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Evaluating Blood Pressure and Hypertension Awareness in Municipal Workers in the Southeast US

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EVALUATING BLOOD PRESSURE AND HYPERTENSION AWARENESS IN MUNICIPAL
WORKERS IN THE SOUTHEAST US

by

KAYDEN MCALVIN

(Under the Direction of Bridget Melton)

ABSTRACT

The primary purpose of this study was to describe municipal workers' blood pressure (BP) status and awareness; the secondary purpose was to examine the association between BP misconception and department. Municipal employees in a southeastern rural community (n=75) were asked to participate in a 15-minute survey, including the BASIS Hypertension Awareness survey, and blood pressure measurements to determine hypertension risk. Results show a significant difference in diastolic blood pressure (DBP) between police with a higher DBP of 87.64 ± 10.9 mm Hg and fire departments 78.98 ± 11.1 mm Hg ($p=0.005$), a significant difference in DBP between city hall/public works with a DBP of 86.47 ± 7.8 mm Hg and the lower DBP of the fire department of 78.98 ± 11.1 mm Hg ($p=0.039$), and a significant difference in total BASIS score between city hall/public works with a higher score of 4.58 ± 2.4 compared to the police department score of 3.01 ± 1.4 ($p=0.017$). It is recommended that lifestyle changes are utilized with municipal workers to manage blood pressure and improve blood pressure awareness such as regular BP testing, dietary changes, consistent physical activity, reducing physical inactivity, sleeping 6-8 hours per night, and limiting occupational stress.

INDEX WORDS: Hypertension, Municipal employees, Awareness

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by
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CHAPTER 1

BACKGROUND

Purpose of the Study

The aim of this study is to evaluate blood pressure and hypertension awareness among southeastern US municipal employees to help mitigate risk factors for cardiovascular disease. The first step towards taking control of health risks is understanding if you are at risk and/or affected. The purpose of this study was to describe municipal workers' blood pressure status and awareness; the secondary purpose was to examine the association between blood pressure misconception and department.

How This Study Is Original

In order to address cardiovascular disease among high-risk individuals, hypertension and hypertension awareness were evaluated among municipal employees. Many of these employees have factors associated with their job that heavily influence their health. For example, firefighters and police officers have physically demanding occupational tasks with both situational and organizational stress compared to those working in an office setting who might only encounter organizational stress. This study aimed at exploring measured blood pressure and hypertension awareness among different professional departments in a municipal setting. Participants benefited from the study by gaining knowledge of their current health status.

CHAPTER 2

INTRODUCTION

Hypertension impacts nearly every 1 in 5 Americans, leaving 116 million adults in America affected (Kaur et al., 2014). Chronic hypertension increases a person's risk for stroke and heart disease, which are two leading causes of death in the United States (CDC, 2021). Less than half of adults with hypertension are diagnosed, and only 20% of those diagnosed have their hypertension under control (Kaur et al., 2014). Hypertension is commonly termed a silent killer, with 20% of hypertensive Americans unaware that they are affected due to a lack of warning symptoms or signs (Kaur et al., 2014; WHO, 2021; AHA, 2022). Increasing individual awareness of hypertension is critical to controlling one's blood pressure and reducing the complications of the condition (Carey et al., 2018).

When unaware and undiagnosed adults with hypertension do not receive treatment risk maintaining a chronically high blood pressure leading to an increased risk of stroke, kidney damage and heart disease (Paulose et al., 2017). Blood pressure awareness in adults with hypertension was found to have decreased to 77% in 2017-2018 from the previous 85% in 2013-2014 (NIH, 2020). Increasing awareness of hypertension in those who are diagnosed helps reduce the long-term cardiovascular consequences, especially for those at an increased risk for hypertension (Bramlage et al., 2007).

