5-2017

UNIVERSITY WELLNESS: A NUMBERS GAME – HOW HEALTH NUMBERS RELATE TO BLOOD PRESSURE

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by

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A Thesis

Presented to the Faculty of

The Graduate College at the University of Nebraska

In Partial Fulfillment of Requirements

For the Degree of Master of Science

Major: Nutrition and Health Sciences

Under the Supervision of Professor Virginia Chaidez

Lincoln, Nebraska

May, 2017

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University of Nebraska, 2017

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Background: Heart disease is the number one leading cause of death in the United States (CDC, 2016). People who have hypertension are at greater risk for other heart disease (World Heart Federation, 2017). Preventing hypertension through education of health numbers can greatly reduce the hypertension prevalence in the United States.

Objective: Determine the relationship between blood pressure and other health status indicators used in worksite wellness health fairs including; body mass index, waist circumference, stress, and time management.

Design: 156 participants at the University of Nebraska attended a wellness fair, in which blood pressure, body mass index, waist circumference, time management, and stress were assessed. Once data was obtained, analyses were performed to determine the relationship between blood pressure and all other assessments

Results: Stress and time management were not statistically significant correlated with blood pressure. Waist circumference and body mass index were statistically significant and positively correlated with blood pressure. Lastly, the odds ratio for BMI was the only significant ratio; the odds of having high blood pressure increase by 1.244 times for every one unit that BMI increases, holding the other variables constant.

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CHAPTER 1: INTRODUCTION

Blood Pressure and Contributing Factors

Blood pressure is the amount of pressure exerted against the arteries during the contraction and resting phases of the heart. Blood pressure increases in result of weight gain, consuming a diet low in potassium and calcium or high in sodium, having little to no physical activity, and excessive alcohol consumption (Chobanian, 2003). Blood pressure is an important health number due to the risks associated with high blood pressure. High blood pressure increases the risk of myocardial infarction, heart failure, stroke, and kidney disease (Chobanian, 2003).

The purpose of this study was to examine relationships between time management, stress, and blood pressure, while controlling for other confounding variables. The findings from this study could be used to inform wellness staff when creating future programming.

Blood Pressure

Blood pressure has been a topic of interest since the early 1700's. Stephen Hales was the first person to record his experiment of examining blood pressure in a female horse. Hales was able to measure the horse's blood pressure through direct contact, inserting a fixed glass tube into an artery, determining the pressure by how far the blood traveled up the tube. This was the first of many attempts at determining what blood pressure was and how people could use it to identify non-visible signs of vascular diseases. Around 150 years later, Faivre was performing a surgery when he connected an artery to a mercury manometer and determined a reading of 120 mmHg in the femoral artery. He then took many more artery blood pressure readings throughout the body, including the brachial artery pressure, which was between 115 and 120 mmHg. Once he took all of the readings he determined a normal reading for systolic and diastolic blood pressure to be 120/80 mmHg (Booth, 1977). He knew this was not an appropriate way to routinely check blood pressure so further experiments continued to create an instrument that was easy for doctors to use in routine checkups. This early invention has helped medicine develop over the years and has helped in the early diagnosis and treatment of deadly diseases.

In 2015, 70 million U.S. adults reported having high blood pressure; only about 52% of these people reported to have their high blood pressure under control (CDC, 2015). High blood pressure or hypertension is defined as a resting systolic blood pressure greater than 140 mmHg and/or diastolic blood pressure above 90 mmHg (AHA, 2014). High blood pressure is often referred to as the “silent killer” because it normally does not show any signs or symptoms, and is only determined by checking your blood pressure regularly. Hypertension increases the risks for two of the leading causes of death in the United States, heart disease and stroke. Risk factors for developing hypertension, include health conditions, family history, and lifestyle factors (CDC, 2014). In a study performed by Al-Majed and Sadek (2012), it was found that 13.9% of male college students and 1.8% of female college students in Kuwait had hypertension, which raise a concern.

Eng, Moy, and Bulgiba (2016) performed as study on 1,365 employees at a public university in Malaysia who participated in their workplace health promotion program. They measured participants’ blood pressure at an annual health screening, followed up with at least one screening within a six-year period. They found that 56.7% of participants were at-risk of hypertension and 18.2% were hypertensive. The study determined that 83.4% of men and 68.2% of women had above normal blood pressure readings at baseline. The health promotion program included different events and resources for participants including: medical assessment, behavioral counseling, behavioral education, web-based health programs, training courses, health coaching, or social support groups. After six years and at least one follow up visit, the results found that overall the hypertension blood pressure readings decreased significantly: 2.34 mmHg systolic per year and 1.76 mmHg diastolic per year.

Lastly, in a study performed at The University of Alabama at Birmingham, 958 adults were evaluated on hypertension prevalence, awareness, treatment, and control. Buys et al. (2015), found that 76% of participants had hypertension, however not all participants were aware of their hypertension: 17% of participants with hypertension were unaware of their high blood pressure readings. When one is not aware of their hypertension, and it goes unnoticed for a long duration, it could have lasting effects to the cardiovascular system. Many people are unaware of their health numbers, in which they may be at higher risk for disease, and not know it.

Body Mass Index

Body mass index (BMI) is a measure of body fat based on height and weight that applies to adult men and women (NIH, 2016). BMI was first created in the 19^{th} century to determine body composition using weight adjusted for height (Hall & Cole, 2006). BMI compares weight in kilograms to height in meters squared [Weight (kilograms) / $Height^2$ (meters)], however it does not account for different types of tissues, such as muscle or fat. There are many health risks associated with having an abnormal BMI, such as Type 2

Diabetes, cardiovascular disease, depression, metabolic disease, and obesity (Hall & Cole, 2006).

