<table>
<thead>
<tr>
<th>UNIVERSITY:</th>
<th>North Carolina Agricultural and Technical State University</th>
</tr>
</thead>
<tbody>
<tr>
<td>TITLE OF PROJECT:</td>
<td>Can You Hear It Now?: A Study of Personal Listening Devices and Pedestrian Safety</td>
</tr>
<tr>
<td>FEDERAL FUNDS:</td>
<td></td>
</tr>
<tr>
<td>Requested Amount</td>
<td>Proposed Duration</td>
</tr>
<tr>
<td>$49,997</td>
<td>15 months</td>
</tr>
<tr>
<td>MATCHING FUNDS:</td>
<td></td>
</tr>
<tr>
<td>Source 1:</td>
<td>Source 2:</td>
</tr>
<tr>
<td>$50,205</td>
<td>$</td>
</tr>
<tr>
<td>DEPARTMENT SUBMITTING PROPOSAL:</td>
<td></td>
</tr>
<tr>
<td>PI Name/Title: Dr. Maranda McBride</td>
<td></td>
</tr>
<tr>
<td>Address: Transportation Institute, 1601 E. Market Street, Greensboro, NC 27411</td>
<td></td>
</tr>
<tr>
<td>Phone: 336-285-3359</td>
<td></td>
</tr>
<tr>
<td>Fax: 336-334-7093</td>
<td></td>
</tr>
<tr>
<td>Email: <a href="mailto:mcbride@ncat.edu">mcbride@ncat.edu</a></td>
<td></td>
</tr>
<tr>
<td>Signature:</td>
<td>Date: 04/01/2016</td>
</tr>
<tr>
<td>SUBCONTRACTING INSTITUTION:</td>
<td></td>
</tr>
<tr>
<td>ADMINISTRATIVE REPRESENTATIVE AUTHORIZED TO CONDUCT NEGOTIATIONS:</td>
<td></td>
</tr>
<tr>
<td>Name/Title:</td>
<td></td>
</tr>
<tr>
<td>Address:</td>
<td></td>
</tr>
<tr>
<td>Phone:</td>
<td></td>
</tr>
<tr>
<td>Fax:</td>
<td></td>
</tr>
<tr>
<td>Email:</td>
<td></td>
</tr>
<tr>
<td>Signature:</td>
<td>Date:</td>
</tr>
<tr>
<td>ADMINISTRATIVE ORGANIZATION’S REPRESENTATIVE:</td>
<td></td>
</tr>
<tr>
<td>Name/Title:</td>
<td></td>
</tr>
<tr>
<td>Address:</td>
<td></td>
</tr>
<tr>
<td>Phone:</td>
<td></td>
</tr>
<tr>
<td>Fax:</td>
<td></td>
</tr>
<tr>
<td>Email:</td>
<td></td>
</tr>
<tr>
<td>Signature:</td>
<td>Date:</td>
</tr>
<tr>
<td>OTHER REQUIRED SIGNATURES:</td>
<td></td>
</tr>
<tr>
<td>Name/Title:</td>
<td></td>
</tr>
<tr>
<td>Address:</td>
<td></td>
</tr>
<tr>
<td>Phone:</td>
<td></td>
</tr>
<tr>
<td>Fax:</td>
<td></td>
</tr>
<tr>
<td>Email:</td>
<td></td>
</tr>
<tr>
<td>Signature:</td>
<td>Date:</td>
</tr>
</tbody>
</table>
**Project Title:** Can You Hear It Now?: A Study of Personal Listening Devices and Pedestrian Safety  
**Principal Investigator:** Maranda McBride  
**University:** North Carolina Agricultural and Technical State University  
**Telephone:** 336-285-3359  
**Email Address:** mcbride@ncat.edu

**External Project Contact (if applicable):**
<table>
<thead>
<tr>
<th>Address</th>
<th>Street</th>
<th>City</th>
<th>State</th>
<th>Zip</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telephone:</td>
<td>04/01/2017</td>
<td>End Date:</td>
<td>07/01/2018</td>
<td></td>
</tr>
<tr>
<td>Other Milestones, Dates:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>06/30/17: Finalize experimental design</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12/31/17: Complete data collection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>06/30/18: Submit final report</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project #:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Project Objective:**
The objectives of this study are to: a) evaluate the extent to which pedestrians use auditory stimuli to cross streets and b) determine whether a non-occlusive bone conduction headset can improve pedestrian safety by increasing the perception of auditory feedback from oncoming vehicles.

**Project Abstract:**
In this study, we will investigate the impact of using bone conduction headsets in lieu of earbuds on pedestrian safety. The three aims of this study are to evaluate street crossing behavior 1) in the absence of auditory distractions, 2) when earbuds are worn while listening to music at two different sound levels, and 3) when a bone conduction headset is worn while listening to music. Fifty participants ages 18 to 25 will be recruited for the study. Each participant will cross a simulated virtual street 10 times for each experimental condition using a virtual reality viewer such as Google Cardboard. The following data will be collected and analyzed: number of unsafe crossings, delays entering gaps, and missed crossing opportunities.

