

1. Cover page

Title: Biobehavioral Program to Lower Blood Pressure in the Community (BP-LowC)

Participating Departments:

- Kinesiology
- Philosophy
- Psychological Science
- Public Health Sciences
- Sociology

Leaders:

- Jeanette M. Bennett, Associate Professor in Psychological Science
- Reuben Howden, Professor in Kinesiology

Target Category: Unique Distinction

Keywords:

- Hand-grip exercise training (HGET)
- Biobehavioral health and well-being
- Community-based interventions
- Healthy aging
- Minority health and health disparities

2. Executive Summary

Hypertension (HTN) is an asymptomatic chronic condition and a gateway risk factor for cardiovascular diseases (CVDs). The World Health Organization considers CVD a global health crisis with ~18m deaths worldwide and ~50% are caused by HTN. CVDs are a group of pervasive conditions that place a burden on health and well-being in the US and NC, including the Charlotte metro region. Sadly, ~19,000 North Carolinians die each year due to CVDs, and CVD care burdens hospitals and places a financial strain of \$5-6 billion on the State's budget annually. Furthermore, 30% of Mecklenburg County residents have HTN, and 22% of low-income residents do not have health insurance, limiting access to healthcare. The cause of HTN in 90% of cases is unknown, but it is thought to arise from a variety of biobehavioral factors.

The impact of HTN has been exacerbated by the current global viral pandemic, which rapidly challenged the fabric of our developed societal systems such as healthcare, education, and the economy. It also underscores the role each person's health or lack of it played in their risk of developing severe Coronavirus disease 2019 (COVID-19). The high prevalence of HTN places many individuals at greater risk for severe COVID-19 and death, meaning a dysregulated body does not respond or adapt well to the sudden emergence of novel viruses or the accompanying stressors. Thus, mitigating the risks of HTN is necessary to prepare for future global health crises, which will certainly come. *Our team is **uniquely** poised to address the critical need of improving physiological functioning via a simple intervention that prevents and treats hypertension, one of the greatest non-communicable disease pandemics.*

Similar to COVID-19 morbidity and mortality, HTN prevalence is affected by factors including minority race/ethnicity, sex, psychological stress management, aging, health behaviors, occupation, and income. Both preventative interventions and reducing high blood pressure will have profound effects on HTN prevalence as well as health and well-being. Unfortunately, standard HTN treatment strategies (pharmaceuticals and time-intensive lifestyle changes) have not been successful long-term for a variety of reasons (e.g., cost, lack of access to care, adherence, side-effects, etc.).

Currently, we are one of a few groups in the global research community to demonstrate the efficacy of a simple hand-grip exercise training (HGET) program for the treatment and prevention of HTN. HGET is a very low-cost, self-directed intervention that only takes a few minutes per week to perform and reliably produces clinically significant reductions in blood pressure. It has been endorsed by the American Heart Association and the American College of Cardiology. Because HTN is multifactorial, several complementary approaches are needed to increase the efficacy of HGET and its ability to improve health and well-being in diverse populations. Thus far, HGET investigations have focused on fairly homogenous populations, primarily Europeans or those of European and Caucasian descent.

We are expanding the current interdisciplinary team to enhance UNC Charlotte's **unique** opportunity to become a local and global leader in implementing HGET in the community and workplace, and among diverse populations. We will also customize the intervention to enhance its effectiveness in preventing and treating HTN. Our team includes experts from the College Health & Human Services and the College of Liberal Arts & Sciences, with knowledge in stress and cardiovascular physiology, biobehavioral health, implementation science, community-based participatory research, cardiovascular disease, systemic oppression, health disparities, systemic and interpersonal discrimination, healthy aging, mixed methodological approaches, minority health, community-based interventions, workplace interventions, mind-body connection, emotion regulation, and biopsychological adaptations to behavior change.