In a study performed on Australian adults, it was shown that 59.8% of adults were either overweight or obese. Of those adults who were overweight or obese, 24% were also diagnosed with Type 2 Diabetes, 77% were pre-hypertensive, and 65% were diagnosed with dyslipidemia. When compared to the 40.2% of participants who had a normal BMI, only 2.2% were diagnosed with Type 2 Diabetes, 2.8% were hypertensive, and 12.8% were diagnosed with dyslipidemia (Dalton et al, 2003). Body mass index, blood pressure and cardiovascular disease have a strong, linear, and independent positive association (Wang et al, 2010). Body mass index classifies individuals into four categories (NIH, 2016). The four categories include Underweight <18.5 kg/m^2, Normal weight 18.5-24.9 kg/m^2, Overweight 25.0-29.9 kg/m^2, and Obesity >30.0 kg/m^2.

Al-Majed and Sadek (2012), found that overweight college students constituted a rather large portion of those who were placed into the hypertensive group. This helps validate the findings that blood pressure and body composition are related and one may impact the results of the other. Body mass index can be used as a preliminary assessment to determine if an individual is at high risk for disease, but individual must see physician for further assessment.

Waist Circumference

Waist circumference is a measurement taken between the top of the hipbones and at the bottom of the ribs, when all air has been expelled from the lungs (Heart, 2016). This measurement indicates the potential risk for developing obesity-related conditions or disease. These diseases include Type 2 Diabetes, high blood pressure, and coronary artery disease (CDC, 2015). Males with a waist circumference of greater than or equal to 40 inches or 102 centimeters have an increased risk for these diseases. Non-pregnant females with a waist circumference greater than 35 inches or 88 centimeters also have an increased risk for these diseases. Measuring waist circumference is also a pre-assessment for disease risk; an individual must see a physical for future assessment if above these numbers (CDC, 2015).

In a study performed by Dalton et al. (2003) it was found that 48.7% of male participants with a waist circumference over 102 centimeters had hypertension. It was also found that 46.8% of female participants with a waist circumference over 88 centimeters had hypertension. However, this study showed that the waist to hip ratio measurement provided a higher prevalence of hypertension, type 2 diabetes, and dyslipidemia among participants in the obesity category when compared to using waist circumference. It was discussed that when using the waist circumference measurement there were a higher number of participants who fell into the obesity category, but a lower percent of these participants had hypertension. When compared to the obesity group using the waist to hip ratio measurement, the number of participants who had hypertension was higher.

Stress

Stress can be measured using questionnaires or physiological markers. The main stress hormone that humans produce is called cortisol. When situations are normal, cortisol levels are highest in the morning hours, followed by a decline throughout the day, finally being replenished during the night. However, when one is presented with a stressful situation the hypothalamus-pituitary-adrenal gland is stimulated, in result producing an excess amount of cortisol, raising the levels. When measuring stress, measuring cortisol levels would be the preferred method of measurement (CSHS, 2007). Stress can also be measured using many different questionnaires. Popular stress questionnaires include Holmes and Rahe Life Stress Inventory and the Masstricht Assessment of Coping Strategies. The Life Stress Inventory by Holmes and Rahe, includes 43 questions about life events, from a traffic violation to the death of a spouse. Each question is assigned a point value, if the life event has occurred in the last year, the points are added to the total score. If the score is below 150 points, there is a low susceptibility to stress-induced breakdown. If the points are between 150-300, there is about a 50% chance of a major health breakdown in the upcoming two years. If the score is over 300 points, there is about an 80% chance of a major health breakdown in the upcoming two years (Holmes, 1967). The Maastricht questionnaire is a 37-item questionnaire, yes or no responses, asking about ability of physical state, emotions and mental activities in different situations (Rau, 2006). The Masstricht questionnaire has been validated using the construct validations process.

Stress can be caused by many factors including a variety of situations, environments, and roles (Rashid & Talib, 2015). Rashid performed a correlational study on 334 doctors who worked in Indian government hospitals, looking at how role stress is impacted based on demographic variables, gender, experience, specialization, and geographical areas (2015). She found that females experienced significantly more stress than their male counterparts. It was suggested that this might be due to the stress of home and job interface using the Organizational Role Stress scale, using content validity. It was also reported that participants in a disruptive ambience, based on geographical area; city or rural, had higher stress score than those in a peaceful ambience (Rashid, 2015).

A cohort study performed on 126 adult men, with white collar jobs in Eastern Germany by Rau 2006, was used to help determine the relationship between work stress and hypertension. Rau used multiple assessment tools to help determine stress including the Task Diagnosis Survey, substantive and discriminant validity, and the Maastricht questionnaire, construct validity. The Task Diagnosis Survey is a rated scale in which there are defined levels describing job characteristics. The rated scale is based on five groups including the areas of: technological and organizational work characteristics, work-related cooperation and communication, mental regulation requirements, learning potential, and responsibility. Rau determined that those who have a high isolated systolic blood pressure work more than twice as much overtime, compared to those who are normotensive. They are also more susceptible to disturbed unwinding or trouble relaxing, due to high stress using the Maastricht questionnaire (Rau, 2006).

Walders-Abramson (2014), performed a study on 497 youth in treatment for type 2 diabetes. The Yeaworth Adolescent Life Change Event survey was used to determine the frequency and self-rated distress associated with the occurrence of life events. The survey consisted of 33 items, asking participants to rate their response to life events including relationships, job, and school over the past year. Out of 497 participants about 50% of participants reported one or less major stressful life events in the past year. In result, Walders-Abramson found that stressful life events alone were not associated with a few components of metabolic syndrome including hypertension. There were a few major limitations with this study. The first limitation was there no validation process recorded for the Yeaworth Adolescent Life Change Event Scale. The second limitation was the population only included adolescents. Lastly, many of the participants did not report two or more stressful life events. Another study was performed in a similar manner however only with adults. The additional study was cross-sectional, performed by Pyykkonen, (2010), included 3,407 adults 18-78 years who had stressful life events. Pyykkonen used a questionnaire consisting of 15 events including finances, work, and health as stressful life events. Pyykkonen, found that these stressful life events were associated with a few of the metabolic disease risk factors, such as waist circumference, body mass index, and triglycerides. However, Pyykkonen, found that stressful life events did not significantly associate with other metabolic disease risk factors such as, cholesterol levels and blood pressure. A limitation to this study was that there was not a validation process in place for the questionnaire.

