Cleveland State University
Transportation Center
Fenn College of Engineering

TECHNICAL REPORT
CSUTC-TR-08-03

Demonstration of Innovative Techniques for Work Zone Safety Data Analysis (Quarterly Report)

Stephen F. Duffy

OHIO DEPARTMENT OF TRANSPORTATION
QUARTERLY RESEARCH REPORT

For Quarter Ending March 30, 2008

Date Submitted September 2, 2008

Project Title: Demonstration of Innovative Techniques for Work Zone Safety Data Analysis
Research Agency: Cleveland State University
Principal Investigator(s): Stephen F. Duffy

State Job No.: 134332
Agreement No.: 21457
Pooled Fund Study No. (if applicable): _____

Project Start Date: May 1, 2007
Contract Funds Approved: $61,316 ($62,683 - CSU match)
Project Completion Date: July 1, 2008
Spent To Date: $57,141.86 ($50,725 - CSU match)
% Funds Expended 93% (81% - CSU match)
Work Done 67%
Time Expired 75%

List the Technical Liaisons and other individuals who should receive copies of this report: Monique Evans, Jennifer Gallagher, Omar Abu-Hajar, Karen Pannell, Jill Martindale, Vicky Fout

SUMMARY OF PROGRESS FOR QUARTER:

Schedule of Research Activities

As of March 30, 2008, approximately 67% of the research has been completed. Figure 1 shows the proposed time schedule for each research task and the actual schedule of work completed on each task to date.

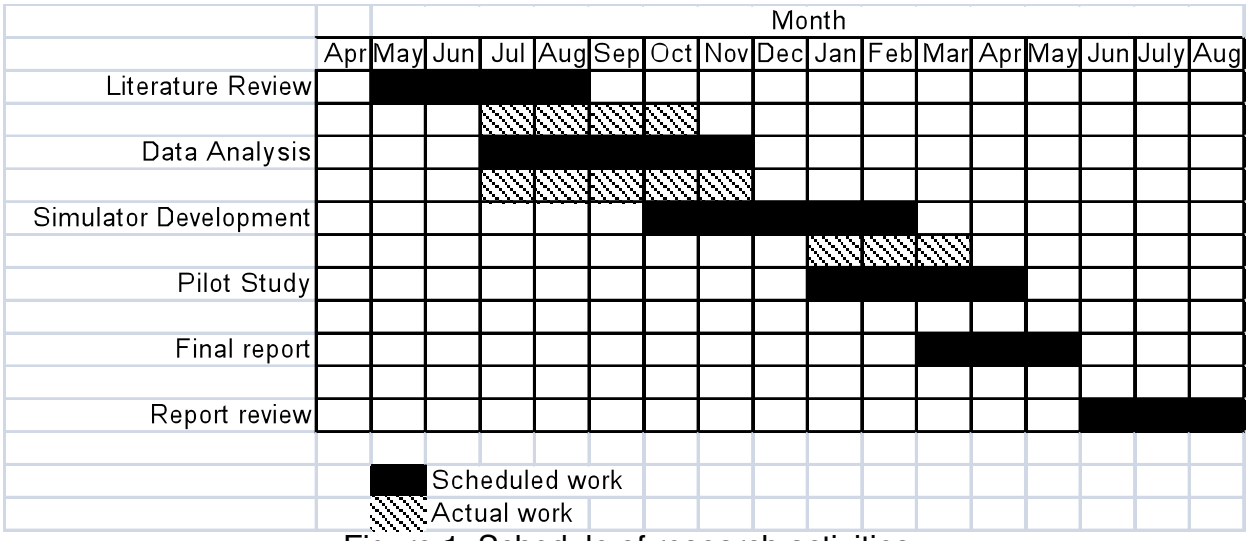

Figure 1. Schedule of research activities

During the third quarter, the development of the simulator scenarios were to occur.

Actual vs. Estimated Expenditures

Figure 2 shows actual vs. estimated expenditures for work completed during the fourth quarter. As of March 30, 2008 approximately 86% of the work was estimated to be completed according to the schedule shown in Figure 1.