**Task Description:**
The primary tasks associated with this project include literature review, experimental design, participant recruitment, data collection and analysis, and dissemination of results.

**Total Budget:** $ 100,205

**Student Involvement (Thesis, Assistantships, Paid Employment):**
Thesis, Research Assistantship, Paid employment

**Relationship to Other Projects:**
N/A

**Technology Transfer Activities:**
Results of the research will be disseminated via conference

**Potential Benefits of Project:**
Results of this study are expected to contribute to the pedestrian safety body of knowledge by determining whether bone conduction headsets improve the ability to detect critical traffic cues.

**TRB Keywords:**
Pedestrian safety, bone conduction, portable music players, distracted walking, auditory perception
Can You Hear It Now?:
A Study of Personal Listening Devices and Pedestrian Safety

PROBLEM STATEMENT

Any observer tracking the movement of students between classes on a college campus will undoubtedly notice the prevalence of headphones or earbuds being used with a cell phone or digital media device. A large number of students use personal listening devices to listen to music or callers as they walk to and from classes. The same is true for many pedestrians outside of college campuses, regardless of whether they are walking for leisure or work. In fact, recent work conducted by our team on two urban college campuses, University of Alabama at Birmingham and Old Dominion University, suggests about 18% of pedestrians were walking across busy streets while distracted by stimuli through headphones or earbuds (Schwebel, 2016).

A recent Stateline news report revealed that pedestrian injuries due to cell phone use increased 35% from 2010 to 2014 based on federal emergency room data (Henderson, 2014). This can likely be attributed at least partially to the rise in electronic device use while walking. According to research conducted by Lichenstein et al. (2011), the number of reported cases of pedestrian/vehicle crashes in the United States in which the pedestrian involved was believed to be wearing headphones to listen to a digital media device at the time of the crash nearly tripled from 2004 to 2011. Fifty-five percent of the 116 victims identified in their study were hit by a train and 70% of the collisions were fatal. In 34 of those cases, witnesses report that an alarm, such as a person yelling, horn, or siren, was sounded just before the collision occurred. Whether or not the pedestrian heard the alarm is unknown in most of the cases; however, it is reasonable to assume that in some of the cases the alarm may not have been detected because the headphones masked the environmental noises that would have otherwise been heard by the pedestrian.

The rise in the number of injuries caused by pedestrian use of cell phones has even led to the inclusion of “distracted walking” in the National Safety Council’s annual report of unintentional deaths and injuries. According to a report found on Breitbart.com, 54% of adult cell phone users have run into an object or person due to cell phone distraction (Church, 2014). Even Secretary Anthony Foxx, the U.S. Secretary of Transportation, has acknowledged the dangers associated with distracted walking by awarding grants to cities interested in developing safety programs to curtail hazardous distracted walking behavior (Henderson, 2014).

Over the years, there has been quite a bit of attention devoted to driver distraction (McEvoy et al. 2005; Drews et al., 2009; Hosking et al., 2009, Collet et al., 2010a, 2010b), but the safety implications associated with the use of cell phones and other digital media devices by pedestrians has received much less consideration. In one available study conducted by our team (Stavrinos et al., 2009) we found that children talking on a cell phone while engaged in a simulated virtual reality street crossing task were less attentive to traffic, took more time to make a decision to cross the street, and experienced more close calls and collisions with traffic. In another study by our team, Schwebel et al. (2012) discovered similar effects in their evaluation of adult pedestrians distracted by a cell phone. In that study, we investigated the
impact of not only talking on the phone but also texting and listening to music during a simulated street crossing task, and found that participants listening to music or texting were hit by a vehicle more often in the virtual testing environment than those who were not distracted by the use of a cell phone. Distracted attention and reduced situation awareness in pedestrians using mobile phones has been documented by other research teams as well (e.g., Hatfield & Murphy, 2007; Hyman et al., 2010; Nasar et al., 2008, Stavrinos et al., 2011).

In summary, available evidence suggests use of electronic devices while walking can be hazardous. Much of the research associated with the use of cell phones and other digital media devices while walking focus on the impact of cognitive and visual distraction. The extent to which auditory stimuli influence pedestrian safety is poorly understood. In fact, research focused specifically on auditory distraction by pedestrians is unavailable in the published literature. We might assume that wearing earbuds or headphones to listen to cell phone conversations or digital media will mask some ambient noise in the surrounding environment, but it is unclear exactly how that masking may or may not influence pedestrian safety because the pedestrian fails to perceive important auditory signals that would otherwise alert them of a potential hazard.