Stress is a complex construct; there are many definitions in the literature with varying meanings. “Stress is a psychological construct that people may experience on a daily basis” (Quick, 2001). “Stress has been defined traditionally either as a stimulus, often referred to as a stressor, that happens to the person such as a laboratory shock or loss of a job, or as a response characterized by physiological arousal and negative affect, especially anxiety” (Folkman, 2013). “Stress, defined as a state of threatened homeostasis, mobilizes a complex spectrum of adaptive physiologic and behavioral responses that aim to re-establish the challenged body homeostasis” (Kyrou, 2009).

The American Institute of Stress (2017) uses Hans Selye’s definition from 1936, “the non-specific response of the body to any demand for change”. Hans Selye was an endocrinologist who is known as the “Father” of the field of research by the Canadian

Medical Hall of Fame. He spent many years of his career studying responses to emotion, illness, and injury in the medical field (CMHF, 2006). According to Merriam-Webster stress is “a state of mental tension and worry caused by problems in your life, work, etc” (2015). The Medical Dictionary (2007) defines stress as “an organism's total response to environmental demands or pressures”. Stress can occur at many points in our daily lives, however prolonged stress can affect your overall health and ability to manage daily experiences. Stress has many symptoms such as; tension, anxiety about the future, loss of appetite, nightmares, anger, crying, sleep problems and in extreme situations, shock. However, this list is endless and differs for everyone (CDC, 2012). The American Institute of Stress states that stress is difficult to define because it is different for each person, using the following metaphor helps describe stress

> “A good example is afforded by observing passengers on a steep roller coaster ride. Some are hunched down in the back seats, eyes shut, jaws clenched and white knuckled with an iron grip on the retaining bar. They can’t wait for the ride in the torture chamber to end so they can get back on solid ground and scamper away. But up front are the wide-eyed thrill seekers, yelling and relishing each steep plunge who race to get on the very next ride. And in between you may find a few with an air of nonchalance that borders on boredom. So, was the roller coaster ride stressful?” (2017).

This metaphor aids in the explanation of how our perception of a situation can create a negative stressor creating a stressful situation.

Time Management

There is a limited amount of research in the literature about time management. According to Collins English Dictionary (2012), time management is “the analysis of how working hours are spent and the prioritization of tasks in order to maximize personal efficiency in the workplace”. Another source defined time management as “the ability to plan and control how you spend the hours in your day to effectively accomplish your goals” (Psychology Today, 2017). Lastly “time management” refers to the way that you organize and plan how long you spend on specific activities (mindtools.com, 2016). Everyday people experience a variety and number of tasks to accomplish. Some might use a to-do list, others might be able to remember every task; it is these techniques that help people to manage their time and accomplish every task.

In a cross-sectional study performed by Jex and Elacqua (1999), 525 employees completed a 13-question self-reported survey. The survey contained questions about conflict, role overload, work-family conflict, family-work conflict, strain, feelings of control over time, and time management behaviors (Jex, 1999). Jex also used a time management behaviors tool, developed by Macan (Macan, 1994). The time management behaviors assessment included a multi-dimensional 33-item scale based on goal setting and prioritization, mechanics of time management, and preference for organization with construct validity. Strain was measured using the General Health Questionnaire. The General Health Questionnaire was tested for reliability using Cronbach alpha coefficient. The General Health Questionnaire is a 10-item scale asking participants to indicate if they have had symptoms associated with poor mental and physical health over the previous six weeks. It was found in this study that feeling of control over time was associated with increased time management behaviors, which decreased strain. It also showed that with both increased feelings of control over time and time management behaviors there was a positive impact on mental and physical health, including amount of sleep, ability to concentrate, decision making, feelings of happiness, and confidence levels (Jex, 1999).

Macan (1994) performed a cross-sectional study on 177 participants. Participants completed a time management training and a survey of 33-time management behavior techniques using construct validity. It was found that the time management training was not effective for participants to adopt new time management behaviors. Those who set goals and priorities perceived they had control over time compared to those who were less likely to set goals and priorities. It was also found that those who perceived they had more control over time had more job satisfaction and reduced stress tension (Macan, 1994).

Wellness on Wheels

The University of Nebraska Wellness Initiative hosts Wellness on Wheels health screening events. These events provide free wellness screenings to all faculty, staff, students and spouses across the university's campus. These screenings include blood pressure, body mass index, waist circumference, lower body strength and balance, lower body flexibility, upper body mobility, stress, time management, and blood glucose and cholesterol, all of which are optional screenings (wellness.unl.edu, 2015). The data from Wellness on Wheels will be used in this project to determine relationships between assessments described below.

Conclusion

High blood pressure can be due to many factors. The literature suggests that increased BMI, waist circumference, and stress are associated with increases in blood pressure. What is less understood is the relationship between time management and the previously mentioned variables of interest. By having a better understanding of the relationships between time management, stress, BMI, waist circumference and blood pressure, the University of Nebraska-Lincoln Wellness Initiative can plan to program around the areas which need improvement. The preventative actions taken can help in reducing the risk of developing life-threatening diseases among faculty, staff and students at the University of Nebraska-Lincoln.

