**PERSONAL STATEMENT**

My long-term aim is to become an independently funded clinical investigator in neurocardiology with a specialization in computational techniques to elucidate the role of the autonomic nervous system on sudden cardiac death and arrhythmia. I seek to answer the question of what triggers sudden death, building off my studies of the mind-body connection as an undergraduate student, clinical training in medicine, academic interest in the neurocardiac axis, my background in computer programming and data visualization, and my current research in heart rate variability (HRV). The mentored training received through the TL1 award and the MSCR will provide me the fundamental tools needed to launch myself on a trajectory to become a successful, compassionate physician-scientist.

My interest in this field is rooted in my academic and clinical experiences thus far. I am currently a senior resident in internal medicine, serving on the hospital wards at Emory, Grady, and the VA. The stories that stay with me have always been the stories of the unexpected: the gentleman who presented to the ER with a heart attack while holding his divorce papers, the elderly lady that died peacefully in the hospital the day after reuniting with her grand-daughter who flew in from out-of-country, or the sprint to two simultaneous cardiac arrests that happened just at 7 AM. The commonality in these types of events is the presence of a triggering moment, whether that be a stressful event, a moment of reunion, or the abrupt circadian change from sleep-to-wake. With the power of hindsight, its clear the seed of my interest was planted as an undergraduate student. I majored in linguistics and neuroscience & behavioral biology, through which I studied the mind-body connection highlighted by a multidisciplinary course load (e.g. Behavioral Neuroscience, Evolution of the Human Mind and Brain, Meaning in Human Language). This interest was further elevated through an independent study of meditation, religion, and science at a Tibetan monastery in MacLeod Ganj, India. I also was introduced to research early on working at Yerkes Primate Research Center, studying the effects of maternal separation on stress in rhesus monkeys. I developed the perspective early-on that psychological concepts could have profound physical manifestations, which has led to my current research in autonomic dysfunction.

As an undergraduate student, I developed a background in computer programming and data management during my linguistics thesis, involving word-processing and phonetics. As a medical student, I greatly advanced my programming and statistical background during my work at Johns Hopkins with Scott Blackman, MD, PhD. We studied the detection of individuals at risk for cystic fibrosis related diabetes using genome-wide association study analysis, where I also built a working knowledge of Perl, Python, and C++, and became proficient at data visualization using the R language. As a medical resident, I continued to expand my research skills as I identified my Lead Mentor, Amit J. Shah, MD, MSCR, and began my work on HRV as a measure of autonomic function. As our first cohort used twin pairs, I learned more complex statistical techniques, including logistic regressions and mixed effect models. His lab is at Rollins School of Public Health at Emory in the Department of Epidemiology, through which I have met a number of mentoring team, including Alonso Alvaro, MD, PhD, Marc Thames, MD, Viola Vaccarino, MD, PhD, and Arshed Quyyumi, MD. I began to work with Dr. Alvaro, my Co-Lead Mentor, shortly thereafter, and I learned how to submit my first manuscript proposal for an ancillary study on a large community-based cohort called the Atherosclerotic Risk In Communities study. This latest project, which looks at psychological stress and HRV, is challenging as it follows a population of approximately 15,000 patients over many years, which is teaching me new skills in large data manipulation and more complex statistical techniques such as survival and cross-lag analysis.

My proposed research project, entitled “Disturbances of the Neurocardiac Axis”, is built on the premises of my research findings thus far. My most recent first-author work, a manuscript currently under review called “Circadian Changes in Heart Rate Variability Predict Abnormal Myocardial Perfusion”, highlights an index of HRV that was predictive of abnormal myocardial perfusion imaging. My research was accepted at the American Heart Association Scientific Sessions 2018 conference. Not only had it made it to a national conference, but my poster was selected as one of two top-rated posters that highlighted real-world relevance and scientific impact. This was a pivotal moment for me as a young researcher, as I was starting to see the difference I could make by continuing down the path to become a clinical investigator. The paper generated more questions than it answered, as I could not yet confidently say abnormal HRV would predict heart disease without confirmatory cardiac catherization. More than the practical questions, the paper exposed gaps in the literature– the reason for the increased prominence of the findings in the morning hours, the mechanisms that affect both the autonomic system and coronary blood flow, and the limitations of measuring the complexity of sympathovagal balance with a “simple” abstraction. The discussions on these unanswered questions I have had with Marc Thames, MD, an advisor on my mentoring team, have particularly inspired me to delve farther into the literature. He has an extraordinary research career in cardiac autonomic physiology, and recently invited me to write a clinically-oriented review on cardiac sympathetic innervation as an extension of my capstone lecture on sudden cardiac death and the autonomic nervous system. I was also invited to co-author a review article for *Hypertension* on the brain-heart connection in psychological stress by Paul Marvar, PhD from George Washington University in collaboration with our lab group. The actual literature review process itself in both cases is an exciting academic challenge for me, as it has required me to synthesize a highly complex topic in a clinically succinct and meaningful way.

The goals of the proposed research on the neurocardiac axis are to 1) establish the role of autonomic dysfunction as an independent risk factor for obstructive coronary artery disease (CAD), and 2) identify the impact of neuropsychological factors on autonomic dysfunction. This is an important first step in understanding how the brain may affect the heart and creates a quantifiable measure to allow for risk-stratification of patients. The TL1 award will grant me the protected time to learn from the experience of my mentors in the specific technical skills required for ECG collection and analysis, the design of clinical studies that involve psychological stress, and the implementation and enrollment of patients in an ongoing study. The MSCR will enhance my background in biostatistics and epidemiology with formal didactics, optimizing my ability as a researcher to study epidemiological phenomenon, particularly psychological factors that affect cardiovascular risk. I also hope to gain the practical skills in clinical research, including study implementation, data collection, and dissemination of findings through improved grant and scientific writing skills.

The multidisciplinary and novel research approach will capitalize on the multiple strengths of my mentors, including Dr. Shah who is an expert in HRV analysis and has shown a personal dedication to my growth as a physician-scientist, and Dr. Alvaro who is an investigator in large, epidemiological studies such as the Atherosclerotic Risk in Communities and an expert in neuropsychological impairment and cardiac arrhythmias. The proposed training plan also incorporates career development through grant writing, seminars, and weekly lab meetings in the Emory Program in Cardiovascular Outcomes Research and Epidemiology, which is led by part of my mentoring team, Dr. Viola Vaccarino. As I complete the training of the TL1, I plan to apply for research-based training positions within cardiology, with the overall goal to join as a junior faculty while applying for K grants. I hope that future funding will allow me to implement and translate my research findings into a clinical setting. I can see HRV analyses becoming wide-spread due to its low-cost nature and intend to conduct studies that will use autonomic dysfunction as an independent risk factor for ischemic heart disease, helping to best identify vulnerable patients. My mentorship team, the formal didactics of the MSCR, and implementation of these skills in this research proposal will give me the foundation to reach my goal of becoming a physician-scientist in the field of neurocardiology and epidemiology. I believe the TL1 award and MSCR is the best method for me to pursue my career goal of becoming an independently funded clinical investigator.