The research that does exist suggests pedestrians may use auditory feedback from oncoming vehicles quite extensively to determine when it is safe to cross the street (Schwebel et al., 2012; Schwebel, 2013). Specifically, pedestrians use their localization skills to determine from which direction a car is approaching (Barton et al., 2013). In addition, changes in sound along the road enable pedestrians to determine the level of risk (Bach et al., 2009). Some of the measures that have been evaluated using auditory stimuli include the distance at which a vehicle was detected, the direction from which a vehicle is approaching, and the vehicle’s time of arrival at the pedestrian’s location. Auditory cues are especially relied upon in situations when visual cues are not available, such as when an object obstructs the view of oncoming traffic or locations such as the crest of hills and areas where the road curves sharply (Ampofo-Boateng & Thompston, 1989; Roberts et al., 1995; Barton et al., 2012). Previous studies have even uncovered age-related differences in pedestrians’ ability to detect and localize oncoming vehicles based on these measures. For instance, Barton et al. (2013) found that children age 6 to 9 years old had significantly smaller detection distances than adults age 18 to 40 years old. Adults in their study were also better at correctly identifying the direction of approach than children. In addition, older children (age 8 and 9) correctly identified the direction of approach more often and identified the time of arrival more accurately than younger children (age 6 and 7).

It can be assumed that wearing earbuds or headphones to listen to cell phone conversations or digital media will likely mask some of the ambient noise in the surrounding environment. As a result, pedestrians may not perceive important auditory signals that would otherwise alert them of a potential hazard, such as an oncoming vehicle. An ideal solution may be to restrict use of earbuds/headphones by pedestrians walking near traffic. Although this may appeal to scholars, such an objective may be unrealistic, even with legislative policy changes.

Bone conduction headsets offer a viable alternative to traditional headsets and may alleviate some of the problems associated with pedestrian use of earbuds/headphones. Instead of covering the ears completely or in part, bone conduction headsets transmit auditory stimuli, such as music and speech, to listeners without covering the ear canal, thus increasing
the ability to perceive ambient noise. These devices use mild vibration to stimulate the bones of the skull, including the middle and inner ear structures that transmit auditory signals to the brain. These vibrations are not felt at normal listening levels nor are they hazardous to the listener. Our previous research has shown that bone conducted signals can even be heard clearly within an environment of low to moderate background noise (McBride et al., 2008; McBride et al., 2015), such as those present in a typical pedestrian environment. Given this alternative, the present study is designed to determine whether the use of a bone conduction headset in lieu of traditional personal listening devices such as earbuds or headphones will increase pedestrian safety.

RESEARCH OBJECTIVES

The overall objective of this study is twofold: (a) evaluate the extent to which pedestrians use auditory stimuli to cross streets and (b) determine whether a non-occlusive bone conduction headset design improves pedestrian safety by increasing the perception of auditory feedback from oncoming vehicles. The proposed work has three specific aims:

1. Evaluate street crossing behavior when no auditory distractions are present
2. Evaluate street crossing behavior when earbuds are worn while listening to music at two different sound levels
3. Evaluate street crossing behavior when a bone conduction headset is worn to listen to music

RESEARCH APPROACH

Fifty participants ages 18-25 in the Greensboro, NC area will be recruited for the study. We anticipate the sample will be 50% male and 50% female, and of diverse racial/ethnic/cultural backgrounds. All participants must be able to speak and read English and have no significant vision or hearing impairment.

In a randomized order, participants will cross a simulated virtual street 10 times each using virtual reality viewer such as Google Cardboard (Figure 1) under four conditions: (a) no auditory distraction, (b) while listening to music through earbuds at approximately 65 dBA (enough to partially block ambient and Doppler-based vehicle noise), (c) while listening to music through earbuds at approximately 75 dBA (enough to fully block ambient and vehicle noise), and (d) while listening to music through a bone conduction headset (Figure 2) at approximately 75 dBA.

Figure 1: Google Cardboard
The virtual street crossing environment will be projected to participants by an Android or IOS smartphone inserted into the Google Cardboard viewer. The foundation of the system used to develop the virtual street crossing simulation incorporates a software library based on the Unity game engine by Unity Technologies used to deliver the real-time virtual environment. The system also incorporates the game play logic and data collection mechanism. The system depicts an actual street crossing in a suburban community. The system also emits ambient background and Doppler-accurate traffic noise. Google Cardboard has an interactive click button that can be used to transmit commands to compatible phones. Initial work demonstrates the system’s feasibility, usability, and efficacy; it also indicates low levels of simulator sickness during use (Schwebel, He, & Severson, 2016).

Prior to initiating the experimental tasks, each participant will be required to provide informed consent. Demographic and experiential information will be gathered through a survey. Once all of paperwork is complete, participants will be screened for normal hearing. The volume of the earbuds and bone conduction headsets will be set to the appropriate sound level prior to the arrival of the participant. Order of trial conditions will be randomized and participants who are about to take part in one of the distracted trials will be instructed to insert the earbuds or put on the bone conduction headset. They will then be asked to play a prerecorded stream of music. Participants will have the option to choose from five genres of music (pop, hip hop, R&B, classical, and country) based on their personal preferences.