Table 1.1

Literature table for stress and time management

Reference	Purpose/Objective	Participants, Setting, Design	Measures, Outcomes	Results	Limitations	Validity
Stress						
Pyykkonen, 2010	1. To test associations between stressful life events, their accumulation, and metabolic syndrome in a large population 2. To test associations between stress and individual components related to metabolic syndrome	3,407 participants, 18-78 residing in Western Finland, population-based random sample, cross-sectional	*Independent variables:* Stressful life events: self-questionnaire 15 stressful life event items, 5- point scale; self-report weekly alcohol consumption (grams/wk), current smoker, exercise, education, family history of diabetes *Dependent variables:* Risk of metabolic syndrome	Participants who had stressful life events defined as moderately or extremely stressful life events on any of the 15 scenarios, including finances, work, and health, displayed higher levels of waist circumference, BMI, and triglycerides compared to normal or healthy ranges. However, stress did not associate significantly with Impaired Fasting Glycaemia (IFG), High-density Lipoprotein (HDL) cholesterol, or blood pressure	Findings may not generalize to different ethnic groups, only whites were examined, a bias toward the inclusion of younger, more educated, and healthier participants might diminish ability to find significant associations	Questionnaire consisting of 15 stressful life events-No validation process

Rashid, 2015	1.To investigate the nature and amount of role stress among doctors 2. To explore variation of role stress among doctors across demographic variables, gender, experience, specialization and geographical areas 3. To investigate various role stress coping styles 4. To propose remedial measures for management of stress	334 doctors at government hospitals, Central Kashmir, western UP, correlational	*Independent variables:* ORS Scale-Role Stress: 50 statements based on roles, 5-point scale; Role Pics-Coping strategies: instrument in which the participant is given 24 cartoon picture situations, asked to report how they would feel in each situation and how they would respond *Dependent variables:* Coping style: avoidance & approach	Senior doctors were found to be more stressed than younger counterparts because of their stress levels caused by work. Female doctors experience more stress than male counterparts; doctors in disturbed ambience have higher stress score than those in peaceful ambience; majority of doctors employ avoidance coping followed by approach coping.	Participants were doctors, did not include different occupations	Organizational Roles Stress ORS Scale-content validity; Role Pics-factor analysis validity
Rau, 2006	1. Relationship between work stress and hypertension (HTN) 2. unwinding after work and HTN, depend on criteria used for diagnosis of HTN	126 men, 20-66 years old, white-collar jobs, Eastern Germany, Cohort	*Independent variables*: TDS-analysis and evaluation of work technological and organizational work characteristics, cooperation, communication, mental regulation, responsibility; MQ- vital exhaustion tested, 37 item questionnaire, yes or no answers, questions ask about ability of physical state, emotions, and daily activities *Dependent variables:* Blood pressure & work stress	Normotensive (NT) avg 42 mins overtime (OT) OT/day; HT averaged 61 mins OT/day; OT work was assessed as a work-related stressor because OT increases demand on employee; participants with Isolated systolic hypertension (ISH) worked more than 2x as much OT than NT and Isolated diastolic hypertension(IDH); significantly more men with ISH had a disturbed ability to relax compared to NT	# of participants in each group were not the same, all groups contained smokers, study population was selective to male, white-collar workers	Task Diagnosis Survey (TDS)-Substantive & Discriminant Validity; Maastricht Questionnaire (MQ)-construct validity

Walders-Abramson, 2014	To examine relationship between stressful life events and physiological measures, medication adherence, depressive symptoms, and impaired quality of life in adolescents with recent onset of Type 2 Diabetes (T2D)	497 participants in final year of the Treatment Options for type 2 Diabetes in Adolescents and Youth clinical trial, randomized controlled cohort	*Independent variables:* Yeaworth Adolescent Life Change Event Scale: modified with supplemental material from Holmes and Rahe Social Readjustment Rating Scale, 33 items, 1 item for girls only related to menstrual cycles was excluded, 5-point scale *Dependent variables:* depressive symptoms, medication adherence, and quality of life	Total number of stressful life events: 33% none, 67% at least one, 47% at least two, 33% at least three and 20% four or more; no associations between stressful life event and exposure to physiological markers, including hypertension	Single time point measurement of life stressor inventory collected, data collection ranged from 2-6.5 years depending on randomization date, self-report of stressful life event exposure.	Yeaworth Adolescent Life Change Event Scale- no validation process recorded
Time Management						
Hafner, 2014	1. Examine the research on effects of time management training on perceived control of time and perceived stress among students 2. Look at the stability of the effects with two time points of measurement after training	48 local undergraduate students of medium sized German university, non-equivalent dependent variable	*Independent variable:* time management training, duration 4 hours *Dependent variable:* Time management behavior: questionnaire, 18 items 5-point scale, prioritizing, setting clear goals and monitoring; Perceived stress: mental fatigue, trouble relaxing, feelings of nervousness, 5 items 5-point scale; Perceived control of time: adoption & adaptation of	Trainees reported significant less perceived stress 2 weeks after training compared to pretest; four weeks after training participants reported less perceived stress and more perceived control of time; participants with little to no training prior to the study profited more verse those were exposed to some sort of previous training prior to the study	No control group, only one questionnaire or training went through validity testing, small sample size	Time Management Behavior Scale- construct validity

			Time Management Behavior Scale: 10 items 5-point scale, feeling in control of one’s time			
Jex, 1999	To examine whether time management behaviors moderated relations between stressors and strain	525 full-time employed men and women, University of Wisconsin Oshkosh, surveys distributed via instructor to students, cross-sectional	*Independent variables:* Role conflict: 8-items, assess workload demands by 5-point scale; work-family/family-work conflict: four item, “time-based” conflict between domains; time management: 33-item scale, goal setting, prioritizing, mechanics of time management (TM), preference for organization, 5-point scale. *Dependent variables:* Strain on mental and physical health: GHQ, 10 item scale, asked about experiencing number of symptoms associated with poor mental and physical health	TM behaviors were negatively associated with strain, were mediated by feelings of control over time. Regression analysis failed to provide support for TM as a moderator for stress. Stressors were positively associated with strain. Time management behavior was most strongly associated with feelings of control over time. Engaging in time management behaviors may have a positive impact on mental health of employees.	Self-reported data, all participants were pursuing graduate or undergraduate degrees on part-time basis, low reliabilities associated with the measures of work-family conflict and feelings of control over time.	Role Conflict- content validity; Work-family conflict & Family-work conflict- construct validity; General Health Questionnair e- Cronbach alpha coefficient validity; Time Management construct validity