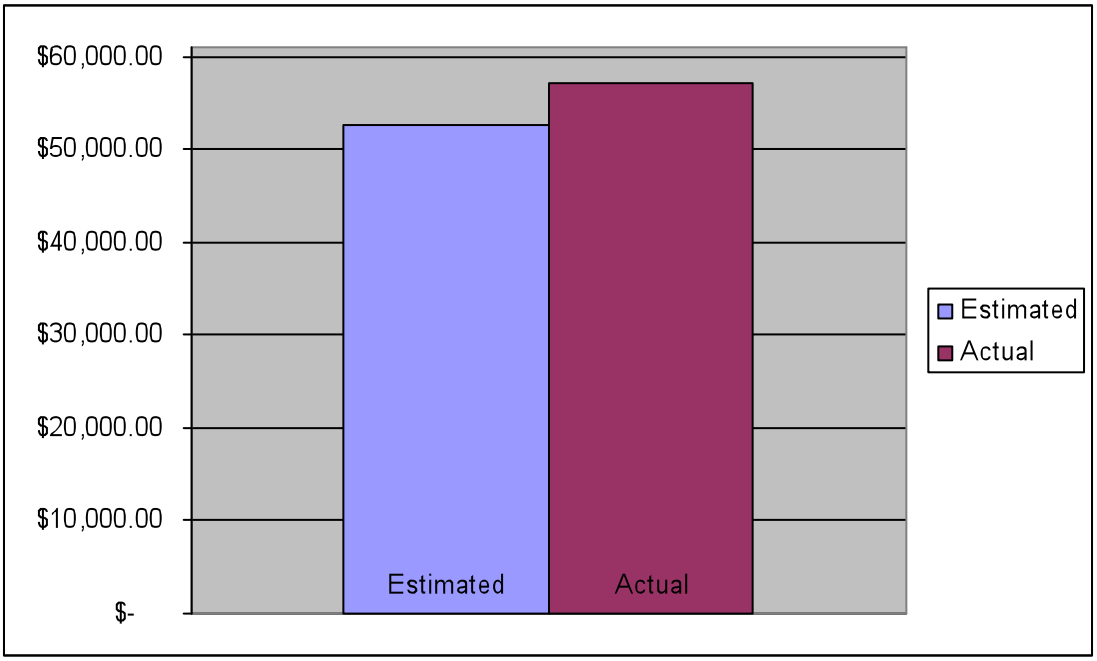

Figure 2. Estimated vs. Actual Expenditures

The estimated expenditures as of March 30 were $52,631.76 (calculated as 86% of total budget). The actual expenditures were $57,141.86.

Percent Completion of Research

At the end of the fourth quarter of this grant approximately 75% of the research as been

completed.

Literature Review
The literature review has been completed.

Data Analysis
CSU received the VTTI deliverables. The data includes an excel spreadsheet representing all the relevant variables associated with all 100-Car Study crashes, near-crashes, and incidents that occurred in a work zone. In addition, CSU's analysis of Ohio work zone crash data is complete.

Simulator Development
Simulator development began in January with the creation of virtual work zones in driving simulator scenarios. The work zones include traffic control devices and signs placed on the roadway in accordance with the Ohio MUTCD. These work zones will be used in the validation and pilot studies. The experimental design has been developed in order to assess the relative validity of the driving simulator as compared to the naturalistic data. The following factors and levels will be used:

1. Traffic density in work zone
    a. Free flow, no restrictions
    b. Free flow, some maneuverability and speed restrictions
    c. Stable flow, maneuverability and speed more restricted
2. Precipitating factor
    a. Stopped or slowing vehicle ahead
    b. Object in roadway
3. Road type
    a. Divided highway
    b. Undivided roadway
4. Work zone type
    a. Lane closure
    b. Shoulder work with minor encroachment

The data collection metrics will be as follows:

1. Driver response to event
    a. Driver behavior
    b. Acceleration, deceleration, lateral acceleration
2. Mean speed/mean speed over posted limit/max speed/speed variance
3. Absolute lane position
4. Lane deviation
5. Collision
6. Number of Crashes, Near Crashes, Crash Relevant Conflicts

Definitions

1. Precipitating factor – The driver behavior or state of the environment that initiates the crash, near-crash, or incident and the subsequent sequence of actions that result in a crash relevant conflict, near crash, or crash.
2. For purposes of the validation study, traffic density levels are defined as follows:
    a. Free flow, no restrictions = low density (occupancy) of ambient traffic on road and in work zone;
    b. Free flow, some restrictions = slightly increased density of ambient traffic on road and in work zone; 10mph decrease in posted speed limit

c. Stable flow, more restrictions = greater increase in density of ambient traffic, more than 10 mph decrease in posted speed limit or ambient traffic moving at reduced speed.

A total of 4 scenarios will be presented to study participants. Each scenario will contain 6 treatment combinations (3 on divided roads, 3 on undivided roads). The order in which treatment combinations appear in the scenario was counterbalanced to prevent confounding. The order in which scenarios are presented to each participant was also randomized.