Approximately three-quarters of emergency responders are prehypertensive or hypertensive (Kales et al., 2009). First responders such as firefighters and police officers are observed to have an elevated hypertension level, along with self-reported hypertension (Landsbergis et al., 2015). Emergency responders also display inadequately controlled blood pressure, linking them to cardiovascular disease morbidity and mortality (Kales et al., 2009). Sudden cardiac death, commonly from myocardial infarction or arrhythmia, is a leading cause of fatality during emergency responses among career and volunteer firefighters (CDC, 2006). In law enforcement officers, stressful law enforcement duties are associated with sudden cardiovascular events (Varvarigou et al., 2014). Sudden physical exertion, shift

work, acute and chronic psychological stress, and noise all contribute to occupation-specific risk factors in law enforcement personnel (Zimmerman, 2012).

Previous research has established elevated blood pressure in first responders (Landsbergis et al., 2015) however, blood pressure awareness in first responders needs additional research. The purpose of this study is to evaluate blood pressure and hypertension awareness among municipal professionals in the southeast region.

Research Questions

RQ1: Is hypertension awareness different between municipal employee departments?

RQ2: Is there an association between blood pressure and hypertension awareness?

RQ3: Based on the three categories, are certain municipal professions more at risk of hypertension?

Hypothesis

RQ1 Null- In municipal employees, there is a difference in hypertension awareness by department.

RQ1 Alt- In municipal employees, there is no difference in hypertension awareness by department.

RQ2 Null- In municipal employees, there is an association between blood pressure and hypertension awareness.

RQ2 Alt- In municipal employees, there is no association between blood pressure and hypertension awareness.

RQ3 Null- In municipal employees, certain professions are at a higher risk of hypertension.

RQ3 Alt- In municipal employees, certain professions are not at a higher risk of hypertension.

CHAPTER 3

METHODS

Design and Participants

This was a cross-sectional study with a convenience sample. Participants were recruited from a municipal setting within a southeastern rural community with 320 employees, occupations ranging from law enforcement officers, firefighters, public works personnel, and other clerical personnel. The university's Institutional Review Board approved all procedures prior to any data collected (H23172).

Procedures

Data was collected in collaboration with the wellness employee program. To recruit participants, a promotional flyer was delivered via email and posted in break rooms for all municipal employees via the marketing department. Participation was encouraged, and a time and location were highlighted on the promotional flyer. The flyer described the traveling health fairs and promotional incentives.

The traveling health fairs took place at four different municipal worksite locations, including the fire department, police department, city hall, and public works. Each of these locations were visited at shift change and/or lunch break when employees were able to dedicate around fifteen minutes to the initial and final interactions including a brief survey, health measurements, and consultation. The traveling health fair took place over a one-week period in February 2023.

Prior to engaging with the health fair, employees were asked if they would volunteer to participate in the study, which included a blood pressure screening and completing an online questionnaire.

Measures

Blood Pressure- The participant was seated in a quiet, temperature-controlled room, 68°-77°, with an empty bladder for five to ten minutes while completing their initial survey. Each participant was sized for a blood pressure cuff that covered at least 80% of the arm and placed 2-3 cm above the antecubital fossa. Once done resting, with both feet flat on the floor and the left arm resting on a table at heart height, a

blood pressure cuff was placed on the arm, and an automatic blood pressure monitor recorded the measurement. (Kasper et al., 2022)

Weight and Body Composition- Weight and body composition were recorded using a TANITA scale which applies a bioelectrical impedance method (DC- 430U Dual Frequency Total Body Composition Analyzer, Tanita Corporation of America, Inc., Arlington Heights, Illinois). The examination is painless and non-invasive, and the procedure does not take long. A 3-hour fast was requested prior to measurement. The participant was asked to remove their outer clothing, socks and shoes. Upon stepping on the scale with weight equally distributed, the participant entered their self-reported height and weight, and then the body composition was recorded.

BASIS Hypertension Awareness and Insight Scale- Hypertension awareness was assessed using the BASIS scale with a previously established Cronbach's $\alpha = .75$ (Gerretsen et al., 2018). This short form has seven questions on hypertension-related symptoms; if all answers are 'NO,' then the participant is finished with the survey. If the participant has answered 'YES,' then they are advised to agree or disagree with the following eight questions on a scale of 1 to 10. The eight questions ask the participant if they believe their symptoms are related to high blood pressure, do they have hypertension, do they believe they should make lifestyle changes, do they believe their blood pressure can lead to negative health consequences, do they believe they should be on medication, and other questions related to their personal hypertension awareness. The Total BASIS score is the mean of 4 categories- Illness Awareness, Symptom Attribution, Awareness of Need for Treatment, and Awareness of Negative Consequences. The Total BASIS score is on a scale from 1 to 10- low to high awareness.

