The Lasting Physiological Effects of Phone Separation

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Abstract

Compulsive cell phone use in college-aged students has been increasingly reported over the past few years. Frequent use has merited past research to examine the immediate physiological changes from cell phone use and/or cell phone separation in order to make inferences about larger social and behavioral trends. Some of these studies have concluded that increased cell phone usage can elicit physiological responses related to addiction and anxiety. This experiment was designed to better understand if a prolonged physiological response in heart rate, galvanic skin response, and respiration rate occurred between two different treatment groups. To obtain the data, nineteen participants were asked to work on a puzzle, with one group of ten participants having their phones lying face down in front of them and the other nine participants completing the same task with their phones on a chair behind them. During both conditions, the participants received an unexpected phone call from the experimenter approximately 150 seconds into the study. The participants were instructed to continue working on the puzzle during the call. Heart rate, galvanic skin response, and respiration rate responses were measured throughout the entirety of the study. Specifically, the researchers are concerned with the difference in time it takes to return to baseline for each physiological variable post unexpected call between the two treatment groups, and hypothesize that the group with their phones in front of them will have prolonged physiological responses. The analysis of the results did not indicate any significant differences in response times of galvanic skin response and respiration rate between the two experimental conditions. There are significant results suggesting that the heart rate is higher among the group performing the puzzle with their phones behind them. With insignificant mean differences in the times for the physiological variables to return to baseline between the two treatment groups, the researchers are not able to make any inferences regarding physiological responses to cell phone use.

Introduction

There is an increasing amount of scientific literature regarding cell phone use among young adults leading to feelings of attachment and addiction (Manolis, Pullig, & Roberts, 2015). Sixty-seven percent of people aged 18 to 24 now own a smartphone (Roberts, Yaya, & Manolis, 2014). With cell phones becoming increasingly advanced in function and capability, it is not surprising that the use of smartphones has increased over the past few years. With added features that allow quick and easy access to the internet (and thus to social media and unlimited information), compulsive cell phone use is an important issue; as much as 60% of college students admitted they may be addicted to their cell phones (McAllister, 2011). A 2015 study found that cell phone addiction has been associated with a wide range of personality and behavioral traits. In addition, the study found behavioral addiction to cell phones exacerbates

personality traits such as attentional impulsiveness (Manolis *et al.*, 2015). The cell phone has transcended its basic features to become a piece of technology that acts as a primary mode of communication that is essential to maintain relationships (Junco & Cole-Avent, 2008; Junco & Cotton, 2012).

College students' increased dependence on cell phones is likely to have behavioral changes for its users. A 2014 article published in *Computers in Human Behavior* analyzed a group of studies that sought to learn about increased cell phone use and possible relationships to academic performance. Over two-thirds of college students reported to use their cell phones while doing homework or studying. A separate Taiwanese study showed a negative correlation between students' self-reported cell phone use and academic performance. A meta-analysis also showed an inverse relationship between GPA and cell phone use during studying (Lepp *et al.*, 2014).

In a previous study, it was found that not being able to answer one's iPhone while it was ringing led to a decline in cognitive performance. The study utilized a word search and the number of words found was used as an indication of cognitive performance. In contrast, it was found that cognitive performance increased when participants had their iPhone in their possession (Clayton *et al.*, 2015). This suggests that anxiety caused by the inability to access one's cell phone can impair cognitive performance. The anxiety experienced by the participants was also associated with physiological arousal, including increased heart rate and blood pressure (Clayton *et al.*, 2015). This study further investigates this by measuring the amount of time it takes for these physiological effects to return to a baseline level.

The purpose of this study is to find out how long it takes for a student to return to baseline physiological levels after a cell phone interruption, and to see if the placement of the

cell phone makes a difference in the physiological response time. Current research has found that 82% of all interrupted work is resumed throughout the day, but it takes an average of 23 minutes and 15 seconds to return one's focus to the task (Mark, *et al*. 2004). The research also concluded that a distraction leads people to change work strategies; therefore, distractions not only impact the amount of time it takes one to complete a task, but also the efficacy of the subject's work. Students' desire to check social media or text messages can be detrimental to productivity in that it causes a shift in attention that is not quickly regained. While many common distractions are external and relatively unforeseen, being distracted by one's cell phone is distinct in that the person promotes his/her own distraction; thus, it is important to draw the distinction between self-instigated and involuntary distractions.