Macan, 1994	To examine structure of the Time Management Behavior Scale (TMB) in an employed sample and to assess linkages among TM training, TM behaviors, perceived control over time, and job tensions.	177 useable surveys, Southwestern urban area, public social service agency and department of corrections system, cross-sectional, TM training was available for those who wanted to attend	*Independent variables:* *all were self-administered; TM training; yes or no; TM behaviors: 33-item scale, goal setting, prioritizing, mechanics of TM, preference for organization, 5 point scale; Perceived control over time: 5 items assessing how individuals believe they can directly affect their time spent, 5 point scale; Job satisfaction: 3 items, how satisfied an employee is with work in general; Job performance ratings: 5 item scale, 5 point scale, immediate supervisor performance ratings; Person and situational factors. *Dependent variables:* TM behaviors; perceived control over time; Job induced tension scale: 6 items, perceptions of pressures and frustrations stemming from their work; Somatic tension scale: examined possible outcomes of stress in terms of physical symptoms	All significant effects of TM training or engaging in TM behaviors on perceived control over time, job induced tension, and somatic tension were indirect. Employees who preferred organization when compared to those who did not prefer organization, reported less job-induced tension. TM training did not show effective adoption of new TM behaviors, however individuals who marked that they set goals and priorities preferred organization and perceived themselves to have greater control over time compared to those who marked that they did not.	Findings are applicable to only the TM training used	Time Management Behavior Scale- construct validity

Research Questions

1. Are time management and stress correlated?
2. Are time management and stress correlated with blood pressure?
3. Does stress mediate/moderate the relationship between time management and blood pressure?
4. Are body mass index and waist circumference correlated?
5. Do body mass index and waist circumference correlate with blood pressure?

Hypotheses

H_1: Time management and stress are negatively correlated.

H_2: Stress positively correlates with blood pressure.

H_3: Time management negatively correlates with blood pressure.

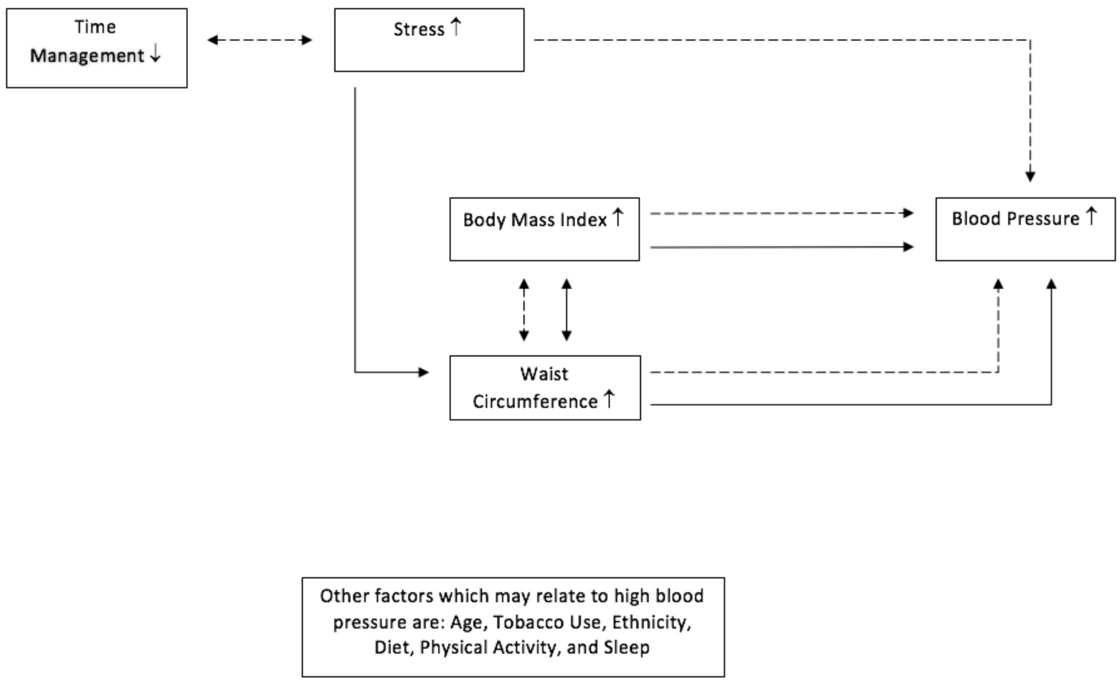
H_4: Stress mediates or moderates the relationship between time management and blood pressure.

H_5: Body mass index and waist circumference are positively correlated.

H_6: Body mass index and waist circumference are positively correlated with blood pressure.

Figure 1.1

Diagram of hypothesized interactions among variables.



*Solid lines represent previously established interactions between variables. Dashed lines represent hypothesized relationships between variables. Paths which have both solid and dashed lines are under investigation for this specific population.

CHAPTER 2: METHODS

Participants

Participants included 63 males and 93 female students and employees from the University of Nebraska. All participants included in the study were at least 19 years of age and were associated with the University as a student or employee.

Measures

Participants attended a "Wellness on Wheels" event located in the student union where they participated in five assessments: blood pressure, body mass index, waist circumference, time management, and stress assessment.

Blood pressure: readings were obtained using an Omron blood pressure monitor. Readings were recorded as a numerical value on a continuous scale, as well as categorical values. The systolic reading was recorded separately from the diastolic. Blood pressure scores were also classified into one of the following categories using the highest number from the reading; Normal ≤120/≤80 mmHg, Pre-hypertension 121-139/81-89 mmHg, or Hypertension >140/>90 mmHg.

Body mass index: height and weight were obtained using calibrated medical scale with a height rod. Measurements were recorded and used to determine a numerical value for body mass index. Body mass index (BMI) was determined using a BMI calculator and recorded. Participants were also categorized based on their BMI. Participants with a BMI of <18.5 kg*m^2 were considered normal, 18.5-24.9 kg*m^2 were considered overweight, 25.0-29.9 kg*m^2 were considered obese I, and greater than 30.0 kg*m^2 were considered obese IISF. Categories were recorded.