Table 1 shows the 24 treatment combinations. Table 2 shows the order in which treatment combinations are presented in each scenario.

Table 1. Levels of each treatment combination

Treatment combination	Road type	Traffic Flow	Work zone type	Precipitating factor
1	divided	Free flow	lane closure	stopped truck in WZ
2	divided	Free flow	lane closure	cone knocked over in travel lane
3	divided	Free flow	shoulder work	slow moving car in WZ
4	divided	Free flow	shoulder work	barrel encroaching on travel lane
5	divided	free, some restrictions	lane closure	braking truck
6	divided	free, some restrictions	lane closure	worker in roadway
7	divided	free, some restrictions	shoulder work	stopped car in WZ
8	divided	free, some restrictions	shoulder work	sign encroaching on travel lane
9	divided	stable, more restrictions	lane closure	slow moving truck
10	divided	stable, more restrictions	lane closure	cone encroaching on travel lane
11	divided	stable, more restrictions	shoulder work	braking car
12	divided	stable, more restrictions	shoulder work	barrel knocked over in travel lane
13	undivided	Free flow	lane closure	braking car
14	undivided	Free flow	lane closure	cone encroaching on travel lane
15	undivided	Free flow	shoulder work	braking truck
16	undivided	Free flow	shoulder work	barrel knocked over in travel lane
17	undivided	free, some restrictions	lane closure	slow moving car in WZ
18	undivided	free, some restrictions	lane closure	cone knocked over in travel lane
19	undivided	free, some restrictions	shoulder work	stopped truck in WZ
20	undivided	free, some restrictions	shoulder work	barrel encroaching on travel lane
21	undivided	stable, more restrictions	lane closure	stopped car in WZ
22	undivided	stable, more restrictions	lane closure	sign encroaching on travel lane
23	undivided	stable, more restrictions	shoulder work	slow moving truck
24	undivided	stable, more restrictions	shoulder work	worker in roadway

Table 2. Order of treatment combinations

Scenario #			
1	**2**	**3**	**4**
6	17	5	22
3	20	8	13
9	16	11	15
18	1	23	2
19	7	24	12
21	4	14	10

In order for the simulator study to commence, the CSU Institutional Review Board governing the use of human subjects needed to approve the study. The IRB forms were submitted and approval is pending as of April of 2008. The forms that were submitted are attached for reference.

The scenarios for the simulations discussed above are approximately 80% complete.

PROPOSED WORK FOR NEW QUARTER:

Simulator Development
Simulator development will continue by finishing programming of multiple driving scenarios.

Validation Study
The validation study will be developed and run based on the findings of the naturalistic data analysis. A qualitative validation analysis will be conducted.

Pilot Study
The pilot study will be developed based on collaboration with ODOT.

IMPLEMENTATION (if any): N/A

PROBLEMS & RECOMMENDED SOLUTIONS (if applicable):
The original contract start date was March 1, 2007. Administrative delays in processing the OPREP contract resulted in an actual work start date of May 5.

Additional administrative delays in processing the VTTI subcontract resulted in a delayed start to the 100-Car data analysis by VTTI researchers. The original due dates for the VTTI portion of the data analysis were July 1 for the first deliverable and July 30 for the second deliverable. Due to the delay, the first deliverable will be received by August 1 and the second deliverable will be received by mid-October.

As a result, the work time schedule and research task order was adjusted to accommodate the administrative delays and prevent downtime by CSU researchers.

A contract extension of one year was requested due to the delays associated with the IRB approval and the by the fact that the original PI, Professor Nancy Grugle has left CSU. Traditionally, an IRB approval requires ten days. With the completion of the semester at CSU, obtaining subjects for the pilot study will be difficult. Therefore, the majority of the pilot study will have to be completed when school commences in the fall.

As to the departure of Professor Nancy Grugle, Professor Stephen Duffy has proposed to ODOT that he take over the grant as PI in order to finish the research. Professor Duffy reached out to Professor Deb McAvoy at Ohio University to help in completing the data analysis. A contract for Professor McAvoy's services is being prepared. Drs. Duffy and McAvoy are waiting for approvals from ODOT for this change in grant leadership. Work on the grant is proceeding under the assumption that approvals from ODOT will be granted.

EQUIPMENT PURCHASED (if any): N/A

CONTACTS & MEETINGS:

A project meeting is being scheduled for sometime after the Spring Semester at CSU is completed to discuss details on how the grant will proceed to completion.