Relevant research states that individuals are continually being alerted to their cell phones even when there is no stimuli (Pew Research Center, 2015). Separation between one's cell phone causes an increase in cortisol levels, which is associated with an increase in anxiety. Additionally, the distractions a person has throughout the day can cause him/her to lose focus. To build upon this research, this study aims to measure the physiological effects of a cell phone distraction. Galvanic skin response, respiration rate, and heart rate of participants in the study is measured. Measurements will analyze the amount of time it takes to return to baseline function from peak physiological response during the distraction (the phone call). Participants will be divided into **(an experimental condition)** one group where their cell phones are called while their phone is in front of them, while the other group will experience the phone call with their cell phone behind them **(positive control)**. During the experiment, both group participants will be completing a puzzle. After a specific amount of time has passed, researchers will call the subjects' phones and record the physiological responses. It is hypothesized that a prolonged

physiological response to anxiety (i.e.longer time to return to baseline measurement associated with measured variables) associated with the individuals who are distracted with the cell phone in front of them will be found.

The hypothesis being tested is: will the physiological markers of anxiety-respiration rate, heart rate and galvanic response-brought about by phone separation persist longer after a phone call when the phone is in view in comparison to when the phone is out of view? This study stems from increasing inquiry and research on the effects of increased cell phone attachment and use while studying. Technology has become a key outlet for communication and information retrieval for college students within the digital age. The ease with which one can check email, text messages, social media, etc. makes using a cell phone increasingly motivating, particularly in instances of boredom. If the hypothesis were supported through data from this experiment, one could reasonably assume that cell phones elicit physiological effects that are longer in duration while in view versus while not in view. The implications of a prolonged physiological response can help to form more effective methods for studying and working. For example, a student who chooses to put his/her cell phone out of view may be distracted for a shorter duration of time, as shown through these physiological measurements, than someone studying with his/her cell phone in front of them.

The three physiological measurements to be assessed are heart rate, respiration and galvanic skin response; it is expected that these physiological markers of anxiety will take a longer amount of time to return to baseline when the phone is in a subject's line of view rather than out of view. Galvanic skin response is a known autonomic nervous system response to the presence of stimuli that is used as a measurement of emotional change and arousal. A statistically significant change in any one of these variables would support the idea that cell phones elicit

longer lasting physiological effects when in present view of studying or doing an activity. If one variable increases and the other two decrease or similar variations of this scenario occur, conclusions will be based on analyzing each variable independently.

By measuring the time it takes for physiological symptoms to return to a "normal state" after being aroused by a phone call-and comparing this duration from when the phone is in view versus when the phone is out of view-the hypothesis can be supported or rejected.

The positive control for this experiment will be testing that the tools to measure physiological changes are calibrated and working properly. Through pilot studies, notable changes were detected in heart rate, respiration and galvanic skin response. As this experiment tests the effects of the presence of a cell phone in a participant's view in correlation to physiological stress responses, the control will be the phone ringing while not in view. These studies will serve as the positive control as they ensure that the response seen in the treatment group studies is due to the physical presence of the phone.

Materials

A printed Google document survey (Appendix A) was used to recruit participants for the study and to find a proper time-slot for experimentation. Once recruited for the study, the participants were given a consent form modified by the University of Wisconsin - Madison Department of Physiology (Appendix B). The Biopac Student Laboratory System software was used to assess the physiological response of participants. Data on heart rate, respiration rate and electrodermal activity (EDA) were all collected according to the student Biopac instructions. The following materials were used: EDA Transducer (BSL EDA Finger Electrode Xdcr, SS3LA, BIOPAC Systems, Inc., Goleta, CA, USA) and Electrode gel (GEL 101, BIOPAC Systems, Inc., Goleta, CA, USA) to ensure proper contact was being made with the participants fingers,

BIOPAC Respiratory Transducer (BSL Respiratory Effort Xdcr, SS5LB, #13116897, BIOPAC Systems, Inc., Goleta, CA, USA) and Pulse Oximeter/Carbon Dioxide detector (Model: 9843, Nonin Medical, Inc.). The MP3X Acquisition unit (MP36, # MP36E1204002773, BIOPAC Systems, Inc., Goleta, CA, USA) was used to connect the materials to the software, with the exception of the HR monitor, which was recorded by hand. The participants were asked to work on a 300 piece puzzle (Sunrise Feasting 300 Large Piece Jigsaw Puzzle, 2016 Bits and Pieces) throughout the course of the experiment.