Waist circumference: measurement was obtained using a vinyl tape measure recording to the nearest half inch. Measurements were taken at the smallest part of the waist, just above the hip bones. Female categories were: <27.5 inches – very low risk, 27.5-35 inches – low risk, 35.5-43 inches – high risk, and >43 inches – very high risk. Male categories were: <31.5 inches – very low risk, 31.5-39 inches – low risk, 39.5-47 inches – high risk, and >47 inches – very high risk.

Time management: Time Management Self-Assessment is a 15-item questionnaire asking participants to rate themselves on general practices using a 5 point-scale, (1-Not at All, 2-Rarely, 3-Sometimes, 4-Often, 5-Very Often). Questions included items related to priority lists, completion of tasks, awareness of time commitments, and goal setting. The scores were added up and placed into one of the following categories: 15-30 points "Improvement Necessary", 31-45 points "Good Skills", and 46-75 points "Effective Skills". The higher the score, the better time management the participant recorded. The questionnaire was amended and printed with permission by http://mindtools.com. The original source of this tool did not perform validation tests, followed by no validation tests once amended by the Employee Assistance Program at the University of Nebraska.

Stress: Are You Stressed? Self-Assessment is a 20-item questionnaire with "yes" or "no" responses. The assessment asked about daily routines, how one reacts to situations, organization, relaxation and exercise, and ability to cope. The number of questions answered "yes" were added up, and placed into one of the following categories: 1-6 "Few Hassles", 7-12 "Good Control", 13-17 "Danger Watch Out!", 18+ "Stressed Out". The lower the score, resulted in a lower stress level by the participant. The assessment was taken from the University of Nebraska Employee Assistance Program. The University of Nebraska Employee Assistance Program developed this tool and to date, it has not undergone any process to assess its validity or reliability.

All data were collected and recorded anonymously on a carbon copy assessment document, one copy kept for the study, one copy given to the participant.

Procedure

This project has been approved by the University of Nebraska Institutional Review Board. All data was collected from the UNL Wellness Initiative with written consent to use by the initiative chair.

Participants were recruited through flyers via the Chancellor's Committee on Wellness electronic newsletter. The Chancellor's Committee on Wellness received the email list from previous events where participants who were interested in upcoming events signed up for a bi-weekly newsletter. Participants signed up for a time to attend "Wellness on Wheels" using an online registration site. All assessment readings were obtained at the "Wellness on Wheels" events.

Participants were welcomed by a wellness staff member and asked to begin with blood pressure. The staff member then explained they would take blood pressure by placing a cuff around their left arm. Once the digital cuff presented the reading, it was recorded on the assessment sheet. The participant was then asked to see the Employee Assistance Program (EAP) employee where they first administered the "Time Management Self-Assessment" and the "Are You Stressed? Self-Assessment". Each assessment was scored and written on the assessment document. The EAP employee then asked participants to go to the next station, where a trained wellness services staff member asked them to step behind a screen for privacy. Once behind the screen participants stepped onto a scale, weight was recorded in kilograms. They were then asked to turn around so their height could be measured using a height rod attached to the scale. Height was recorded in centimeters. Participants were then asked to meet with a health coach where they were encouraged to ask questions about the assessments that they participated in. The health coach then discussed the purpose of the assessments and offered additional resources including brochures and handouts with more information. The health coach then took the white carbon copy assessment document and gave the yellow carbon copy assessment document to the participant. The entire duration of the pre-assessment lasted about 20 minutes, unless the participant had many questions for the health coach.

Statistical Analyses

Descriptive statistics, Spearman correlations, linear regression model, and logistic regression model were computed to determine the relationships between variables. The Spearman correlation matrix was used to evaluate all variables, including categorical data. Logistic regressions was used to determine the effect of variables on the outcome of interest, high blood pressure. For the logistic regression model, high blood pressure was defined as having either systolic >140 mmHg or diastolic >90 mmHg.

CHAPTER 3: RESULTS

Table 3.1 and 3.2 illustrate descriptive data. This study population consisted of more females (60%) than males (40%), with a mean age of 43.8 years. Three-quarters (76%) of participants had never used tobacco products, while 8% were current users and the remaining 16% quit using tobacco products. More than one-third (39%) of our study population is considered overweight, and an additional 23% are considered obese. Regarding waist circumference, one-third of females in our population (33%) are considered at high risk and an additional 12% are very high risk for chronic disease. Males in our population have similar distribution with almost one-third (30%) in the high risk and 11% at very high risk for chronic disease. Most participants ranked their stress under control (good control, 34%; few hassles, 57%), whereas 9% of participants indicate stress levels of concern (7% watch out; 2% stressed out). The results for time management are similar where a majority of participants (87%) scored as having ‘effective skills’, 12% ‘good skills-could improve’ and 1% considered as ‘improvement necessary’ for time management. Nearly half (46%) of the population have normal blood pressure; whereas over half of the population are either pre-hypertensive (31%) or hypertensive (22%).

Table 3.3 shows the Spearman correlation table. Results show that time management and stress are positively correlated, rejecting H_1. It also shows that stress is positively correlated with systolic blood pressure; and negatively correlated with diastolic blood pressure. Neither correlation is statistically significant, rejecting H_2. Conversely, stress is positively correlated with waist circumference, although it is a weak correlation ($r=0.16$, $p=0.04$). Time management is negatively correlated with both systolic and diastolic blood pressure, however it is not statistically significant, rejecting H_3. Because H_3 was rejected, that is, the relationship between time management and blood pressure were not established, we did not test H_4 to explore stress as a mediating/moderating variable between time management and blood pressure. Waist circumference and body mass index are statistically significant and positively correlated, accepting H_5. Findings also indicate statistically significant positive correlations between waist circumference and both systolic and diastolic blood pressure, accepting H_6. Similarly, it also shows a statistically significant positive correlation between body mass index and both systolic and diastolic blood pressure, accepting H_6. The regression equation for reduced model for systolic blood pressure, Table 3.6, including BMI, Stress and Age is:

$$S\_BP = 113.94 + 1.00 \times BMI - 33.70 \times Stress1 - 35.99 \times Stress2 - 32.48 \times Stress3 + 0.35 \times Age$$

The regression equation for reduced model for diastolic blood pressure, Table 3.9, including BMI and Age is: $D\_BP = 44.11 + 0.94 \times BMI + 0.25 \times Age$

The results showed that high blood pressure is not related to waist circumference, stress, time management, and age based on the non-significant p-values, Table 3.10. The only effect with a significant p-value was body mass index, showing that the outcome of high blood pressure is related to BMI. The results also show that the odds ratio for BMI is 1.244, indicating that the odds of having high blood pressure increase by 1.244 times for every one unit that BMI increases, holding the other variables constant, Table 3.11. Table 3.11 also shows the 95% confidence interval, showing that the odds of having high blood pressure increase between 1.078 and 1.435 times for one unit increase in BMI, holding the other variables constant.