Appendix A

CSU Institutional Research Board

Application Form

Cleveland State University

Institutional Review Board for Human Subjects in Research
Application for Project Review

I. Title Page

Date (mm/dd/yyyy): **04/08/2008** **Transaction Number (office use only):** _____
Project Title: **Demonstration of Innovative Techniques for Work Zone Safety**

PRINCIPAL INVESTIGATOR OR ADVISOR
Name: (Last, First): **Duffy**, **Stephen** Title: **Chairperson**
Department: **CIVIL & ENV. ENGINEERING** Campus Address: **SH 114**
Electronic Mail Address: **s.duffy@csuohio.edu**
Office Phone: **(216) 687-3874** Home Phone: **( ) -**
Has the investigator completed the CITI course in the protection of human subjects? ☒ Yes ☐ No

CO-PRINCIPAL OR STUDENT INVESTIGATOR
Name: (Last, First): **McAvoy**, **Deborah** Title: **Assoc./Assist. Professor**
Department: **Civil Engineering, Ohio University**
Electronic Mail Address: **mcavoy@ohio.edu**
Office Phone: **(740) 593-1468** Home Phone: **( ) -**
Has the investigator completed the CITI course in the protection of human subjects? ☒ Yes ☐ No

If this is a student investigator, please indicate status:
☐ Undergraduate ☐ Master level student ☐ Doctoral level student
and level of involvement in the research:
☐ Assisting Faculty Research ☐ Thesis ☐ Dissertation ☐ Classroom project: Class name/number _____

ADDITIONAL INVESTIGATORS? ☒ **Yes** ☐ **No** **(If yes, please complete the "Additional CSU Investigators" form.)**

PROPOSED PROJECT DURATION (research may not begin prior to IRB approval):
From (mm/dd/yyyy): **04/08/2008** To (mm/dd/yyyy): **04/08/2009** (date following anticipated approval; maximum one year later)

Please be aware that ***data collected prior to approval or outside of authorized dates may not be used.*** If your study (i.e. collection of data) will extend beyond the one year authorization, ***it is your responsibility to notify the IRB prior to expiration and request an extension.***

*****Type of funding or support:** **Other Sponsor**

FOR IRB USE ONLY

Initial Evaluation	**Final IRB Action**
☐ Approve as is	☐ Exempt Status: Project is exempt under 45 CFR 46.101 _____
☐ Requires Revision before evaluation or final action	☐ Expedited Review: Approval Category _____
☐ Full IRB review required	☐ Regular IRB approval
	☐ Other: _____

Reviewer: _____ Signature: _____ Approval Date: _____

Institutional Review Board
Human Subjects in Research
Instructions and Checklist for Applicants

The Institutional Review Board (IRB) of Cleveland State University (CSU) is responsible for ensuring the protection and ethical treatment of human participants in research conducted under the auspices of the University. Accordingly, the IRB must evaluate all such research projects, in compliance with Federal Regulations. Your application to the IRB for permission to test human subjects should follow the guidelines provided below. *Proposed Departures from the guidelines should be justified thoroughly.*

Some protocols may be approved through one of the expedited or exempt categories in the Federal Regulations, and some require full Committee consideration. These determinations are made by the IRB, **not** by the researcher. If your protocol requires full Committee consideration, the University Office of Sponsored Programs and Research must receive it no later than two (2) full weeks prior to the IRB meeting; this meeting normally occurs during the first week of the month. Protocols should be submitted to the IRB, Office of Sponsored Programs and Research, 2258 Euclid Avenue, Hannifin Hall, Cleveland, OH 44115-2440 ATTN: IRB Coordinator.