The within-subject experiment will require all participants to experience each of the four experimental conditions. When participants are ready to begin the street crossing task, they will look through the Cardboard viewer at simulated traffic moving along a two-lane bidirectional street. They can view the traffic coming from either direction by moving their head left and right. Traffic speed and density will be programmed by the researchers at 30 mph and 10 vehicles per minute per lane on average, representing actual traffic in a moderately busy community. When they judge it to be safe, participants will press a button on the VR viewer to indicate they are ready to cross the street. The button press triggers the system to initiate movement of the pedestrian in the virtual environment and the participant will be able to view the scene in first person as though s/he is walking across the street. The screen will freeze in case of a collision, and feedback concerning the safety of the crossing will be provided for all crossings.
We will evaluate pedestrian safety using standard outcome measures including the number of unsafe crossings, delays entering gaps, and missed opportunities. Unsafe crossings are defined as crossing during which a pedestrian was struck by a vehicle, or was within one second of being struck, while crossing the virtual street. This will be computed as the percentage of unsafe crossings per condition. Start delays are defined as the time (in seconds) between the appearance of the traffic gap the pedestrian chose to cross within and the pedestrian stepping into the street to cross. This measure will also be computed as an average across each condition. Missed opportunities to cross refer to those instances when there was a safe traffic gap to cross within yet the pedestrian chose not to cross within that gap. Since there can be multiple missed opportunities per trial, this measure will be computed as a count across all conditions.

Parametric and nonparametric statistical methods will be used to analyze the data as appropriate. These may include ANOVA, MANOVA, t-tests, regression, Kruskal-Wallis H test, or Mann-Whitney U test.

RESEARCH DURATION AND COST

The proposed study is expected to take approximately 15 months to complete. The total cost of the research is $100,201 of which $50,205 will be matching funds. The NCA&T match will be used to provide the PI with release time which will enable her to dedicate sufficient time and effort to the completion of the proposed project. Figure 3 is a summary of the project schedule/timeline.

<table>
<thead>
<tr>
<th>Task/Outcome</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finalize experimental design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Write IRB protocol</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Get IRB approval</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obtain and test equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recruit participants and conduct experiment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Submit data to Digital Artefacts for processing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analyze data</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Write preliminary report on results to present at a conference</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prepare presentation of research results and submit final STC report</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 3: Project Estimated Timeline

QUALIFICATIONS OF RESEARCH TEAM

Dr. McBride will lead this research effort on N.C. A&T’s campus. Her expertise as it relates to the project revolves around the use of bone conduction communication devices. She has performed multiple studies on auditory perception with bone conduction devices in collaboration with the Army Research Lab and has published several papers related to bone conduction communication devices (e.g., McBride et al., 2015; Blue et al., 2013; Hodges & McBride, 2012; McBride et al., 2008a; McBride et al., 2008b). Dr. McBride will be responsible
for overall project management and budget management. She has successfully served as PI and budget manager for several funded projects including one STI O/E Grant. Dr. McBride will generate and review quarterly budget reports, and spending will be closely monitored to ensure that the funds are utilized in the manner outlined in the proposal. Reports will be prepared for and delivered to STC as requested in order to assess the progress of the project. In addition to managing the budget, Dr. McBride will assist with experimental design, data collection, data analysis, and report preparation. She has over 20 years of experience conducting laboratory-based studies utilizing human participants.

Dr. Schwebel offers substantial expertise to this project in the form of pedestrian safety, distracted pedestrian behavior, and laboratory-based studies of pedestrian behavior. A clinical psychologist by training, Dr. Schwebel is internationally known in the domains of pedestrian safety, distracted pedestrian behavior, and using virtual reality to study pedestrian behavior. He has published over 180 peer-reviewed manuscripts, including research on using virtual reality to study risk for pedestrian injuries, as a means to train children in pedestrian safety, and to study distracted pedestrian behavior. Dr. Schwebel will serve as a consultant on this project by providing training for the simulation software, assisting with the experimental design and development of assessment measures, providing assistance with data analysis and interpretation, and contributing to dissemination of results and preparation of the final report.

Dr. Stavrinos has been conducting research that has identified risk factors for transportation-related injuries in both the pedestrian and roadway environments for the past decade. She currently serves as Director of the Translational Research for Injury Prevention (TRIP) Laboratory (www.triplaboratory.com) which is part of the UAB Department of Psychology and seeks to reduce the morbidity and mortality rates related to unintentional injury in the Southeastern United States. Dr. Stavrinos has extensive experience in behavioral research involving attention, distractibility, pedestrian and driving simulation, and the analysis of transportation-related outcomes in samples across the lifespan, particularly adolescents and young adults. She has served as Principal Investigator (PI) for several UTC-funded studies investigating transportation issues involving child pedestrians, vulnerable at-risk populations (such as individuals with Attention-Deficit/Hyperactivity Disorder), teen drivers, older drivers and commercial truck drivers. Dr. Stavrinos will serve as a consultant for the proposed work, assisting with the final experimental design and development of assessment measures, data analysis and interpretation, and dissemination of results and preparation of the final report.