Table 3.1

Descriptive Data

Variable	Mean	Median	Mode	Range	Standard Deviation
Age	44	45	29	19-75	14.1
Systolic Blood Pressure	123	120.5	108	80-197	18.1
Diastolic Blood Pressure	81	79	77	58-149	12.5
Body Mass Index	26.9	26	24	17-52	5.7
Waist Circumference Male	38.6	38	35	26-57	6.4
Waist Circumference Female	35.5	35	32	25-49	6.6

Table 3.2

Variable Frequency

Variable		Number of participants	%
Gender			
	Male	63	40%
	Female	93	60%
Tobacco Use			
	Never Used	118	76%
	Quit 2+ years	16	10%
	Quit < 2 years	10	6%
	Smokes/Chews	12	8%
Blood Pressure			
	Normal	72	46%
	B1SWSGoEG	49	31%
	Hypertension	35	22%
Body Mass Index			
	Normal	61	39%
	Overweight	58	37%
	Obese I	27	17%
	Obese II	10	6%
Waist Circumference Male			
	Very Low Risk	7	11%
	Low Risk	30	48%
	High Risk	19	30%
	Very High Risk	7	11%
Waist Circumference Female			
	Very Low Risk	5	5%
	Low Risk	46	49%
	High Risk	31	33%
	Very High Risk	11	12%
Stress Level			
	Few Hassles	89	57%
	Good Control	53	34%
	Watch Out	11	7%
	Stressed Out	3	2%
Time Management			
	Effective Skills	136	87%
	Good Skills-Could Improve	18	12%
	Improvement Necessary	2	1%

Table 3.3

Spearman Correlation Coefficients, N=156

Prob> |r| under H0: Rho=0

	Systolic BP	Diastolic BP	BMI Calculated	WC Calculated	Stress	Time Management	Age
Systolic BP	1	**0.74947**	**0.36506**	**0.34516**	0.07864	-0.02398	**0.32101**
		<.0001	**<.0001**	**<.0001**	0.3292	0.7664	**<.0001**
Diastolic BP	0.74947	1	**0.51735**	**0.46412**	-0.04263	-0.09304	**0.29025**
	<.0001		**<.0001**	**<.0001**	0.5972	0.248	**0.0002**
BMI	0.36506	0.51735	1	**0.86523**	0.14272	-0.06654	0.08099
	<.0001	<.0001		**<.0001**	0.0755	0.4092	0.3148
WC	0.34516	0.46412	0.86523	1	**0.16214**	-0.08543	0.15692
	<.0001	<.0001	<.0001		**0.0432**	0.289	0.0504
Stress	0.07864	-0.04263	0.14272	0.16214	1	**0.4039**	0.06849
	0.3292	0.5972	0.0755	0.0432		**<.0001**	0.3956
Time Mgmt	-0.02398	-0.09304	-0.06654	-0.08543	0.4039	1	-0.00154
	0.7664	0.248	0.4092	0.289	<.0001		0.9848
Age	0.32101	0.29025	0.08099	0.15692	0.06849	-0.00154	1
	<.0001	0.0002	0.3148	0.0504	0.3956	0.9848	

*Bold indicates significant

Table 3.4

Model for Systolic Blood Pressure

Type I Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
BMI_CALC	1	147	26.29	<.0001
WC_CALC	1	147	1.12	0.2915
STRESS	3	147	5.51	0.0013
TM	2	147	0.5	0.6097
AGE	1	147	14.13	0.0002

Table 3.5

Reduced Model for Systolic Blood Pressure

Parameter Estimates

Effect	STRESS	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper
Intercept		113.94	11.9823	150	9.51	<.0001	0.05	90.2636	137.62
BMI		1.004	0.2223	150	4.52	<.0001	0.05	0.5648	1.4433
STRESS	**1**	-33.6979	9.2155	150	-3.66	0.0004	0.05	-51.9067	-15.489
STRESS	**2**	-35.988	9.2978	150	-3.87	0.0002	0.05	-54.3595	-17.6164
STRESS	**3**	-32.48	10.1788	150	-3.19	0.0017	0.05	-52.5924	-12.3676
STRESS	**4**	0	.	.	.	.	.	.	.
AGE		0.3527	0.08907	150	3.96	0.0001	0.05	0.1767	0.5287
Scale		243.14	28.0758	.	.	.	.	.	.

Table 3.6

Reduced Model for Systolic Blood Pressure

Type I Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
BMI	1	150	26.68	<.0001
STRESS	3	150	5.57	0.0012
AGE	1	150	15.68	0.0001

Table 3.7

Model for Diastolic Blood Pressure

Type I Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
BMI	1	147	43.07	<.0001
WC	1	147	2.94	0.0886
STRESS	3	147	2.17	0.0945
TM	2	147	0.02	0.9821
AGE	1	147	15.53	0.0001

Table 3.8

Reduced Model for Diastolic Blood Pressure

Parameter Estimates

Effect	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper
Intercept	44.1067	4.7933	153	9.2	<.0001	0.05	34.6372	53.5762
BMI	0.9438	0.1511	153	6.25	<.0001	0.05	0.6453	1.2422
AGE	0.2536	0.06091	153	4.16	<.0001	0.05	0.1333	0.3739
Scale	114.46	13.0866	.	.	.	.	.	.