Issues of Particular Concern to the IRB

- **Privacy:** In most research, subjects' willingness to participate will depend on the researcher's explanation of the project and its purpose, the subject's understanding of risks and benefits, and the assurance that the specifics of their participation will not become known to other individuals. A mismatch between your assurance to the subjects and the procedures you explain in your Project Description will lead the IRB to request revisions before approval can be granted. Issues of anonymity and confidentiality are of special concern when subjects might divulge sensitive information, including situations in which their responses might place them in jeopardy (e.g., public embarrassment, threats to job security, self-incrimination). The care with which you address these issues in your procedures is very important to the IRB approval process
- **Risk:** In much research, subjects' participation involves little or no risk. If this is genuinely the case, say so; e.g., "minimal risk," "no foreseeable risk," "no risks beyond those of daily living." If there is some risk, where physical, psychological, social, legal, or otherwise, the IRB will be particularly interested in the safeguards you implement to deal with these risks. The overall importance and soundness of the research project will be especially important if subjects are placed at some degree of risk by participating.
- **Special Populations:** Testing minors, pregnant women, prisoners, mentally retarded or disabled persons, or other special populations raises serious issues regarding risk and informed consent, which your protocol must address. On the other hand, recent federal guidelines mandate the inclusion of women and minorities in research. The nature of your subject population must be clear in your proposal, and you must provide your rationale for including/excluding identifiable subgroups based on gender and minority status.
- **IRB Procedures:** CSU's IRB receives approximately 300 applications a year, each of which must be evaluated for adequate protection of the subjects against research risks. You will enhance the acceptability of your proposal, and the speed with which the IRB can evaluate it, if your protocol is concise, deals specifically with the issues discussed in these instructions, and shows your sensitivity to the overriding concerns of ethical treatment of human subjects. Please feel free to suggest any modifications or elaboration to these instructions that would be helpful to you as you write or revise your applications.

II. Participant Information

Total number of participants: **60**
Age range (lower limit – upper limit): **18+**
Gender: **Both**
Ethnic Minority: **None/Not applicable**
Inclusionary criteria: **Must have a valid U.S. driving license**
Exclusionary criteria: **Must have corrected or uncorrected vision of 20/20**
Source of participants: **Cleveland State University**

Is the data going to be extracted from records that already exist on these participants (e.g. school records, grade transcripts, medical records, etc.)?

☐ Yes ☒ No

If yes, will the data be recorded in a way that prevents subjects from being identified?

☐ Yes ☐ No

Length of participation (x time/session, y sessions, over z months): **120 minutes per session to be held in 1 session over a period of 1 day**

Participants in Special Consideration Categories: (Check all that apply.)

☐ None
☐ Children (age range: ____)
☐ Cognitively impaired persons
☐ Prisoners
☐ Pregnant or lactating women
☐ Blind individuals
☐ Military personnel
☐ Wards of the State
☐ Institutionalized individuals
☐ Non-English speaking individuals
☒ Students
☐ Other subjects whose life circumstances may interfere with their ability to make free choice in consenting to take part in research (please specify): ____

Site(s) of data collection: **Cleveland State University-SH 037**
Letters of approval from project site officials: **are not needed (research on-campus at CSU).**

*You ***MUST*** include letters of approval from appropriate administrative officials at the facility where you will be collecting data.

III. Project Description

a. Give a concise statement of the area of research and briefly describe the purpose and objectives of your proposed research:

This area of research studies work zone crashes, near crashes, and incidents to determine the specific causal factors. The general purpose of this area is to increase work zone safety. The specific objective of this study is to have participants use a driving simulator to replicate previous findings from natural settings. Once the findings have been replicated, experiments using the driving simulator will have increased external validity.

b. Provide a detailed description of how participants will be recruited and used in the project. Please include a description of the tasks subjects will be performing, the circumstances of testing, and/or the nature of the subjects' involvement.

Voluntary participants for the project will be students recruited from the Cleveland State University campus. The participants will be paid $10 per hour for their involvement in this research. At the beginning of the experiment, participants will read and sign the informed consent and fill out a pre-experiment questionnaire that includes demographic information and information about driving experience. Participants will be verbally informed that they may experience simulator sickness when driving which includes dizziness, nausea, headache, or general discomfort. They will

be reminded that if they feel any of these symptoms, they are allowed to discontinue driving and thereby drop out of the study. After this instruction, participants will then get accustomed to driving in the simulator by driving a 20 min. baseline session. They will then drive four 20 min. sessions, with a short 2 min. break between all sessions. Video of the participants will be taken only during driving in the simulator. At the end of the experiment, participants will fill out a post-experiment questionnaire to assess their driving experiences in the simulator.

c. Make an explicit statement concerning the possible risks and benefits associated with participating in the research. Describe the nature and likelihood of possible risks (e.g., physical, psychological, social) as a result of participation in the research. Risks include even mild discomforts or inconveniences, as well as potential for disclosure of sensitive information. If a risk exists, how does it compare to those of daily living? What are your safeguards for avoiding risks, for protecting subjects' privacy, etc.?

The risks involved in this experiment are minimal. Some participants may experience simulator sickness after driving in the simulator for extended periods of time. If a participant indicates at any time that they are too uncomfortable to continue, they will be released from the experiment at that point. Also, crackers and water will be available for the participants to help with any simulator sickness.