STUDENT INVOLVEMENT

Using funds provided by this grant, students at N.C. A&T State University will engage in various stages of the research project and contribute to research publications. Dr. McBride has been successful in engaging underrepresented undergraduate students in such projects with tremendous results. For example, one of the students Dr. McBride began mentoring as an undergraduate student had the opportunity to conduct experiments using human subjects, presented at two student research conferences, and wrote a conference paper on his findings as an undergraduate. As a result of these experiences, he chose to pursue a doctoral degree at North Carolina A&T State University and is expected to complete his Ph.D. in 2017.

Dr. Schwebel has mentored over 125 students in the UAB Youth Safety Lab over the past 16 years, about 20% of whom were of underrepresented minority background. He has had
exceptional success in guiding students to the next stages of their career; among the successes are four undergraduates accepted to medical school (two of underrepresented minority status) and 20 undergraduates admitted to PhD programs in psychology and related fields (6 of underrepresented minority status). Dozens of other students have graduated to Master’s programs, and his doctoral students have all initiated successful careers, many of them in research positions.

Dr. Stavrinos has mentored over 100 students in transportation at various levels in their academic careers and from various disciplines (though primarily psychology). Dr. Stavrinos has a longstanding commitment to promoting diversity in the scientific workforce. Of her past research assistants, 69% have been women and 43% have been of minority background. Her first graduate student (a Hispanic female, first-generation college student) recently accepted a tenure-track faculty position at St. Louis University. Of the 40 posters first authored or co-authored by undergraduate students, 93% were by women, and 65% were by members of racial/ethnic minority groups. Furthermore, 76% of undergraduates trained in the TRIP Lab have gone to science-based graduate or professional programs, and 100% of high school students are currently working towards science-based undergraduate degrees.

The PIs intend to continue their practices by engaging undergraduate as well as graduate students in the proposed research activities. Students engaged in this research will be required to participate in the data analysis and interpretation phases of the research. They will also be required to write portions of the papers that will be submitted to various conferences and journals and to present the results of the research in forums both on- and off-campus.

TECHNOLOGY TRANSFER
To disseminate the results, the researchers will author practical manuscripts and scholarly papers to be presented at national conferences and published in peer-reviewed journals. Students will also be expected to present at conferences. In addition, a 2-page research brief will be shared with relevant organizations such as the Organization for Youth Safety (NOYS) and distraction.gov, and a press release announcing the published results of the research will be issued. If awarded, the funds obtained from this grant will be used to establish a foundation that justifies the need for additional research. Future studies will be proposed internally as well as to private, public and government (e.g., National Science Foundation and U.S. Department of Transportation) organizations as a means of building a larger research program designed to address transportation safety issues.
REFERENCES

- Hatfield, J., & Murphy, S. (2007). The effects of mobile phone use on pedestrian crossing behaviour at signalised and unsignalised intersections. Accident Analysis & Prevention, 39(1), 197-205.

Maranda E. McBride, Ph.D., CPIM

Associate Professor of Management
North Carolina A&T State University
1601 E. Market Street
Greensboro, NC 27411

Phone: (336) 285-3359
Fax: (336) 256-2645
Email: mcbride@ncat.edu

Professional Preparation
N.C. A&T State University, Greensboro, N.C.
Industrial Engineering
B.S.I.E., 1996.

N.C. A&T State University, Greensboro, N.C.
Industrial Engineering

N.C. A&T State University, Greensboro, N.C.
Industrial Engineering

Wake Forest University, Winston Salem, N.C.
Business Administration
MBA, 2011.

Appointments
1. Director, Transportation Institute
   North Carolina A & T State University, Greensboro, NC (August 2015 – present).

2. Associate Professor, Department of Management
   North Carolina A & T State University, Greensboro, NC (August 2009 – present).

3. Director, Ronald E. McNair Post-baccalaureate Achievement Program, Embry-Riddle Aeronautical University, Daytona Beach, FL (November 2007 – July 2009).

4. Assistant Professor, Department of Human Factors and Systems
   Embry-Riddle Aeronautical University, Daytona Beach, FL (August 2005 – May 2009).

5. Faculty Researcher, Auditory Research Group

6. Assistant Professor, Department of Industrial Engineering

7. Adjunct Assistant Professor, Department of Industrial Engineering

8. Research Assistant, Visual Research Group
   Army Research Laboratory, Aberdeen, MD (June 1996 - August 1996).

Select Journal Publications


Maranda E. McBride, Ph.D., CPIM


Select Grant Awards


8. “Bone Conduction Speech Intelligibility Differences between Male and Female Voices,” Amount Awarded: $10,564; Sponsor: Embry-Riddle Aeronautical University Office of Sponsored Programs; Term: July 1, 2006 – June 30, 2007; McBride, M.E. (PI).