Table 3.9

Reduced Model for Diastolic Blood Pressure

Type I Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
BMI_CALC	1	153	42.65	<.0001
AGE	1	153	17.33	<.0001

Table 3.10

Logistic Regression of "High" Blood Pressure

Type 3 Analysis of Effects

Effect	DF	Wald Chi-Square	Pr > ChiSq
BMI_CALC	1	8.9302	0.0028
WC_CALC	1	0.4969	0.4808
STRESS	3	2.8538	0.4147
TM	2	0.5995	0.741
AGE	1	2.7649	0.0963

Table 3.11

Logistic Regression of "High" Blood Pressure

Odds Ratio Estimates

Effect	Point Estimate	95% Wald Confidence Limits	
BMI	1.244	1.078	1.435
WC	0.956	0.843	1.084
STRESS 1 vs 4	0.36	0.025	5.17
STRESS 2 vs 4	0.177	0.012	2.579
STRESS 3 vs 4	0.239	0.012	4.594
TM 1 vs 3	1.384	<0.001	>999.999
TM 2 vs 3	2.489	<0.001	>999.999
AGE	1.028	0.995	1.061

CHAPTER 4: DISCUSSION

The categorical data shows that 22% of this population were in the hypertension category, whereas the United States has an average of 29% hypertensive people (CDC, 2016). Our university population had an average body mass index of 26.9 kg/m^2. According to the CDC, 2016, the United States average is 29.4 kg/m^2 for females and 28.8 kg/m^2 for males, therefore our study population has a slightly lower average BMI than the U.S. as a whole. The U.S average waist circumference according to CDC, 2016 is 39.7 inches for males and 37.5 inches for females. This population has a slightly lower waist circumference than the United States. Our population might be under the U.S. averages due to the relatively younger study population.

The findings in this study showed that there was a weak positive correlation between stress and time management. One explanation for this might be that people who have good time management skills, might take on additional responsibilities, stimulating stressors. They might agree to be members of committees, take on increased workloads, or pick up slack elsewhere, resulting in less down time and higher stress.

Our study showed that there was a positive correlation between stress and systolic blood pressure, but a negative correlation with diastolic blood pressure. One reason these correlations may differ is due to the fact that diastolic blood pressure often does not deviate from normal, unless hypertension has set in. Systolic blood pressure often increases with age, due to the hardening of arteries, as well as with poor diet choices (AHA, 2014).

The results from this study showed that body mass index and waist circumference were positively correlated with blood pressure, which has been shown previously in the literature. Pyykkonen (2015), shows that there are higher odds for metabolic syndrome risks, including waist circumference. Our study showed a weak correlation; these results could be due to the majority of our participants reporting low stress or “few-hassles” on the stress assessment.

There were a few limitations with this study. The largest limitation was that two of the tools used, did not go through any validation process. Validation is important to confirm the tool is measuring variables that are intended to be measured. Since these tools were not validated a weakness was created, forming doubt that the variables tested were truly measured. The Time Management Self-Assessment was taken from the University of Nebraska Employee Assistance Program. A representative from the

Employee Assistance Program informed our team that their staff members created the Time Management Self-Assessment for the Wellness on Wheels' event. EAP staff, consisting of licensed independent mental health practitioners, located time management questions from the time management self-assessment on http://mindtools.com, as well added extra questions to the assessment used in this study. When contacting http://mindtools.com for their validation process our team was informed that the quizzes were put together by their editorial team to help people decide which mind tools resources will be useful to them.

Similarly, the Are You Stressed-stress assessment was amended and printed with permission by http://mindtools.com. This particular tool is an electronic version of the Holmes and Rahe Stress Scale. The Employee Assistance Program took questions from the Holmes and Rahe questions, as well as created other questions creating an amended form of the tool.

Another limitation is that stress has many definitions. As shown above stress is a complex construct, causing it to have varying meanings. Varying definitions of stress create barriers in research. Different areas of research use these many definitions. Some measure using life events, stressors, or biomarkers. This specific study used a self-assessment measuring a variety of life events. As explained in the metaphor in the literature, not everyone has the same reaction to stressors.

There is also limited research on time management. Without previous knowledge in an area it is difficult to understand how poor time management can affect people, physically and psychologically. Additionally, this study population consisted of a large group with a wide range of ages, which could impact the results. There are 56 years between the youngest and the older participant in our study. The major difference among our range of participants is the experiences they have had. The younger participants might have just left home for the first time, attending school, or trying to figure out how to live on their own, creating stress in their life. The older participants could be dealing with health issues, the thought of retirement, or the loss of a spouse, also creating stress in their life. Both situations can be stressful, but the older participants have had many more experiences in their lifetime, but that does not mean they deal with stress better than the younger participants.

Lastly, there was no information collected from participants about health history, including whether or not medication for hypertension was prescribed and taken, they had a family history of hypertension, or other health history. These health history factors could create a false-negative reading, resulting in false claims within the research.

CHAPTER 5: CONCLUSION

Wellness on Wheels is a great way to inform employees about their health and to give them an opportunity to learn how to modify behaviors. However, one critical suggestion for future events would be to use validated tools for stress and time management. Our study found that stress had a statistically significant positive correlation with waist circumference, indirectly related to blood pressure; a validated tool may give better insight on this relationship. Likewise, time management had a statistically significant positive correlation with stress, indirectly related to blood pressure. These indirect relationships might become statistically significant correlations when using validated tools. Some stress assessment tools that have been validated are the Maastricht questionnaire and the Holmes & Rahe survey. Another tool that has been validated is Time Management Behavior Scale. These tools will help participants to understand their stress and time management techniques and help them to identify areas of improvement. If the Holmes & Rahe survey was added, the assessment would double the length of the assessment, only adding a few minutes to the event. Adding these assessments to the event would allow the participants to use a validated tool to help them determine areas for improvement.

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