Methods

A survey was given to all participants before they were chosen to participate in the study. The survey asked the participants' name, email, phone number, gender, age, laboratory time, and dominant hand. The survey was made via Google Forms. Participants were excluded from the study if they did not put down a cell phone number, due to the fact that this experiment is testing physiological responses to a cell phone stimulus. After the participants completed the pre-study survey, they were then given a consent form. The consent form included the description of the research, what their participation involves, risks and benefits, confidentiality and any questions or concerns the student may have.

In order to obtain results from the experiment that are significant for either rejection of the null hypothesis or failure to reject the null hypothesis, the goal was to test 35-40 participants. After each participant took the pre-survey and signed the consent form, they were randomly assigned to Group 1 or Group 2. Group 1 was assigned to put their cell phones behind them on a chair, while Group 2 was assigned to place their cell phone in front of them within arm's reach.

At the beginning of the experiment, the participant was be led into a room in which the necessary materials were already set up. The room had one table with a 300 piece puzzle placed

on it. There was one chair facing the table and directly adjacent, a computer with all necessary equipment. Once in the room, the participant was asked to sit down in the chair facing the table. When sitting, the researchers asked the participant to read an instruction sheet (Appendix C), which directed where the participant placed his/her phone based on the group assignment. The instruction sheet informed the participant to keep his/her phone on its highest volume. Next, the participant was connected to the Biopac equipment. This includes attaching the Galvanic skin response transducer to the index and middle finger of their non-dominant hand, the Pulse Oximeter/Carbon Dioxide detector to the ring finger of the same hand to measure heart rate, and the BSL Respiratory Effort Xdcr attachment across the chest to measure respiration rate. Once the equipment was connected and all responses were being measured accurately, the recording and experimentation began.

In order to analyze the results of such data collection, it is necessary to understand the mechanisms by which the Biopac materials collect such data. Electrodermal activity, measured through the galvanic skin response transducer, numerically describes the changes in the skin's ability to conduct electricity. This microsiemen measurement is used to compute the increase in sympathetic response within the tissues that changes autonomic tone. Specifically, the Biopac EDA transducer operates through two electrodes, one grounded at 0 volts and the other constant at 0.5 volts, with the internal circuit measuring the current required to maintain the 0.5 volts. Therefore, by Ohm's Law the measured current is proportional to the conductance between the electrodes on two fingers since the voltage is held constant. More simply, the sweat caused by sympathetic response to the stressor changes the electrical conductivity between the two finger electrodes. The Pulse Oximeter/Carbon Dioxide detector measures heart rate by recording the differences in subsequent blood volume waveforms between heart beats. The BSL Respiratory

Effort Xdcr converts changes in chest expansion and contraction to changes in voltage. One respiratory cycle records increasing voltage during inhalation and decreasing voltage during expiration.

To begin the experiment, the researcher told the participant, "At this time, please try to complete the puzzle in front of you to the best of your ability and do not answer or respond to your cell phone if it goes off during the experiment. Do not speak to the researcher once starting the puzzle. We will notify you when the experiment is over." A timer began and measurements for the physiological variables were recorded. At the 2.5 minute mark, the participant's cell phone was called. The duration of the cell phone call was 30 seconds for both Groups 1 and 2. Between the start of the experiment and the 2.5 minute mark, the average conductivity of the Galvanic skin response and the average respiration cycles were recorded. In addition, the heart rate was recorded at 30 second intervals up until the phone call (at the 2.5 minute mark) and then at 10 second intervals for the remainder of the experiment. During the cell phone call, maximum physiological responses were recorded. From 2.5 minutes until 8 minutes, their physiological responses were continuously recorded while the participant completed the puzzle. During this time period, measurements were taken from their peak physiological response (maximum value) to the time it takes to return to "baseline" activity. A participant's baseline was calculated as the mean value between 0.5 minutes and 2.5 minutes. At the 12 minute mark, participants were told they could stop working on the puzzle and that the experiment was over. At this time, participants were given an exit survey explaining the purpose of the study and given the option to address any questions/concerns they may have had. It was expected that Group 2 (cell phones placed in front of them) would collectively take a longer time for peak physiological responses to return to baseline activity.

Results

EDA

In the control group (cell phone behind participant), the mean time for the galvanic skin response value to return to baseline was 34.50 seconds. In the treatment group (cell phone in front of participant), the mean time for the galvanic skin response to return to baseline was 46.56 seconds. The galvanic skin response data collected had a statistically insignificant p-value of 0.3516 from comparing the mean value between the treatment group and the control group. All of the values obtained can be found in **Figure 2**.