DAVID C. SCHWEBEL

CURRICULUM VITAE [ABRIDGED; FULL VERSION AVAILABLE FROM: HTTP://WWW.UAB.EDU/CAS/SAFETYLAB/ABOUT-US]

Positions
2011- Professor of Psychology and Associate Dean for Research in the Sciences
2000-2011 Assistant Professor through Professor and Vice Chair, Department of Psychology
University of Alabama at Birmingham, Birmingham, AL
1999-2000 Psychology Resident, Clinical Psychology Internship (General Child Track)
University of Washington School of Medicine, Seattle, WA

Education
2000 Ph.D., clinical psychology
1996 M.A., clinical psychology
University of Iowa, Iowa City, IA
1994 B.A., cum laude with distinction in the major (major: psychology, intensive track)
Yale University, New Haven, CT

Selected Honors and Awards
• Fulbright Award (Senior Specialists Scholar Award to China), 2011
• Fellow, American Psychological Association, elected 2009
• Routh Early Career Award, APA Division 54 (Society for Pediatric Psychology), 2006

Peer-Reviewed Journal Articles [selected out of 183, including 162 in past 10 years]

**Selected Active Extramural Grants/Fellowships**

**Agency:** National Institutes of Health (NIH)

**Proposal:** Distracted pedestrian behavior: Intervention to increase safety

**Details:** Principal Investigator, R21HD078371, Funding period March, 2015-February, 2017

**Agency:** US Department of Transportation/STRIDE Consortium, University of Florida

**Proposal:** Evaluating Child Restraint System (CRS) installation using interactive virtual presence

**Details:** Principal Investigator, 2016-008; Funding period August, 2016-January, 2017

**Agency:** National Institutes of Health (NIH)

**Proposal:** Delivering virtual reality through mobile platforms: Child pedestrian safety training in China

**Details:** Principal Investigator, R21TW010310; Funding period September, 2015-August, 2017

**Agency:** National Institutes of Health (NIH)

**Proposal:** A Website to Teach Children Safety with Dogs: Development and Evaluation

**Details:** Principal Investigator, R21HD075960, Funding period January, 2014-December, 2016

**Agency:** National Institutes of Health (NIH)

**Proposal:** Virtual reality by mobile phone: Improving child pedestrian safety

**Details:** Principal Investigator, R01HD088415, Funding period July, 2016-April, 2021

**Completed grants** as PI from US Department of Transportation/STRIDE Consortium, University of Florida (9/13-7/15); Carr & Carr Attys at Law (10/12-10/14), Vipaar (8/15-8/16), NIH R01 (3/09-1/14), Centers for Disease Control/National Center for Injury Prevention and Control SBIR Phase I (9/11-2/13), and many others

**Trained** over 115 trainees including mentorship of 9 PhD dissertations, 6 MA theses, 13 undergraduate theses
NAME: Stavrinos, Despina

POSITION TITLE & INSTITUTION: Assistant Professor, University of Alabama at Birmingham (UAB)

A. PROFESSIONAL PREPARATION

<table>
<thead>
<tr>
<th>INSTITUTION</th>
<th>LOCATION</th>
<th>MAJOR / AREA OF STUDY</th>
<th>DEGREE (if applicable)</th>
<th>YEAR YYYY</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Alabama</td>
<td>Tuscaloosa, AL</td>
<td>Psychology</td>
<td>BS</td>
<td>2003</td>
</tr>
<tr>
<td>University of Alabama at Birmingham</td>
<td>Birmingham, AL</td>
<td>Lifespan Developmental Psychology</td>
<td>MA</td>
<td>2006</td>
</tr>
<tr>
<td>University of Alabama at Birmingham</td>
<td>Birmingham, AL</td>
<td>Lifespan Developmental Psychology</td>
<td>PHD</td>
<td>2009</td>
</tr>
<tr>
<td>University of Alabama at Birmingham</td>
<td>Birmingham, AL</td>
<td>Transportation Science and Injury Control</td>
<td>Postdoctoral Fellow</td>
<td>2009 - 2011</td>
</tr>
</tbody>
</table>

B. APPOINTMENTS

2014 - Assistant Professor (Tenure Track), Department of Psychology, Secondary Appointment: Department of Civil, Construction, and Environmental Engineering, Birmingham, AL

2012 - 2014 Assistant Professor (Non-Tenure Track), Department of Psychology, Secondary Appointment: Department of Civil, Construction, and Environmental Engineering, Birmingham, AL

2011 - 2012 Assistant Professor (Non-Tenure Track), Department of Medicine, Division of Clinical Immunology and Rheumatology, Department of Psychology, Birmingham, AL

2009 - Director, Translational Research for Injury Prevention (TRIP) Laboratory, Birmingham, AL

C. PRODUCTS

Publications Most Closely Related to the Proposed Project


Other Significant Publications, Whether or Not Related to the Proposed Project


D. SYNERGYSTIC ACTIVITIES

1. Dr. Stavrinos conducts research through the Translational Research for Injury Prevention (TRIP) Laboratory (www.triplaboratory.com) and has mentored 84 students from various disciplines. Dr. Stavrinos involves women and minorities in research and educational activities to increase the diversity of our nation’s workforce. Of TRIP’s past and current research assistants, 65% are women (n=55) and 45% (n=38) are of minority status. Students trained in the TRIP Lab have secured top positions in STEM-related graduate and professional programs.