3. Evidence of Strength and Excellence

Drs. Bennett's and Howden's established collaboration is the core of our research team. They have worked together since Spring 2014 and have co-versed on over 6 graduate student committees at both masters and Ph.D. training levels. The primary focus has been to use a simple hand-grip exercise training (HGET) program that is a low-cost and time commitment, self-directed intervention. HGET reliably reduces resting blood pressure to prevent or treat hypertension, thus improving health and well-being. They have combined their expertise in cardiovascular and stress physiology, developing a biobehavioral approach to their work on lowering blood pressure to enhance health and well-being. *In alignment with the **Unique Distinction** category, only 5 other research teams globally examine the effects of HGET on blood pressure and none have extended it outside the exercise science research field.*

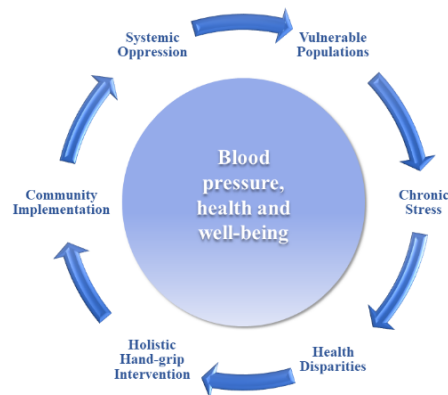
While working together with graduate students, they have used this paradigm to collect data in four human participant studies in the laboratory and the Charlotte community (The Sanger Heart and Vascular Institute, and Charlotte-Mecklenburg Senior Centers). Two of these studies have been published and from the remaining two studies, manuscripts are in preparation.

Data from two of these studies (#5 and #7 in Dr. Howden's CV) were used in an international group project (#8 in Dr. Howden's CV) demonstrating the global recognition and impact of these studies. Drs. Bennett and Howden have secured internal and local funding (~\$29,000) to support their work. Based on feedback from two external proposal (\$284,000) reviews, building a larger team would assist in securing funds to bring the HGET program to more diverse populations and settings to improve overall health and well-being. *Consequently, they have assembled a cadre of multidisciplinary experts to move the research model to the next level.*

Dr. Michael Dulin, is the Director of the Academy for Population Health Innovation at UNC Charlotte, a collaborative designed to advance community and population health. His expertise in community-based participatory research will play a crucial role in building partnerships between the research team and community organizations, as well as designing community implementation strategies to sustainably integrate HGET. He also has a history of managing large externally funded grants. Drs. Howden, Bennett, and Dulin have worked successfully on a variety of academic activities, including letters of interest to funding agencies.

Dr. Candace Brown (Dept. of Public Health Sciences) has essential knowledge and skills in studying motivations for healthy behaviors, including exercise from a health and well-being lens in vulnerable populations, aging minorities, and active military, that are central to the goals of the team. She also approaches research questions with mixed methodologies including survey data collection and semi-structured interviewing. Thus, her past and current externally funded research (totaling ~\$320,000), involving aging and military populations expands the potential opportunities to seek grant funding. Since Dr. Brown arrived at UNC Charlotte in Fall 2019, she and Dr. Bennett have collaborated on research idea generation and responded to calls for letters of interest from foundations and funding agencies.

Dr. Andrew Case (Dept. of Psychological Sciences) examines protective factors among minority populations that reduce cardiovascular disease (CVD) health disparities with an emphasis on African Americans/Blacks from a community and clinical psychologist's



perspective. His collaboration and connections within the local Charlotte area are vital because HTN prevalence is higher in Black, Hispanic, and Latinx communities, in particular Black women. These populations are a primary focus for HGET intervention projects currently planned by the research team. Drs. Case and Bennett currently co-mentor a Ph.D. student. In addition, he has worked on student committees with Drs. Levens and Sullivan. He started collaborating with Drs. Howden and Bennett on HGET research in early Spring 2020.

