@usask.ca (306) 966-2975. Out of town participants may call toll free 1(888) 966-2975.

Consent

SIGNED CONSENT

Your signature below indicates that you have read and understand the description provided; I have had an opportunity to ask questions and my/our questions have been answered. I consent to participate in the research project. A copy of this Consent Form has been given to me for my records.

_____	_____	_____
Name of Participant	*Signature*	*Date*

_____ _____

Researcher's Signature *Date*

A copy of this consent will be left with you, and a copy will be taken by the researcher.

Appendix F

Debriefing Form

Title

The relations between hostility, humor, and blood pressure (REB # 13-403)

Researcher

Darryl Quinlan
Graduate Student, Clinical Psychology
University of Saskatchewan
306-291-3544, darryl.quinlan@usask.ca

Supervisor

Michael MacGregor
Department of Psychology
University of Saskatchewan
306-966-2525, michael.macgregor@usask.ca

Purpose

The purpose of this study is to understand how anger, hostility, and humor are associated with blood pressure. The self-report surveys you completed provided information about these aspects of your personality. For example, they showed whether you use constructive anger, which ways you typically express anger, and how often you experience anger. They also assess which style of humor you use with others (e.g. self-enhancing, affiliative, aggressive, self-defeating). The blood pressure measurements provided information about your resting blood pressure and heart rate. This information will help us to examine blood pressure's relations between the personality traits of anger, hostility, and humor.

Confidentiality

All participants' information will be kept secure with a research identification number and the use of encryption. Electronic data will be encrypted and stored on a dedicated hard-drive within the laboratory space. Only the primary investigator and primary contact person will have access

to the collected data. All data will be stored for a minimum of 5 years. Every possible effort will be made to ensure that participants are not individually identifiable.

Use of data and dissemination of results

Data collected may be disseminated in journal articles, conference presentations and posters, and in theses. To avoid any possible identification of individual participants, all the data will be anonymous.

Contact person

If you have any questions about this study you may contact Michael MacGregor at 306-966-2525 or Darryl Quinlan at 306-291-3544 in the Department of Psychology at the University of Saskatchewan. Any questions regarding your rights as a participant may be addressed to that committee through the Research Ethics Office ethics.office@usask.ca (306) 966-2975. Out of town participants may call toll free (888) 966-2975.