A participant may experience physical discomfort from sitting in the simulator seat for an extended period of time. Approximately every 20 minutes, the participant will have an opportunity to walk around for 2 min. to relieve any discomfort from sitting.

Video of the participants will be taken during their drive in the simulator. A camera will be situated in the simulator's rear so that head movement and driving lane can be observed. The camera's rear position will serve as a measure to protect participant identity because a front view of their head will not be visible. Identities will also be masked by the low level of lighting in the testing room. Specific measures for protecting data (including video) are described below in section "e." Data will only be shared with the researchers listed as investigators on this project.

d. Describe measures to be taken to protect subjects from possible risks or discomforts.

To address the risk of experiencing simulator sickness, participants will be informed verbally that they are free to withdraw from the study should they feel any sickness. Crackers and water will be available for participants if they feel sick. To relieve any discomfort from sitting for an extended period of time, participants will have the opportunity to get up and walk around between driving sessions.

e. Describe precautions to ensure the privacy of subjects and confidentiality of information. Be explicit if data are sensitive. Describe coding procedures for subject identification. Include the method, location and duration of data retention. (Federal regulations require data to be maintained for at least 3 years)

To protect participants' privacy, certain measures will be taken to ensure that no sensitive information will be disclosed. Participants' data from the video, driving simulator, and questionnaires will be tagged by number and date, not by participant name. Simulator data will be stored in a password protected computer file. Video tapes, questionnaires, and informed consent forms will be stored in separate locked file drawers. Data will be kept for three years.

IV. Informed Consent Form

Yes	No	N/A
☒	☐	☐

Does the Informed Consent Statement?

1. Introduce you and your research (including names and phone numbers).

☒	☐	☐	2. Provide the subject with a brief, understandable explanation of the research.
☒	☐	☐	3. Explain the risks and benefits.
☒	☐	☐	4. Explain the details of the time commitment for participation.
☒	☐	☐	5. Explain how your protocol either protects confidentiality or is anonymous.*
☒	☐	☐	6. Mention that participation is voluntary, and that the subject may withdraw at any time without penalty.
☒	☐	☐	7. Include the exact statement about contacting the IRB.**
☒	☐	☐	8. Provide a phone number where the subject may contact you for further information (students should include a phone number for themselves and also for their supervising faculty member).
☒	☐	☐	9. Have a signature/date block for the subject to complete.***

* ***Confidentiality and anonymity are not the same. Confidentiality means that the researcher will know the identity of specific subjects and their data. Anonymity means individuals' responses cannot be associated with the data they generate.***

** ***"I understand that if I have any questions about my rights as a research subject I can contact the CSU Institutional Review Board at (216) 687-3630,"*** or if a minor, ***"I understand that if I have any questions about my child's rights as a research subject I can contact the CSU Institutional Review Board at (216) 687-3630."***

*** ***If you wish to dispense with a signed consent form, for either procedural or substantive reasons, be sure to include a clear statement of your reasons and your alternate procedure for obtaining consent.***

V. Copies of Instruments and Questionnaires

To complete this application, attach a copy of all questionnaires or other instruments. This application **MUST** include copies of instrumentation before approval can be granted.

VI. CERTIFICATION/SIGNATURE

I certify that the information contained in this protocol application and all attachments is true and correct. I certify that I have received approval to conduct this research from all persons named as collaborators and from officials of the project site(s). If this protocol is approved by the Cleveland State Institutional Review Board, I agree to conduct the research according to the approved protocol. I agree not to implement any changes in the protocol until such changes have been approved by The Cleveland State Institutional Review Board. If, during the course of the research, unanticipated risks or harm to subjects are discovered, I will cease collecting data and report them to IRB immediately.

Sign Name → Principal Investigator/Faculty Advisor	Date	**Print** Name→ Principal Investigator/Faculty Advisor
Sign Name → Co-Principal or Student Investigator	Date	**Print** Name→ Co-Principal or Student Investigator
Sign Name → Co-Principal or Student Investigator	Date	**Print** Name→ Co-Principal or Student Investigator
Sign Name → Co-Principal or Student Investigator	Date	**Print** Name→ Co-Principal or Student Investigator
Sign Name → Co-Principal or Student Investigator	Date	**Print** Name→ Co-Principal or Student Investigator
Sign Name → Co-Principal or Student Investigator	Date	**Print** Name→ Co-Principal or Student Investigator

Forward this completed form to:
Cleveland State University
Institutional Review Board
Office of Sponsored Programs and Research
2258 Euclid Avenue
Hannifin Hall
Cleveland, OH 44115-2405