2. Dr. Stavrinos has developed innovative, theory-based approaches to enhance educational activities to equip tomorrow’s STEM workforce with the knowledge and experience to address society’s challenges. The PI has taught via traditional (classroom) methods and online. She developed the first online Elementary Statistical Methods course for her department. The PI integrated research and education by assessing attitudes towards distracted driving in Driver’s Education students, and provided students with an active learning opportunity via a portable driving simulator.

3. To transform the frontiers of science, Dr. Stavrinos addresses applied injury prevention issues from a behavioral science perspective. Her work continues to advance our understanding about how development influences basic psychological processes of attention, executive function, and cognition and how they impact real-world problems. Her work with pedestrian and driving simulation has resulted in a better understanding of the underlying cognitive processes of distracted walking/driving and has led to translational efforts to reduce these dangerous behaviors.

4. To stimulate innovation and address societal needs through research and education, Dr. Stavrinos has formed partnerships with industry, federal and state government, and DOT-funded University Transportation Centers. Her research collaborations span various disciplines including Psychology, Engineering, Medicine, Public Health, Computer Science, and Nursing and include key linkages to build capacity, leverage resources, and increase the speed of translation from discovery to innovation.

5. Dr. Stavrinos has significantly served the scientific community outside of her immediate organization through: (a) Journal Reviewing for over 30 journals, (b) Grant Reviewing for national and international funding agencies, (c) Conference Abstract Reviewing for national and international scientific symposiums, and (d) Professional Memberships through Association for Psychological Science and Transportation Research Board Committee on Operator Education and Regulation and (e) Moderating for a Whitehouse Roundtable Discussion and the Alabama Distracted Driving Summit.
# Southeastern Transportation Center
## Proposed Budget
### O/E Grant 2017-2018

<table>
<thead>
<tr>
<th></th>
<th>Federal Funds</th>
<th>Matching Funds</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title:</strong></td>
<td>Can You Hear It Now?: A Study of Personal Listening Devices and Pedestrian Safety</td>
<td></td>
</tr>
<tr>
<td><strong>University:</strong></td>
<td>North Carolina Agricultural and Technical State University</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Salaries:</strong></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty</td>
<td></td>
<td>24,116</td>
</tr>
<tr>
<td>Administrative Staff</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Staff</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graduate Student Salaries/Stipends</td>
<td>10,800</td>
<td>10,800</td>
</tr>
<tr>
<td>Undergraduate Student Salaries/Stipends</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Total Salaries/Stipends</em></td>
<td>10,800</td>
<td>29,904</td>
</tr>
<tr>
<td>Benefits (including student health insurance)</td>
<td>5,788</td>
<td>5,788</td>
</tr>
<tr>
<td><strong>Total Salaries and Benefits</strong></td>
<td><strong>10,800</strong></td>
<td><strong>29,904</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Other Direct Costs:</strong></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent Equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expendable Equipment and Supplies</td>
<td>1,780</td>
<td></td>
</tr>
<tr>
<td>Non-salary Education Costs – tuition/fees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Costs: (specify)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contractor Services</td>
<td>20,500</td>
<td></td>
</tr>
<tr>
<td>Human Subject Payment</td>
<td>2,200</td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conference Registration / Fees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Travel</td>
<td>4,400</td>
<td></td>
</tr>
<tr>
<td>Computer Costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other miscellaneous costs:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Other Direct Costs</strong></td>
<td><strong>28,880</strong></td>
<td><strong>29,904</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Indirect Costs at 26%</strong></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10,317</td>
<td>20,300</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>TOTAL COSTS</strong></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>49,997</strong></td>
<td><strong>50,205</strong></td>
</tr>
</tbody>
</table>
### Peer Reviewer #1

**Name:** Dr. Tonya Smith-Jackson  
**Organization/University Affiliation:** Industrial Engineering/ NC A&T State University  
**Address:** 1601 E. Market Street, Greensboro, NC 27411  
**Phone #:** 336-285-3759  
**Fax #:** 336-334-7729  
**Email address:** tlsmithj@ncat.edu

**Please submit a brief overview of why this individual is qualified to review the material.**

Qualifications of reviewer: Dr. Smith-Jackson is currently a Professor and the Chair of the Industrial and Systems Engineering Department at NCA&T. She is also a Human Factors and Ergonomic Society Fellow. Dr. Smith-Jackson earned her PhD in Psychology/Ergonomics in 1998 and has over 40 publications in peer-reviewed journals. Her research includes studies on risky behavior, cell phone use, attention, and various elements of safety. Furthermore, Dr. Smith-Jackson has served as an Associate Editor for 3 journals and Reviewer for 5 different peer-reviewed journals and 2 books.

### Peer Reviewer #2

**Name:** Dr. Ben Barton  
**Organization/University Affiliation:** Department of Psychology & Communications Studies/ University of Idaho  
**Address:** Dept. of Psychology & Communications Studies, University of Idaho, Moscow, ID 83844-3043  
**Phone #:** 208-885-6515  
**Fax #:** 208-885-7710  
**Email address:** barton@uidaho.edu

**Please submit a brief overview of why this individual is qualified to review the material.**

Qualifications of reviewer: Benjamin Barton is an Associate Professor of Psychology and teaches cognitive development classes. He received his Ph.D. in Lifespan Developmental Psychology from the University of Alabama - Birmingham in 2005 and his research interests include etiology and prevention of unintentional injuries from early childhood to late adulthood. He is also interested in the processing of visual and auditory information in relation to pedestrian safety and visual search skills in children and adults.