Demographics

Participants were asked basic demographic questions including height, age, gender, race, and the general occupation departments.

Analysis

For data analysis the study utilized SPSS (IBM, 2020). A post-hoc analysis was conducted where appropriate. Descriptive analysis was used for the demographics. A Pearson correlation was used to

determine the association between blood pressure and BASIS Hypertension Awareness total scores. The inferential analysis included a ANOVA in determining awareness between groups.

CHAPTER 4

RESULTS

Participant descriptive data is highlighted in Table 1. The majority of the participants, with a mean age of 36 (11.5), were males (81.3%) and white (83.17%). The majority of the group was not currently taking any blood pressure medication.

Table 1. *Participant descriptives*

Demographics	Mean (SD)	N (%)
Age (years)	36 (11.5)	
Male		61 (81.3%)
Female		14 (18.6%)
Race/ethnicity		
White		83.17%
Black or African American		10.89%
American Indian or Alaska Native		2.97%
Asian		0.99%
Other		1.98%
Taking Blood Pressure Medication		
Yes		20.8%
No		79.2%
Occupation Department		
Fire Department		31 (41.4%)
Police Department		25 (33.3%)
City Hall/ Public Works		19 (25.3%)

Among all data collected from 75 participants in the hypertension awareness survey, the mean blood pressure was Systolic Blood Pressure (SBP) 133.7 ± 14.1 mmHg and Diastolic Blood Pressure (DBP) 83.7 ± 11.01 mmHg. Of the 75 participants, 73% were hypertensive (n=55), including 61% considered systolic hypertensive (n=46), and 64% considered diastolic hypertensive (n=48).