Dr. Kendra Jason (Dept. of Sociology) brings to the research team expertise in social inequality, health disparities, workplace engagement, and employee well-being with focus on the Charlotte metro region. Almost half of working Americans and over 100,000 North Carolinians work in low or poverty-wage jobs that are insecure and do not provide access to healthcare or other benefits (e.g. health insurance, paid sick leave, or vacation). These types of jobs are disproportionately filled by Hispanic, Latinx, and Black individuals, who are also vulnerable to CVDs. Thus, her presence advances the goal of moving HGET into diverse populations and include the effects of work and income-related stresses. Further, she has and continues to successfully manage external grant funding (totaling \$475,800). Drs. Jason and Brown have collaborated on a book chapter and are currently working on a research conference presentation.

Dr. Sara Levens (Dept. of Psychological Sciences) customizes mind-body based interventions to motivate engagement in physical activities and has expertise in emotions and their regulation. In addition, she brings strong collaborative and external grant management skills (totaling ~\$850,000) that will strengthen the team's ability to write competitive grants and work towards enhancing the effectiveness of HGET as it is moved into more diverse populations and settings. Drs. Levens and Bennett have collaborated closely on a variety of research projects and co-mentoring several honors theses, multiple master's theses, 2 dissertations, and 1 publication.

Dr. Shannon Sullivan (Dept. of Philosophy) brings her expertise in systemic societal oppression, mind-body connection, and health. Her humanities perspective grounds and integrates the team's collective focus on addressing health disparities as US social systems were built on and continue to survive off the oppression of minority races and ethnicities, especially Black and African descendants, and women. These effects are observable in the prevalence of HTN and CVDs as well as disparities in income and community resources. She will continue to guide the team's working biobehavioral HGET model, driving the theory underlying the significance and border impact of the team's multidisciplinary research goals. Drs. Sullivan and Bennett have collaborated in the classroom and on undergraduate and graduate committees.

The team's first goal is to procure several R15s targeting HGET in multiple vulnerable populations, deepening connections between UNC Charlotte and local communities. These grants will support the long-term goal of building large community-based health initiatives. Because Dr. Howden has collaborated with all international actors in the field of HGET and HTN, the team can reasonably expect to expand this research to global health initiatives, placing UNC Charlotte at the center of innovative HTN management strategies on the world stage or an area of *unique distinction* nationally and internationally.

Collectively, the team has mentored research development in 97 undergraduates with 43 as Honors theses, 44 master's theses, and 22 dissertations. Thus, the team has experience in and prioritizes mentoring junior scientists as part of their academic work. Hence, the team seeks financial support from UNC Charlotte to provide study participant incentives, Ph.D. student RAs and post-doctoral fellows, and teaching releases. These resources will allow the team time to focus on the multiple research initiatives to move HGET into diverse populations and settings.

4. Participating faculty and summary of contributing expertise

Name	Title	Expertise
Reuben Howden	Professor in Kinesiology	<ul style="list-style-type: none"> • Cardiovascular physiology • Isometric hand-grip exercise training • Hypertension
Jeanette M. Bennett	Associate Professor in Psychological Science	<ul style="list-style-type: none"> • Stress physiology and behavioral response • Stress and chronic disease • Systems and complexity science • Exercise interventions • Interdisciplinary research collaborations
Michael Dulin	Professor in Public Health Sciences	<ul style="list-style-type: none"> • Community-based participatory research • Implementation science • Integrative health • Leading large research collaborations • Physician
Candace Brown	Assistant Professor in Public Health Sciences	<ul style="list-style-type: none"> • Mixed methodological approach to exercise interventions • Healthy aging/gerontology • Minority health • Veteran health
Andrew Case	Assistant Professor in Psychological Science	<ul style="list-style-type: none"> • Cardiovascular health disparities • Community-based intervention • Stress and coping, emphasis in Black/African American population
Kendra Jason	Assistant Professor in Sociology	<ul style="list-style-type: none"> • Black/African American health • Community and workplace-based interventions • Healthy aging/gerontology
Sara Levens	Associate Professor in Psychological Science	<ul style="list-style-type: none"> • Customizing interventions • Mind-body health, emphasis on emotion • Collaborative research groups
Shannon Sullivan	Professor of Philosophy	<ul style="list-style-type: none"> • Systemic oppression • Mind-body connection