Heart Rate

In the control group (cell phone behind participant), the average heart rate was 77.09 bpm before the call and 85.92 bpm after the call. This is an increase of 8.83 bpm from before the call to after the call. For the treatment group (cell phone in front of participant), the average heart rate was 68.82 bpm before the call and 73.6 bpm after the call. This is an increase of 4.78 bpm from before the call to after the call (**Figure 3**). The heart rate data had a statistically significant p-value of 0.04006 from comparing the mean heart rate difference between the treatment group and the control group. These results suggest that the heart rate is higher among the group with the phone behind them, but this should be suspected since multiple tests were done, and the results aren't statistically significant with a Bonferroni correction.

Respiration Rate

In the control group (cell phone behind participant), the average respiration rate was -0.0265 mV before the call and 0.0435 mV after the call. This is an increase of 0.070 mV from before the call to after the call. For the treatment group (cell phone in front of participant), the average respiration rate was 0.01775 mV before the call and -0.00876 mV after the call. This is a

decrease of 0.02651 mV from before the call to after the call (**Figure 4**). The respiration rate data had a statistically insignificant p-value of 0.2122 from comparing the mean respiration rate difference between the treatment group and the control group.

Discussion

EDA

Data collected on the galvanic skin response showed that participants in the treatment group on average took longer (about four seconds) to return to baseline than those in the control group. However, these results had a statistically insignificant p-value of 0.3516. This could be partially due to the relatively small sample size of seven people per group. Additionally, results are consistent with a study done by Andrzejak *et al*. measuring the physiological influence of a mobile phone call. Their study had participants talk on a cell phone for 20 minutes while physiological responses associated with their autonomic nervous system were recorded (heart rate variability, electrocardiogram echocardiogram). The study found that a mobile phone may change the autonomic balance in participants (Andrzejaki *et al*., 2008). Consistent with these findings, this experiment found that both the treatment and control group had a measurable autonomic (EDA) response to the phone call. Implications of this data are that even if a cell phone may not cause someone to be completely disrupted, it still has subconscious effects. Additionally, a student's autonomic nervous system may be less affected if they choose to study with their cell phone out of sight and on low volume.

Heart Rate

One of the physiological variables measured in the study was heart rate (beats/minute). The variable was recorded with the pulse Oximeter/Carbon Dioxide detector (Model: 9843,

Nonin Medical, Inc.). The hypothesis was that participants with their phones in front of them would take a longer time to return to baseline heart rate than participants with their phones behind them. The results indicate that the participants in the group who had their phones behind them took a longer time to return to baseline than the group with the phones in front of them (P-value= 0.04006). The results should be suspect however because multiple tests were performed and the test is insignificant with a Bonferroni correction. The Bonferroni correction is used to reduce the chance of obtaining a false-positive and thus should be noted in further discussion of the results.

The longer time for participant's heart rate to return to baseline activity in the group where their cell phone was behind them could be explained by multiple factors. First, by their cell phone not being in their sight of view it could induce anxiety and loss of attachment. While the group with the cell phone in front of them did not have this anxiety because they knew the location of their cell phone. A study that indicates similar results to in cell phone attachment was done by a Professor of Psychology, Bil Thornton from the University of Southern Maine. He placed two groups of college students in situations where half were asked to place their cell phone in their backpack, out of sight, while the other half were asked to place their cell phone on the desk in front of them. He found that the mere presence of the cell phone correlated with a decrease in cognitive performance and increased anxiety (Thornton, 2014). While the study analyzed cognitive performance and anxiety, an increase in heart rate is normally correlated with an increase in anxiety and thus similar conclusions may be drawn. Another factor that may

explain the increased heart rate could be the term "Nomophobia". This term has been increasingly used by psychologists, which describes the fear of being without a mobile device, or beyond mobile phone contact (Elmore, 2014). The experiment lasted approximately 15 minutes, which depending on the participant's cell phone usage may have caused a fear of cell phone loss. Additionally, the participants who received a cell phone call while it was not in their sight of view could have been more curious on who called them and for what reason in comparison to the group who could easily check their cell phone while it was in front of them. In conclusion, drawing significant conclusions from an increased heart rate in the group where they had their cell phones behind them should be analyzed with caution because of the small sample size and possible influence of extraneous variables in the experiment.

Although the results indicated statistical significance between the control and treatment groups, the small sample size and relatively high P-value indicate hesitation to draw significant conclusions. Multiple reasons could explain the small difference between the control and treatment group in heart rate activity. The first reason for this small difference could be due to the activity of the participant. The participant was completing a puzzle while the cell phone was going off. This task requires no strenuous physical activity and thus would not alter the resting heart rate. One alteration considered in this study was to require a task with more mental effort and/or activity. This idea was neglected because this study's control variable was cell phone placement and not physical activity. The second reason to explain why there was a small difference between groups is due to the noise of the cell phone. All the participants in the study

were alerted with their own cell phone and personal ringtone. A person may have grown accustomed to the same sounds and thus developed an adaptation to the noise. Additionally, studies have shown that noise decibels comparable to a cell phone have no impact on heart rate (Chang S., 2014). Participants in the study may have not found the cell phone disruptive enough because they grew accustomed to their ring tone. All of these factors could explain why there was such a small difference between the control and treatment group in measuring heart rate.

Respiration Rate

In addition, the data for respiration rate did not yield any significant results that could support the hypothesis. The mean difference in respiration rates between the respective groups was statistically insignificant with a p-value of 0.2122. This data indicates a failure to reject the null hypothesis for respiration rate, which means differences in respiration rate will be independent of the placement of the phone during the task. An issue in measuring respiration rate in the context of this study may be due to the sedentary nature of the experiment. Because the participants were sitting down and not completing a physically strenuous task, the treatment was not likely to elicit a wide variation in respiration rates. The data collected indicates that there is no correlation between the respiration rates of the two groups.

Improvements

The results of the study indicated a p-value of 0.3516 for the galvanic skin response, a p-value 0.04006 for the heart rate, and a p-value of 0.2122 for the respiratory rate. The implication of this data is a failure to reject the null hypothesis, and therefore it can be concluded that there was no significant difference between the participants who had their cell phones in front of them or behind them. The environment of the research study could have affected results. The room

was located in a location with poor cell phone reception. This caused a significant number of participants' data to be excluded because the cell phone did not ring. Due to this difficulty, the sample size was decreased and the unique data for these participants could not be used. Some experimental methodologies that could have been implemented to improve the study would be getting data from a larger sample size. The larger sample size would yield a greater power in the study. The power is the chance that null hypothesis is rejected when the alternative is true. Increasing sample size would yield a more confident data set and draw a more accurate conclusion as to whether or not having the cell phone in front or behind the participant caused a more prolonged response or not.

The type of cell phone and how the interruption is initiated could have affected the study. Firstly, each participant on the pre-survey was asked only for their cell phone number and not their type of cell phone. Different cell phones have potentially different durations of call time and call sound. Right before the study, each participant was asked to turn his/her cell phone on "loud" which could be a variety of sounds and volumes from participant to participant. For example, some students had a song set for their ringtone. This could have caused emotions, such as embarrassment, to alter their physiological response. Additionally, in order to improve upon this study, it is recommended that the type of cell phone or ringtone a participant has is known before entering the experiment. This would allow for consistency in interruption sound and duration so that the only variable being measured would be the cell phone location.

The results obtained could have also been affected by the type of activity given during the study. Each participant was assigned to do a puzzle of moderate difficulty to be analogous to mental activities students undergo while studying. The puzzle may not have required enough mental effort in order yield a change in the participants' focus after the phone call. Previous

research concluded that 82% of all interrupted work is resumed throughout the day, but it takes an average of 23 minutes and 15 seconds to return to one's focus (Mark *et al*., 2004). The participants in that study were in an actual working environment, which may explain why the duration of the distraction lasted so long. Using this information, it is recommended that future studies implement a task that requires strenuous mental activity. This would allow for the cell phone interruption to have a more profound disruption of the participants' focus.

From the three physiological variables measured, it is recommended to add a measure of blood pressure before and after the cell phone interruption. Blood pressure measurements would be potentially useful because a previous study found that talking on mobile phones causes a significant rise in blood pressure (G. Crippa *et al*., 2012). This study did not have participants talk on their cell phone; however, it is still thought that this research provides evidence that cell phone use and blood pressure may be correlated. Additionally, G. Crippa *et al*. found that younger phone users had a less significant change in blood pressure than older participants. This indicates that a combination of a strenuous mental activity and a loud, disruptive interruption could affect the blood pressure of college-aged students.

One issue with this study was attempting to hide the fact that participants were going to be receiving a phone call at some point in the experiment. This variability could be due to multiple factors. The pre-survey form (Appendix A) had students give their cell phone number. This input was required for us to know the cell phone number in order to interrupt the participant at some point during the study. Without this information, this study would not be possible. Secondly, before taking the participant to the experiment location, they were asked if they brought their cell phone with them. Thirdly, before starting the experiment, the participant had to read the test form (Appendix C). The test form had them either assigned to place their cell phone

in front or behind them. All three of these required portions of the experiment could have affected the participants' expectations of the experiment. In order to improve upon the methods for future research, it is recommended to place the following statement on the pre-survey form, "If accepted in our study, please bring your cell phone with you and put it on 'loud'." This would eliminate the need to ask participants if they have their cell phone directly before the experiment began, thus reducing the notion that the study is about cell phone use.

Another variable involved in this research study is the variability in phone usage between each participant. The measurements could be skewed to yield more significant results if the majority of participants had extreme attachments to their phone. In a recent study, the researchers put a column in the pre-survey form with an option for participants to describe their phone usage (Nguyen *et al*., 2015). The researchers then categorized participants into groups and then only permitted a person to participate if they were in a particular group. The population sample was already too small and this type of selection would further reduce the research sample size, however, this type of selection is recommended. This is because research has found that 67% of 18-24 year olds own a cell phone, with approximately 60% of college students admitting that they may be addicted to their cell phones (McAllister, 2011). The study could then be directed for only students who indicated excessive phone usage. This would best simulate real life conditions, while also eliminating extraneous variables involved in the research study.

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Figures

Figure 1

Task/ Event						
		Eqipment Setup:				
		EDA Finger				
		Heart Rate				
		Respiratory Rate				
			Peak Physiological Responses recorded			
	Pre-study Survey given out				2nd measurement recorded on return to baseline activity	
	Participants without phones dismissed		Cell phone Distraction Starts	Cell phone Distraction Stops		Participant is disconnected from BSL services
	Consent Form signed					Participant is given short exit survey
		Give Puzzle to Participant				
	*	0 minutes →	2.5 Mintues →	3.0 Minutes →	11 Minutes →	15 mintues
	Time	Start Experiment				End Experiment
				Approximate Experimental Time: 15-20 minutes		

Figure 1 shows a logic timeline for each trial of the experiment. A more detailed description of the timeline can be found within the Methods section.

Figure 2

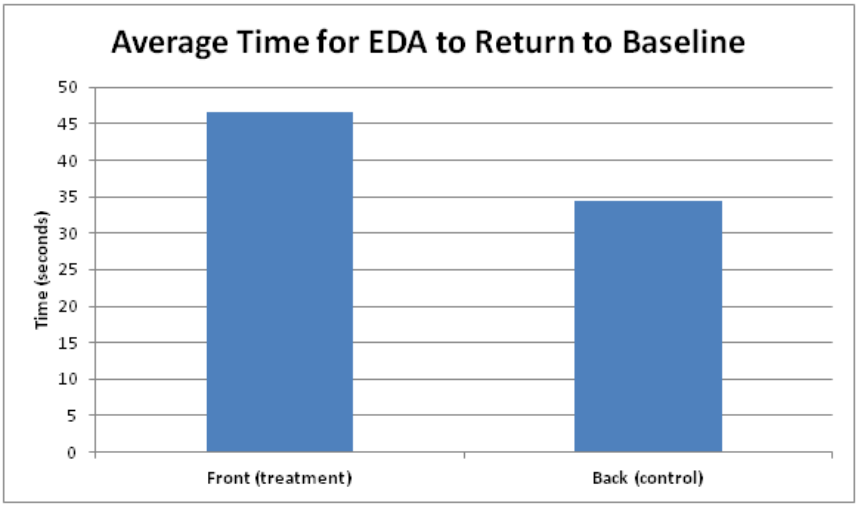


Figure 2 shows the average time for the EDA to return to baseline for both the treatment and control groups in seconds. The average time for the treatment group participants to return to baseline was about 12 seconds longer than those within the control group.

Figure 3

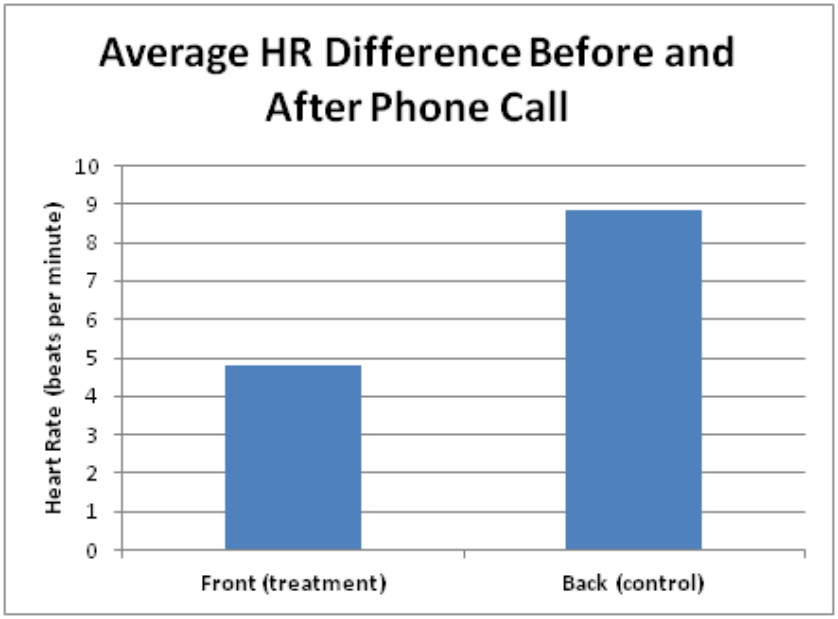


Figure 3 shows the average heart rate difference, that is the average heart rate before the phone call minus that average heart rate after, in beats per minute (bpm). The control group is shown to have a 4 more bpm average difference than the treatment group.

Figure 4

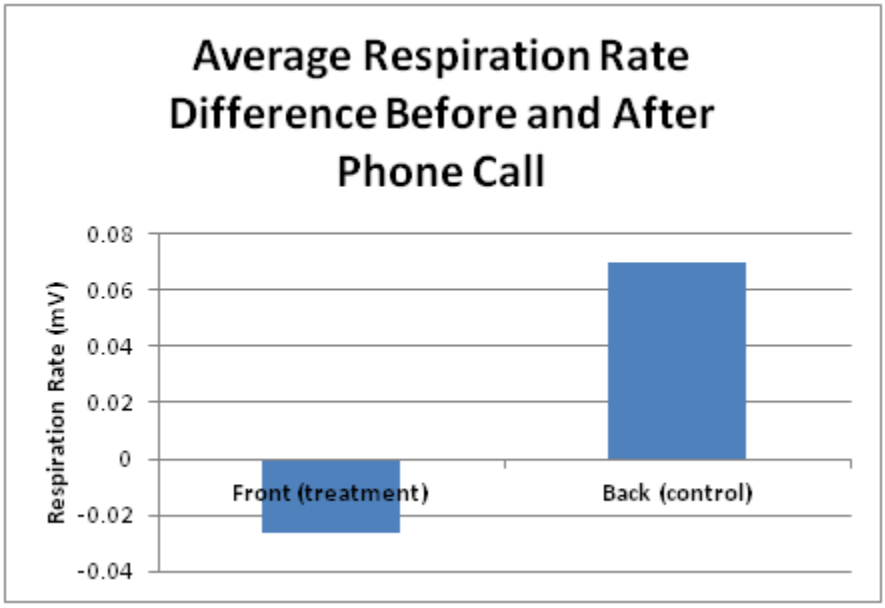
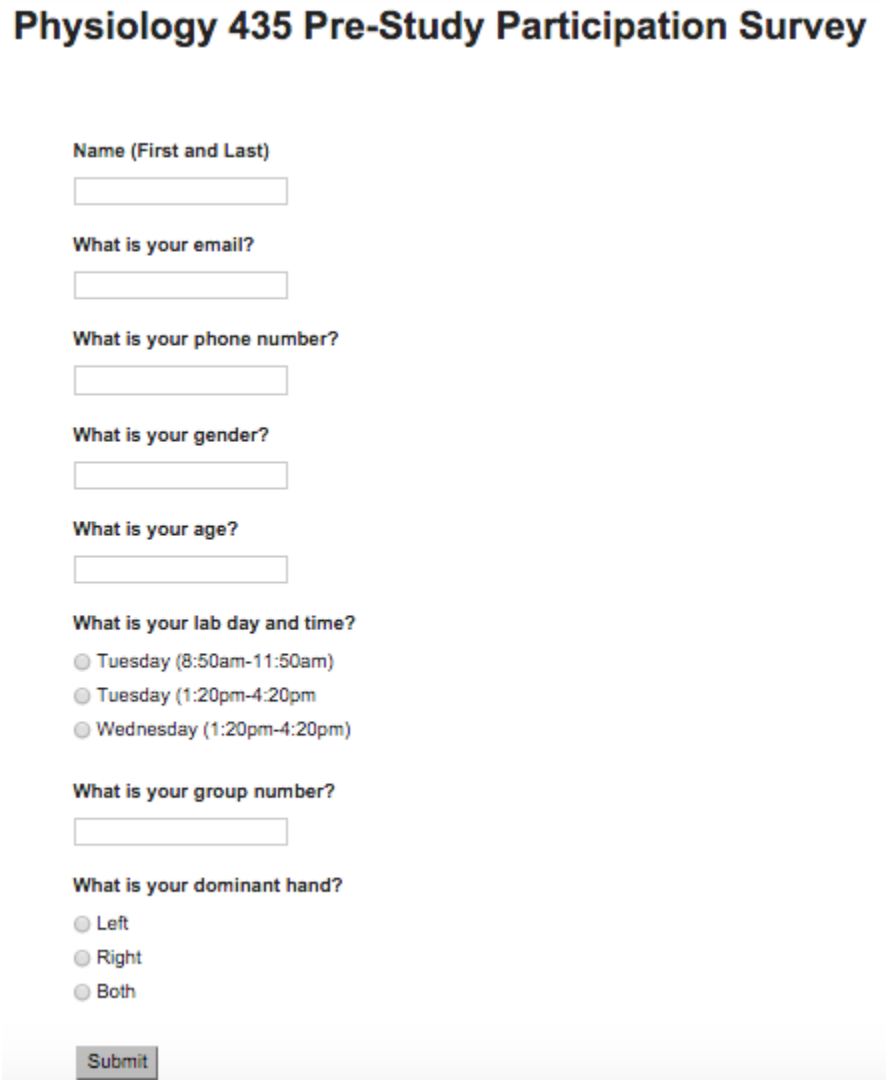


Figure 4 shows the average difference in respirations, that is the average respiration rate after the phone call minus the average respiration rate before, in millivolts (mV).

Appendix

Appendix A:



Physiology 435 Pre-Study Participation Survey

Name (First and Last)

What is your email?

What is your phone number?

What is your gender?

What is your age?

What is your lab day and time?

- Tuesday (8:50am-11:50am)
- Tuesday (1:20pm-4:20pm
- Wednesday (1:20pm-4:20pm)

What is your group number?

What is your dominant hand?

- Left
- Right
- Both

Submit

Appendix B:

University of Wisconsin-Madison
Research Participation and Consent Form

Principle Investigators: Matthew Palm, Prateek Sharma, Lauren Vedrine, Ben Erickson, Alexandra Overman

Description of the research:
You are invited to participate in a research study about galvanic skin response, respiration rate and heart rate. You have been asked to participate because you are a student enrolled at UW-Madison. This study will invite the participation of all students enrolled in Human Physiology 435 at UW-Madison. This research will take place within course laboratory sections.

What your participation will involve:
If you decide to participate in this study, your participation will last approximately 15 minutes. After the semester is completed, our results will be published in an online journal where you will have the option to view our results. Your name will remain completely anonymous. No credit will be assigned for your complete and voluntary participation. If you do not wish to participate, simply return this blank consent form.

Risks and benefits:
There are no known risks or benefits that have been identified with your participation.

Confidentiality:
There may be printed reports as a result of this study, but your name will not be used. Only group characteristics will be reported. We will not include any information that will make it possible to identify you in any reported or publicly presented work.

Questions:
Please ask any questions you have now. If you have questions later, you may contact Matthew Palm at mpalm@wisc.edu. If you are not satisfied with the response of the research team or want to talk with someone about your rights as a research participant, you should contact Dr. Andrew Lokuta at 608-263-7488 or at ajlokuta@wisc.edu. Your participation is completely voluntary. If you decide not to participate or to withdraw from the study it will have no effect on your grade in this class.

Statement of Consent: I have read the above information and have received answers to any questions I asked. I consent to take part in the study.

Name of Participant (please print):_____

_____ _____
Signature Date

Appendix C:

Physiology Test, Group 1

At this moment, please place your backpack on the chair next to you.

Please put your phone on its highest volume. Place the cell phone face down on the chair behind you.

Do not speak to the instructor once the experiment has begun.

Please try to complete the puzzle in front of you to the best of your ability.

If the cell phone goes off at anytime during the experiment, do not answer it. Continue with the puzzle.

We will notify you when the experiment is over.

Physiology Test, Group 2

At this moment, please place your backpack on the chair next to you.

Please put your phone on its highest volume. Place the cell phone face down in front of you on the table.

Do not speak to the instructor while the experiment is in session.

Please try to complete the puzzle in front of you to the best of your ability.

If the cell phone goes off at any time during the experiment, do not answer it. Continue with the puzzle.

We will notify you when the experiment is over.