Figure 1. Total participants who were considered hypertensive

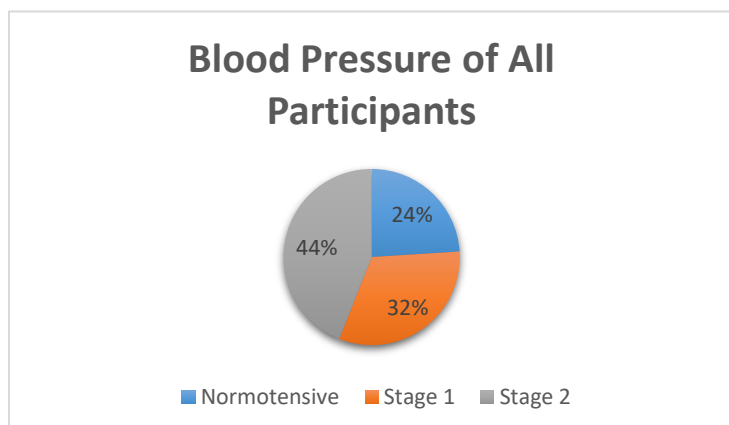


Figure 2. Categorized blood pressure of the police department

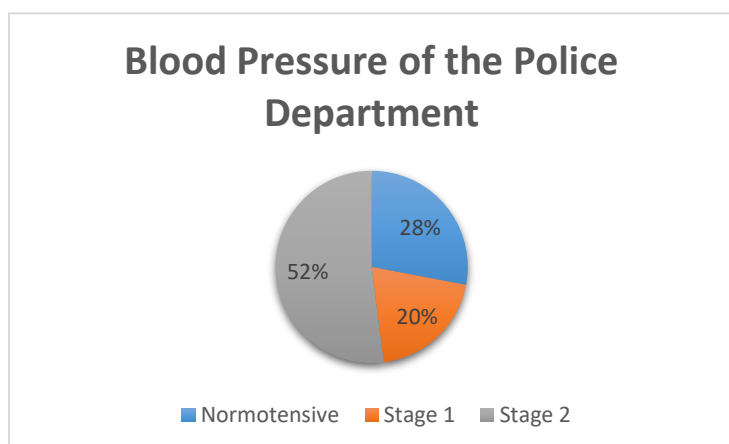


Figure 3. Categorized blood pressure of the fire department

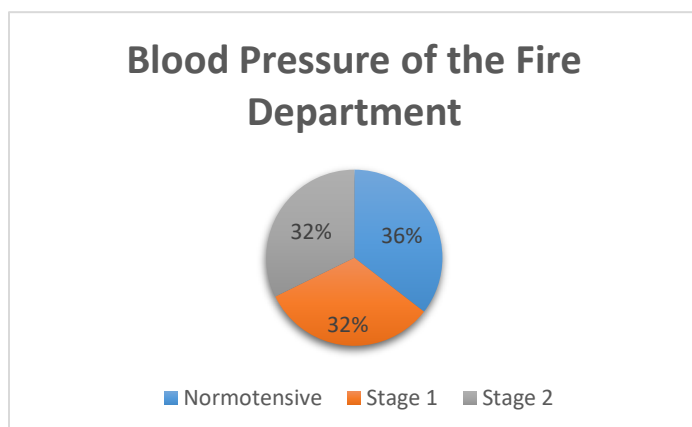
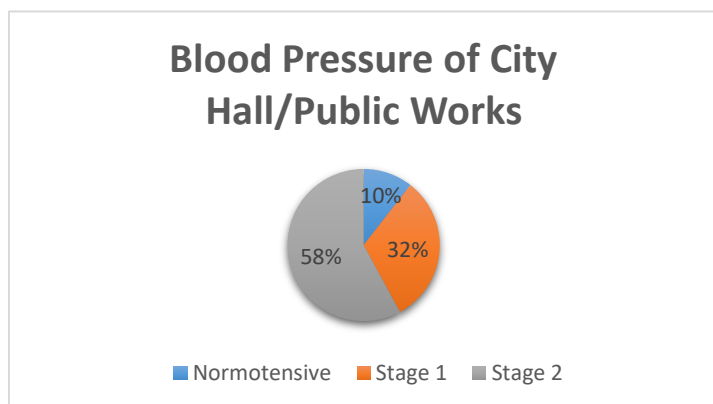


Figure 4. *Categorized blood pressure of City Hall/Public Works*



By department, the fire department had an SBP of 133.03 ± 12.2 mmHg and DBP of 78.94 ± 11.1 mmHg, the police department with a SBP of 133.56 ± 12.6 mmHg and DBP of 87.64 ± 10.9 mmHg, and City Hall and Public Works employees with a SBP of 135.16 ± 18.7 mmHg and DPB of 86.47 ± 7.8 mmHg. Figure 5 and Table 2 highlight the differences in blood pressure.

Figure 5. *Mean Blood Pressure by Department*

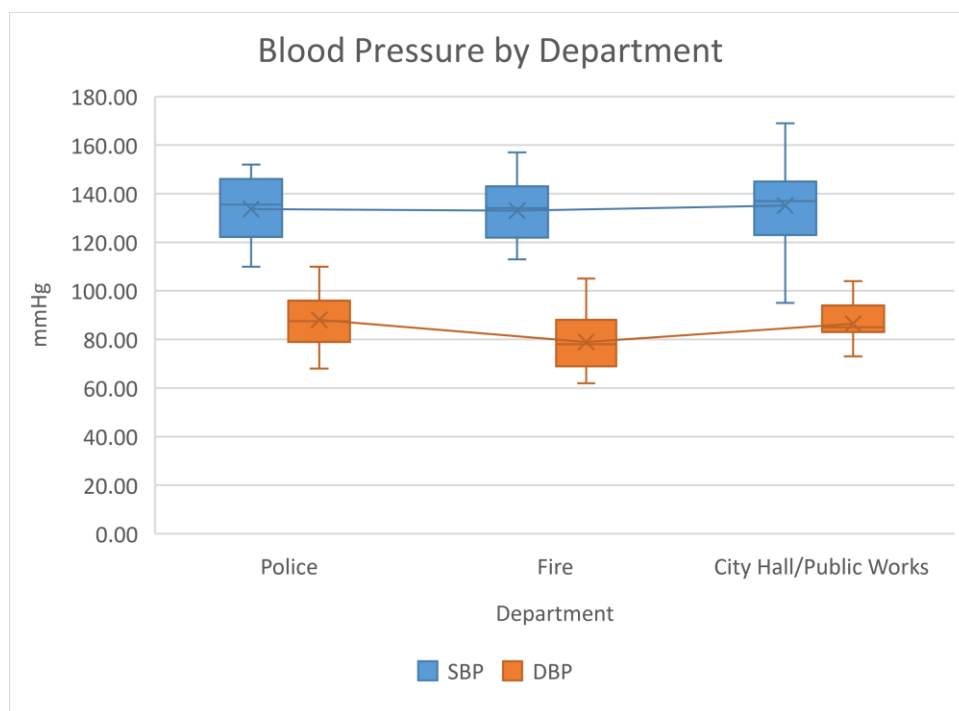


Table 2. Mean Blood Pressure measures in mmHG, Mean (SD)

	All Departments	Fire Department	Police Department	City Hall/ Public Works
Systolic (mm Hg)	133.7 (14.1)	133.03 (12.2)	133.56 (12.6)	135.16 (18.7)
Diastolic (mm Hg)	83.7 (11.01)	78.98 (11.1)	87.64 (10.9)	86.47 (7.8)

An ANOVA test, at a 0.05 significance level with Tukey HSD post-hoc testing, showed there is a significant difference in the DBP of 87.64 ± 10.9 mmHg from the police department and the fire department DBP of 78.98 ± 11.1 mmHg (MD=9.11, $p=0.005$). A significant difference was found between the DBP of 86.47 ± 7.8 mmHg in city hall/public works and the fire department with a lower DBP of 78.98 ± 11.1 mmHg (MD=7.54, $p=0.039$).

The total BASIS Hypertension Awareness score is the mean of scores from the categories of Illness Awareness (3.22), Symptom Attribution (2.89), Awareness of Need for Treatment (4.2), and Awareness of Negative Consequences (4.12). Among all participants, the BASIS Hypertension Awareness total average score was 3.61 ± 1.8 . Total BASIS Hypertension Awareness scores indicated that City Hall and Public Works (CH/PW) employees scored a BASIS total score of 4.58 ± 2.4 , the fire department with a BASIS total score of 3.47 ± 1.6 , and the police department with a BASIS total score of 3.01 ± 1.4 .

Table 3. Total BASIS Hypertension Awareness Scores by Department

	All Departments	Fire Department	Police Department	City Hall/ Public Works
Total BASIS, Mean (SD)	3.16 (1.8)	3.47 (1.6)	3.01 (1.4)	4.58 (2.4)

Total BASIS Hypertension Awareness scores were associated with DBP ($r(72)=0.319$, $p=0.006$), and SBP ($r(72)=0.309$, $p=0.007$). There is also a significant difference in total BASIS Hypertension Awareness scores of city hall/public works with a higher total BASIS score of 4.58 ± 2.4 compared to the police department with a total BASIS score of 3.01 ± 1.4 (MD=1.57, $p=0.017$). A Cronbach's α score of 0.552 was based on the three variables SBP, DBP, and Total BASIS Hypertension Awareness Score.

CHAPTER 5

DISCUSSION

The purpose of this study was to evaluate blood pressure and hypertension awareness among municipal professionals in the southeast region. The major findings of this study indicate that this population is hypertensive both systolically (133.7 ± 14.1 mmHg) and diastolically (83.7 ± 11.01 mmHg) with low hypertension awareness (3.61 ± 1.8). There are significant differences between occupations in both measured blood pressure and hypertension awareness. This chapter will explore the results in detail.

BP descriptive and inferential

Based on the 2021 American Heart Association (AHA) blood pressure categories, the total group means classify this group as Stage 1 Hypertension for both SBP (133.7 ± 14.1 mmHg) and DBP (83.7 ± 11.01 mmHg). Of the 75 participants, 73% were hypertensive ($n=55$) which is alarmingly higher than the national average for adults at 47.3% (CDC, 2021). The majority of the participants were first responders, which in previous research has been found to have higher rates of cardiovascular disease and hypertension (Gill et al., 2019; Pederson et al., 2018).

Interestingly when exploring the differences by department, it was found that 89% of city hall/public works workers were hypertensive ($n=17$), 72% of the police department were hypertensive ($n=18$), and 64% of the fire department were hypertensive ($n=20$). Previous research has highlighted an increase in hypertension in those professionals in higher occupational stress environments (Rosenthal & Alter, 2012; Landsbergis, 2003).

Investigating previous research on first responders, our results were inline. This study found that hypertension prevalence was slightly higher (72%) than in a recent study of 402 police personnel with 67.91% of officers hypertensive (Chauhan et al., 2022). Additionally, in another study on hypertension in 170 police officers only 17.5% were found to be hypertensive, which is much lower than our population (Hussain & Ajuwon, 2020).

Furthermore, according to the American Heart Association the average SBP in firefighters is 131 mmHg (AHA, 2021). In a recent large-scale study on 5,337 firefighters, the findings included a average blood pressure of SBP 124.1 ± 10.6 mmHg and an average DBP of 80.9 ± 7.0 mmHg with 45% of male and 11% of female firefighters hypertensive (Khaja et al., 2021). Comparatively, the firefighters in our study displayed a higher SBP than the established averages with a SBP of 133.03 ± 12.2 mmHg and a higher percentage of our firefighter population was hypertensive (64%).

While collecting data many participants were surprised to see an elevated number or stated that they had not taken their blood pressure in an extended period of time. Seeing this number was shocking for many and brought emphasis to the need for health monitoring for awareness. This feedback reinforces the finding of poor hypertension awareness with an average of 3.16 ± 1.8 out of 10.

Although City Hall/Public Works had the highest departmental blood pressure, their awareness was the highest (4.58 ± 2.4). A possible theory for future research could lean towards it being plausible that they are more aware of the impact of their lifestyle behaviors yet find conflict with changing them due to the nature of their job in an office setting.

Limitations

This study had several limitations. Due to the small participant numbers, the results may not be reflective of the larger population of southeastern US municipalities. Additionally, the gender distribution was 81% male and the national average for protective service occupation was at 75% in 2020 (Bureau of Labor Statistics, 2020). Using automated blood pressure cuffs could have introduced both machine and human error when operating the automatic blood pressure device, along with any errors made in participant blood pressure cuff size. Another limitation of this study is participants with white coat syndrome, which is elevated blood pressure in the presence of normal out-of-office blood pressure values. Finally, medication adherence for participants on blood pressure regulating medication is another limitation of this study.

Conclusions

Municipal workers have a high incidence of high blood pressure with low levels of hypertension awareness. Based on the significant difference in Total BASIS Hypertension Awareness scores and DBP and the significant difference in Total BASIS Hypertension Awareness scores and SBP, we can conclude that the group elevated blood pressure is due to the lack of awareness in participants. Lifestyle behaviors play a significant role in hypertension risk. Numerous lifestyle changes are effective in reducing hypertension, including dietary changes (Gordon et al., 1997), consistent physical activity (Herrmann et al., 2013), reducing physical inactivity (Yang et al., 2017), sleeping 6-8 hours per night (Li et al., 2018; Grandner et al., 2018), and limiting occupational stress (Kaur et al., 2014). In addition, many health behaviors have a direct impact on hypertension risk, such as cigarette smoking, exercise, and body mass index (WHO, 2021; Fuchs & Whelton, 2020). Increasing hypertension awareness and management through education may help mitigate this condition (Oliveria et al., 2005).

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APPENDIX

IRB Approval



Institutional Review Board (IRB)
 PO Box 8005 • STATESBORO, GA 30460
 Phone: 912-478-5465
 Fax: 912-478-0719
 IRB@GeorgiaSouthern.edu

To: Lowe, Kayden
 Melton, Bridget; Romanchik-Cerovic, Joelle; Grosicki, Gregory

From: Georgia Southern Institutional Review Board

Approval Date: January 24, 2023

Expiration Date: December 30, 2023

Subject: Status of Application for Approval to Utilize Human Subjects in Research
 Expedited

After a review of the following proposed research project, it appears that (1) the research subjects are at minimal risk, (2) appropriate safeguards are planned, and (3) the research activities involve only procedures which are allowable.

Protocol #: H23172
Title: Effectiveness of Hypertension Awareness Program Among Municipal Workers
Maximum Number of Subjects: 300
Purpose of Study: The purpose is to assess the effectiveness of a hypertension awareness program among municipal employees.

Therefore, as authorized in the Federal Policy for the Protection of Human Subjects, I am pleased to notify you that the Institutional Review Board has approved your proposed research **with the understanding that you will abide by the following conditions:**

COVID Safety Precautions Required: Precautions will be taken in accordance with current Georgia Southern policies to reduce the risk of the spread of communicable diseases (including COVID-19). Researchers will monitor the current transmission risk assessment by state and county using the COVID Data Tracker provided by the CDC and increase COVID safety measures as appropriate; follow the COVID safety guidelines of the organization whose facility they are am using to conduct research; and any shared devices or equipment will be sanitized using standard sanitation methods.

Incentives: No monetary incentives are approved for this protocol.

Special Conditions: *You are approved to conduct research at the following [locations/counties/schools/businesses] for which you have obtained letters of cooperation:*
 -City of Statesboro
Additional [counties/schools/businesses/locations] may be added to this study by submitting additional letters of cooperation.

If at the end of this approval period there have been no changes to the research protocol, you may request an extension of the approval period. In the interim, please provide the IRB with any information concerning any significant adverse event, whether or not it is believed to be related to the study, within five working days of the event. In addition, if a change or modification of the approved methodology becomes necessary, you must notify the IRB Coordinator prior to initiating any such changes or modifications. At that time, an amended application for IRB approval may be submitted. Upon completion of your data collection, you are required to complete a Research Study Termination form to notify the IRB Coordinator, so your file may be closed.

Surveys

BASIS Hypertension Awareness Survey

NAME/ID:

BASIS[®]

DATE:

Current Weight: _____ kg lbsDate checked: _____ n/aHeight: _____ feet/inches cm

*Body Mass Index (BMI): _____ *To be calculated by clinician

Blood Pressure: _____/_____ mmHg

Date checked: _____ n/aFasting Glucose: _____ mmol/L mg/dlDate checked: _____ n/a

HbA1c: _____ %

Date checked: _____ n/a

We are interested in your own beliefs about your health. We are NOT interested in what others believe or may wish you to believe.

Indicate if you have any of the following health related experiences by reading the questions and marking either Yes or No.

	Yes	No
A) Do you regularly feel nervous?	<input type="checkbox"/>	<input type="checkbox"/>
B) Do you regularly sweat?	<input type="checkbox"/>	<input type="checkbox"/>
C) Do you regularly have difficulty sleeping?	<input type="checkbox"/>	<input type="checkbox"/>
D) Do you regularly have facial flushing? Do your cheeks get red?	<input type="checkbox"/>	<input type="checkbox"/>
E) Do you regularly have shortness of breath?	<input type="checkbox"/>	<input type="checkbox"/>
F) Do you regularly have headaches?	<input type="checkbox"/>	<input type="checkbox"/>
G) Do you regularly have nosebleeds?	<input type="checkbox"/>	<input type="checkbox"/>
H) Other: _____	<input type="checkbox"/>	<input type="checkbox"/>

If 'NO' to ALL of the above, please go to the next page.

If 'YES' to any of the above, indicate the extent to which you agree or disagree at the present moment with the following statement by circling the appropriate number, keeping in mind your health related experiences.

1) My health related experiences are due to having high blood pressure.

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10

Strongly Disagree Moderately Disagree Slightly Disagree Unsure Slightly Agree Moderately Agree Strongly Agree