Appendix B

CSU Institutional Research Board

Application Form – Additional Investigators

CLEVELAND STATE UNIVERSITY
Institutional Review Board for Human Subjects in Research
ADDITIONAL INVESTIGATORS

CO-PRINCIPAL OR STUDENT INVESTIGATOR
Name: (Last, First) **Bialko**, Christopher Degree Attained:
BA, BS, BBA, BSW
Department: PSYCHOLOGY Title: Student
Electronic Mail Address: c.s.bialko@gmail.com
Office Phone: N/A Home Phone: 440-242-9538
Has the investigator completed the CITI course in the protection of human subjects? ☒ Yes ☐ No

If this is a student investigator, please indicate status:
☐ Undergraduate ☒ Master level student ☐ Doctoral level student

and level of involvement in the research:
☒ Assisting Faculty Research ☐ Thesis ☐ Dissertation
☐ Classroom project: Class name/number _____

CO-PRINCIPAL OR STUDENT INVESTIGATOR
Name: (Last, First) **Deyling**, Elizabeth Degree Attained:
BA, BS, BBA, BSW
Department: PSYCHOLOGY Title: Student
Electronic Mail Address: e.deyling@csuohio.edu
Office Phone: N/A Home Phone: 440-915-7384
Has the investigator completed the CITI course in the protection of human subjects? ☒ Yes ☐ No

If this is a student investigator, please indicate status:
☐ Undergraduate ☒ Master level student ☐ Doctoral level student

and level of involvement in the research:
☒ Assisting Faculty Research ☐ Thesis ☐ Dissertation
☐ Classroom project: Class name/number _____

CO-PRINCIPAL OR STUDENT INVESTIGATOR
Name: (Last, First) **Adato**, Jeremy Degree Attained:
BA, BS, BBA, BSW
Department: CIVIL & ENV. ENGINEERING Title: Student
Electronic Mail Address: j.adato@cox.net
Office Phone: N/A Home Phone: 216-287-9125
Has the investigator completed the CITI course in the protection of human subjects? ☒ Yes ☐ No

If this is a student investigator, please indicate status:
☒ Undergraduate ☐ Master level student ☐ Doctoral level student

and level of involvement in the research:

☒ Assisting Faculty Research ☐ Thesis ☐ Dissertation
☐ Classroom project: Class name/number _____

Appendix C

CSU Institutional Research Board

Informed Consent Document

Informed Consent for Research Project

Title of Study: Demonstration of innovative techniques for work zone safety

Principal Investigator: Dr. Stephen Duffy, Department Chair, Civil and Environmental Engineering
Phone: (216)687-3874

I. Purpose of this Research

The purpose of this experiment is to study driver behavior in work zones. During this experiment, you will fill out several questionnaires and drive for several sessions in a simulator. During the driving sessions, you will be videotaped and the simulator will collect data on your driving behavior.

II. Procedure

After reading and signing this informed consent document, you will be asked to fill out a pre-experiment questionnaire which will include questions about your age and driving experience. Then you will perform a baseline driving task for 20 minutes. During the baseline driving, you will get comfortable using the simulator equipment and driving in a simulated environment. You will then complete four driving sessions, each lasting approximately 20 minutes. During these sessions, you will drive through simulated roadways and work zones. A rear-mounted camera will record your head movements and driving lane. You may take up to a two-minute break in between sessions to get up from the simulator, walk around, etc. if you choose. After all four driving sessions are complete, you will be asked to fill out a post-experiment questionnaire to assess your driving experience in the simulator.

Your total participation time will be approximately two hours. If at any point during the experiment you feel that you cannot continue for any reason, you will have the right to terminate your participation. This includes the right to withdraw at any time after reading and signing the informed consent document. If you have any questions regarding the informed consent document, the experimenter, or your rights as a participant, please do not hesitate to ask.

III. Risks

The risks to which you will be exposed by participating in the experiment are minimal. The risks are as follows:

1. Simulator sickness due to driving in a simulator.
2. Discomfort while sitting in the simulator for an extended period of time.

The following precautions will be taken to ensure minimal risk to you:

1. You have the right to withdraw from the experiment at any time.
2. You will be allowed to take up to a two-minute break in between driving sessions to alleviate any discomfort you may experience due to sitting for an extended period of time.

IV. Extent of Anonymity and Confidentiality

Your data will be kept confidential. Your name will appear only on the informed consent document and will not appear in any data files. For data analysis purposes, your data (including video) will be assigned a number along with the date collected. Data pertaining to performance is solely for research purposes and without your written consent, will not be shared with anyone apart from the individuals working on this research.