### Peer Reviewer #3

**Name:** Timothy Barnett  
**Organization/University Affiliation:** Alabama Department of Transportation  
**Address:** 1409 Coliseum Blvd  
**Phone #:** 334-242-6123  
**Fax #:**

**Email address:** barnett@dot.state.al.us

**Please submit a brief overview of why this individual is qualified to review the material.**

Qualifications of reviewer: Tim Barnett’s career has revolved around traffic operations and traffic safety at the state and local levels. He currently serves as State Safety Operations Engineer for the Alabama Department of Transportation. He holds a B.S. and M.S. in Civil Engineering from the University of Alabama in Huntsville. Tim maintains a professional engineer’s license in both Alabama and Mississippi, and is a certified Professional Traffic Operations Engineer. In addition to his duties for the rapid response and resolution of pressing highway safety concerns on the public roadway system, he is responsible for managing the implementation of the Highway Safety Manual for ALDOT. Tim is a Fellow of ITE, and a member of ASCE, ASEM, and IMSA.

*Two peer reviewers will be selected for each final report. Other appropriate reviewers may be selected at the discretion of the STC.*
October 26, 2016

Dear Maranda:

I am delighted to write this letter to confirm my willingness and excitement to work with you on your research examining the role of listening in pedestrian safety and exploring the possibility of bone conduction headsets as a safer listening device compared to traditional earbuds. The distracted pedestrian literature is small, and to my knowledge there have not been any rigorous scientific studies conducted previously to evaluate the role of aural distraction on pedestrian safety. Thus, your proposed research – and the potential solution of bone conduction headsets – is innovative, ground-breaking, and critical to the field.

As you know, I have used virtual reality systems to study pedestrian safety in my laboratory for over a decade and have published widely on pedestrian safety, including distracted pedestrian topics. Thus, the combination of my expertise and background with yours and Dr. Stavrinos’ creates an ideal set of scholarly expertise to complete the proposed research. I have consulted and collaborated with dozens of laboratories and investigators, and we have previously collaborated on grant proposals, so I am confident that our working styles will mesh well and that we can successfully and efficiently complete the proposed research.

As a matter of formality, allow this letter to document my willingness to serve as a highly-involved consultant on this project. I will collaborate throughout the research program and will specifically offer input and direction as we hone the research design, develop the study protocol and assessment measures, interpret the results, and disseminate findings at conferences, in peer-reviewed journals, and as a final report. I expect we will communicate regularly by phone, email and Skype, as well as meeting periodically in person. I look forward to working with you.

Sincerely,

David C. Schwebel, PhD
Professor of Psychology
Associate Dean
October 31, 2016

Maranda McBride, Ph.D.
Director of the Transportation Institute
Associate Professor of Management
College of Business and Economics
N.C. A&T State University

Dear Dr. McBride,

I am pleased to be included on the research team for the proposal titled, “Can You Hear It Now?: A Study of Personal Listening Devices and Pedestrian Safety.” If selected for funding, I am committed to fulfilling all commitments made for this proposal during the project duration. As documented in the supporting information, estimated associated costs for my involvement are expected to be at $5,000 with an hourly rate of $100 per hour for 50 hours of effort.

If there is any additional information needed in support of your proposal, please let me know.

Kindest regards,

Despina Stavrinou, PhD
Assistant Professor
University of Alabama at Birmingham
Department of Psychology
Phone: (205) 934-7861
Fax: (205) 975-2295
dstavrin@uab.edu
October 31, 2016

Dr. Maranda McBride
Transportation Institute
North Carolina A&T State University
1601 East Market Street
Greensboro, NC 27411

Re: Letter of Support for Proposal Titled “Can You Hear It Now?: A Study of Personal Listening Devices and Pedestrian Safety

Dr. McBride:

Thank you for offering me the opportunity to work with your team on the above referenced research proposal designed to study safety issues associated with pedestrian use of personal listening devices. Given my background and interest in pedestrian safety, it will be my pleasure to work with your team on this project.

In line with the proposal under consideration by the Southeastern Transportation Center, Digital Artifacts agrees to collaborate with North Carolina A&T State University researchers in the following ways:

- License the Digital Artifacts virtual reality street crossing software for N.C. A&T’s use for the proposed study.
- Provide engineering and technical support for the software.
- Process the data collected by the software and send it to N.C. A&T researchers for analysis.

Digital Artifacts will provide these services at a rate of $150 an hour. Between 40 to 50 hours of our time is expected to be utilized for this project.

I am looking forward to working with you and your team on this project. If further information is needed, please do not hesitate to contact me.

Sincerely,

Joan Severson
President & Co-founder
Digital Artifacts