V. Freedom to Withdraw
You are free to withdraw from participation in this experiment at any time without penalty. You will not be compelled to participate.

VI. Approval of Research
This research has been approved by the Institutional Review Board for research involving human subjects at the Cleveland State University.

VII. Subject's Responsibilities
I voluntarily agree to participate in this study. My responsibilities are:
1. I should not operate the simulator if I have simulator sickness.
2. I should not participate in the experiment if I have taken any alcoholic beverage or drugs or any substance which might impair my ability to drive safely.

VIII. Subject's Permission
I have read and understood the Informed Consent and conditions of this research. I have had all my questions answered. I understand that if I have any questions about my rights as a research subject I can contact the CSU Institutional Review Board at (216) 687-3630. I hereby acknowledge the above and give my voluntary consent for participation in this research.

_____ _____
Signature Date

If you have any questions about the research, you may contact:

Dr. Stephen Duffy
216-687-3874

Dr. Deborah McAvoy
740-593-1468

Jeremy Adato
216-287-9125

Christopher Bialko
440-242-9538

Elizabeth Deyling
440-915-7384

Appendix D

Pre-experiment Questionaire

Pre-experiment Questionnaire

Directions: Please provide the following information about yourself to the best of your knowledge. The data collected is strictly for research purposes and will be kept confidential.

1. Gender: Male ☐ Female ☐

2. Age:_____ years

3. I have:

perfect vision ☐ to wear corrective lenses ☐

4. Current student status:

Undergraduate ☐

Graduate ☐

Doctoral ☐

Post-doctoral ☐

5. Driving Experience: _____ years

6. Do you own your motor vehicle (e.g., car, truck, sports utility vehicle)?

Yes ☐ No ☐

7. How often do you drive a motor vehicle (e.g., car, truck, sports utility vehicle)?

Very Rarely (e.g., a couple of times a year) ☐

Rarely (e.g., a couple of times a month) ☐

Frequently (e.g., a couple of times a week) ☐

Very Frequently (e.g., everyday) ☐

8. Please list and provide a brief description of any accidents or traffic violations in your U.S. driving history.

_____

_____

_____

_____

_____

9. Do you listen to music (e.g., radio, CD, MP3 player) while driving? Yes ☐ No ☐

9a. If yes, how often do you listen to music while driving?

Very Rarely ☐ Rarely ☐ Frequently ☐ Very Frequently ☐

10. Do you talk on your cell phone while driving? Yes ☐ No ☐

10a. If yes, how often do you use your cell phone while driving?

Very Rarely ☐ Rarely ☐ Frequently ☐ Very Frequently ☐

11. Do you send text messages while driving? Yes ☐ No ☐

11a. If yes, how often do you send text messages while driving?

Very Rarely ☐ Rarely ☐ Frequently ☐ Very Frequently ☐

12. Do you read text messages while driving? Yes ☐ No ☐

12a. If yes, how often do you read text messages while driving?

Very Rarely ☐ Rarely ☐ Frequently ☐ Very Frequently ☐

13. Do you use hands-free devices (e.g., Bluetooth) while driving? Yes ☐ No ☐

13a. If yes, how often do you use hands-free devices while driving?

Very Rarely ☐ Rarely ☐ Frequently ☐ Very Frequently ☐

14. Do you use a Global Positioning System (GPS) while driving? Yes ☐ No ☐

14a. If yes, how often do you use a GPS while driving?

Very Rarely ☐ Rarely ☐ Frequently ☐ Very Frequently ☐

Circle the answer that best indicates how much you agree or disagree with the statement.

15. I consider myself a conscientious driver.

1	2	3	4	5
Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree

16. I obey speed limits when driving on roadways in non-work zones (i.e., drive no more than 5 mph over the posted speed limit).

1	2	3	4	5
Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree

17. I obey speed limits in work zones (i.e., drive no more than 5 mph over the posted speed limit).

1	2	3	4	5
Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree

18. I think that most accidents (both in work zones and non-work zones) are caused by speeding.

1	2	3	4	5
Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree

19. I pay more attention to driving and the surrounding environment when I am going through a work zone.

1	2	3	4	5
Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree

20. I drive more cautiously when I am going through a work zone.

1	2	3	4	5
Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree

21. Using electronic devices (e.g., cell phones, PDAs, and MP3 players) while driving is distracting.

1	2	3	4	5
Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree

22. I think that most accidents (both in work zones and non-work zones) are caused by using electronic devices.

1	2	3	4	5
Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree