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Stephanie Alice Busing

2014

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**Response to the Performed Story:
Tracking Emotional Response to a
Theatrical Performance using Galvanic Skin Response**

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**Response to the Performed Story:
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Theatrical Performance using Galvanic Skin Response**

by

Stephanie Alice Busing, B.I.S.

Thesis

Presented to the Faculty of the Graduate School of
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This work is attributed to the encouragement and assistance received from my family, friends, and theatre mentors. All of you are in this work.

Abstract

Response to the Performed Story: Tracking Emotional Response to a Theatrical Performance using Galvanic Skin Response

Stephanie Alice Busing, M.F.A.

The University of Texas at Austin, 2014

Supervisor: Charlie Otte

Psychologists have used biometric data since the early 1900s to analyze the emotional responses of such subjects as students, patients with autism, and adults suffering from stress. Biometric data, the recording of physiological responses such as galvanic skin response, heart rate, and eye blinking frequency, shows peaks in emotional response to stimuli in a human's environment. Galvanic skin response (GSR) is the most potent form of biometric data used for the study of emotional arousal. GSR, if studied in tandem with stimuli, can help researchers identify events in a subject's environment that trigger emotion. GSR has been used to analyze responses to performance arts, but these studies are typically performed in controlled environments using video-taped performances and not under live performance conditions. Furthermore, this research is more often conducted using dance and not theatre, and often the material studied is less than ½ hour in length. This study combines techniques from several prominent studies of GSR for performing arts response research and applies them to the analysis of a 1 and ½ hour theatrical performance.

GSR data is collected from six audience members during live performances of this theatrical work and the subjects are interviewed based on their galvanic skin response recorded during the play. The results of the analysis and interviews are reported to the director and design team of the play in order to inform them of the emotional impact of their work. Such information holds the potential to inform the creative team's future play-making processes.

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Introduction

I am a human.
I am one member of a many-membered culture.
I am a theatre artist.

Regardless of my chosen profession, I see myself first and foremost as one of many humans sharing a set of cultural universals that make up the human condition. It is my desire as a human to understand the universals that undeniably link every variety of human to the other. And it is my hope as an artist to study these universals, unpack them, and present them in the most affecting way I can.

This thesis document is a record of my research into the impact of theatre on audience members utilizing a common scientific technique for studying human emotions: biometric data analysis. This research attempts to find common emotional responses to a specific theatrical play as experienced by six audience members. Through a granular examination of the stimuli that emotionally arouse my subjects, I aspire to improve my own methods of communication to audiences through my designs. This is a precursor to a greater body of work concentrating on finding and relaying universals. It is my belief that finding the commonalities between disparate peoples is a tedious task. And finding a way to communicate these commonalities requires a great deal of courtesy and care.

A team of researchers in Australia that developed a stylus-based technology for recording response to dance (pARF) stated in a summary of their work, “If artists and art explore organization of the brain, then investigation of response to artistic performance

holds promise as a window to perceptual and cognitive processes.... As in other perceptual domains, it is of psychological relevance to quantify agreement among respondents, identify the underlying mechanisms, and eventually investigate factors that influence agreement such as observer expertise and stimulus familiarity.“ (Parf 800/801)

The pARF team members are a few of many psychologists that have studied audience response to performance using biometric data. I rely heavily and gratefully on the experiment designs and findings of these researchers to format my study. My work is an amalgamation of many projects and aspires to add to the existing body of work by describing a very clear and useable design of experiment, concentrating heavily on post-performance interviews I have with test subjects. And it is to be noted that his work should not be considered an unbiased assemblage of quantitative data for scientific research. This is an informed observation of emotional response to theatre, built using quantitative data to elicit qualitatively relevant responses from its subjects.

Chapter 1: What is Galvanic Skin Response and What Are Its Uses?

Galvanic skin response, or GSR, is a form of biometric data used to measure emotional arousal. Biometric data includes DNA, fingerprints, eye retina and irises shape, eye movement frequency and direction, vocal patterns, facial expressions, skin conductance, and more. There are many other names used to refer to GSR, such as psychogalvanic skin response (PGR) and skin conductance level (SCL), but in this paper galvanic skin response is preferred as it is the most commonly used term. Hegazy and Revett, in “Developing an Affective Companion Utilizing GSR Data”, describe galvanic skin response thus:

GSR refers to Galvanic Skin Response, which is an electro-dermal response (EDR). GSR is a kind of response occurring due to changes in the electrical conductance of a person's skin. The main cause of these physiological changes is a change in the person's psychological state. The skin conductance is measured by applying a constant voltage to the skin through electrodes and then measuring the amount of current flowing. There are... two main types of skin conductance: tonic and phasic. The *tonic* is the baseline level and occurs in the absence of any environmental events. The *phasic* type changes when environmental events take place. When such events occur, the sympathetic nervous system sends signals, which activates the sweat glands. This in turn results in an increase in the amount of sweat in our hand, and consequently, increasing the skin conductance [7][8]. ... the brain sends signals when particular external events occur, and at the same time, a person's affective state changes [9].

The reason why GSR is so useful in the study of human emotional response is that emotions are, “dispositions, or states of readiness, that function to prepare and facilitate interaction with the environment [18].” (Latulipe 1846) GSR is an indicator of the human body's readiness to respond to environmental stimuli and thus indicates emotional arousal. GSR is considered the most potent biometric data indicating arousal because skin conductance is regulated entirely by the sympathetic nervous system. The sympathetic nervous system is one of two parts of the human body's autonomic nervous system. The autonomic nervous system is a division of the nervous system that controls the mostly

unconsciously visceral functions of our body. The parasympathetic nervous system (the other half of the autonomic nervous system) regulates what are known as “rest or digest” triggers, or responses that slow the body for the purposes of recuperation, rest, and digestion. The sympathetic nervous system regulates what are known as “fight or flight” triggers, responses to stimuli that contract muscles, speed up heart-rate, and cause the skin to sweat in preparation for movement. The skin is the only part of the body that is controlled exclusively by the sympathetic system. All other organs are regulated by both systems. Because the sweating of the skin is the only bodily response triggered by the parasympathetic system, skin conductance is the purest biometric data that can be measured for the analysis of emotional arousal. (Ted Talks: Roz Picard)

When GSR is recorded it looks similar to other, more well-known biometric feedback methods such as recording heart-rate. There is a baseline, or a consistent moisture level, that human skin maintains and this level does not adjust significantly during an experiment (unless the subject physically exerts themselves). This is what was referred to as *tonic* skin conductance level in Hegazy’s definition of GSR earlier and is represented by the “baseline” in the diagram below. The *phasic* skin conductance level, shown in the diagram as steep peaks, represents the body’s reaction to stimuli in its environment and this is what is studied when monitoring emotional response. After each emotional response event, the peak in skin conductance slowly diminishes to return the body to a baseline moisture level, but there are often interruptions in a return to baseline,

overlaps in the peaks of response, as can be seen between SCR 1 and 2 below.

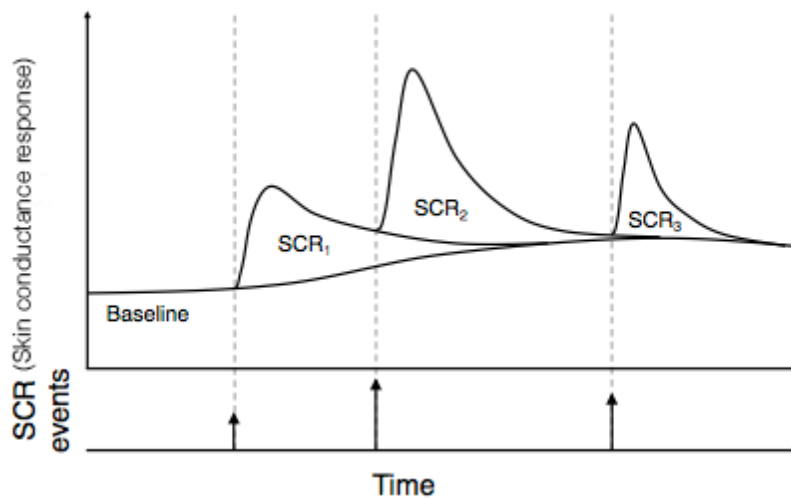


Figure #1: A diagram showing SCR response. Table procured from Silveira et al.'s Predicting Audience Responses to Movie Content from Electro-Dermal Activity Signals, page 708

GSR has been used to monitor emotional arousal in many areas of psychological research. In fact, an entirely new division of the study of emotions has emerged around the effectiveness of GSR and other biometric data in rating emotional arousal: affective computing. Affective computing was developed by Roz Picard, a professor and researcher at MIT, and is essentially the study and development of computer systems that detect user emotions, imitate human emotions, or “feel” a user’s emotions and respond accordingly. GSR is applied heavily to affective computing in the study of stress and autism. Picard and other researchers have developed devices that, when worn by people interacting with patients with autism, can help relay emotions to the patients. People with autism have an intense inability to read the emotions of others and so being able to read data indicating emotion is very useful in cross-communicating with others. Adversely, people with autism so severe they cannot speak are able to wear the devices and communicate their own emotions. GSR devices are also used in lie detection, stress

detection and remediation, and measuring audience reception of advertising and film.
(Hegazy 257)

Chapter 2: Applying GSR to Audience Response

The use of GSR in analyzing audience emotional response has also been applied to the performing arts. Psychologists have performed extensive research into understanding emotional response to live performance and some find this method more useful in understanding response than polls and surveys. Written or verbal polls or surveys rely on the audience members' memory because they are taken after the performance. They are also constrained by space and time because to get the second-by-second response that GSR provides, an interview or poll could take hours, take a lot of space on forms, and could also be exhausting for the audience member. Monitoring the GSR of a subject is very low-impact, involving minimal restriction of movement and very little time commitment as the majority of the study happens while the audience member is watching the performance. (Silviera 707)

While GSR is helpful in analyzing the real-time emotional response to theatre, in simpler forms it only indicates strength of response and not type of response, or whether the response is positive or negative. An audience member may feel angry at a scene in a show or very elated and similarly high GSR levels will represent these two responses.

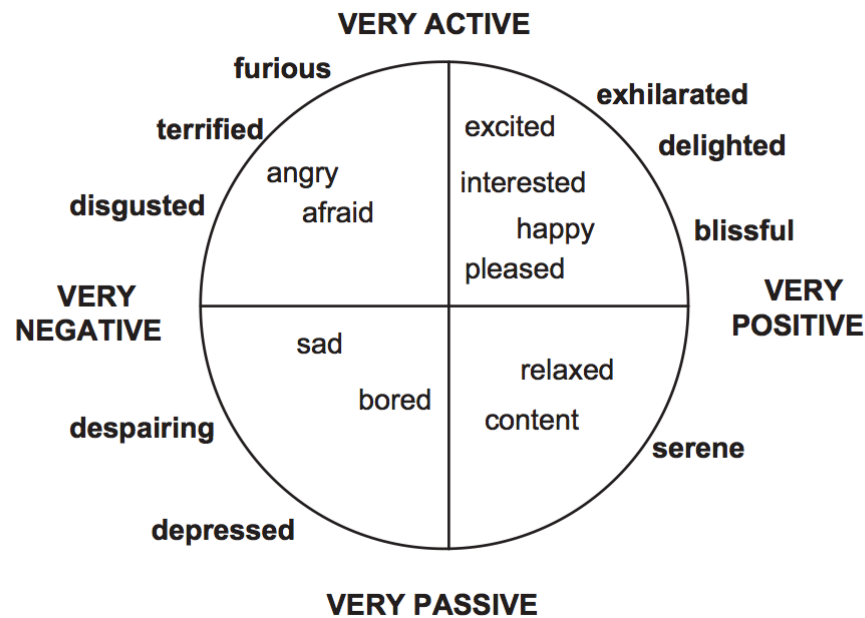
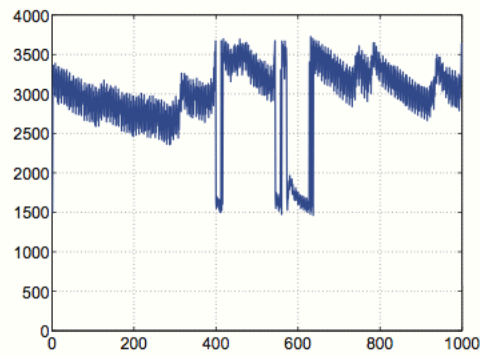


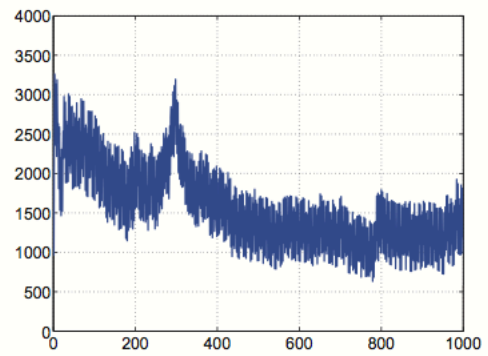
Figure #2: Table procured from Stevens et al.'s Cognition and the temporal arts:
Investigating audience response to dance using PDAs that record continuous data during live performance, page 802

This chart from a study by Catherine J. Stevens, et al. shows how high arousal relates to type of emotion, 'very passive' being a low level of arousal, 'very active' being a high level of response. The strength of a response indicates engagement or what is scientifically known as arousal, whereas the common psychological term for a positive or negative rating of a response is considered its valence. (Parf 802)

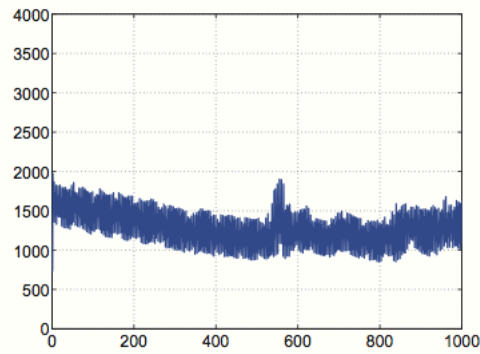
There are analyses of GSR that delineate between positive and negative emotional response. Rui Guo, et al. used very fine-tuned software to show valence arousal as shown here in these images from page 437 of "Pervasive and Unobtrusive Emotion Sensing for Human Mental Health":



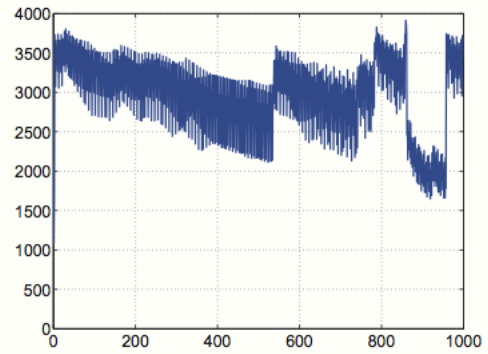
(a) Amusement



(b) Fear



(c) Relax



(d) Sadness

Fig. 1. Raw GSR signals for 4 types of human emotions.

Figure #3: Table procured from Guo et al.'s Pervasive and Unobtrusive Emotion Sensing for Human Mental Health, page 437

In researching Guo et al.'s studies, the devices and software they used were expensive and the GSR data they collected took a large team of psychologists and assistants to analyze. I have designed my experiment to focus on arousal levels and not valence levels in order to keep cost levels low and to limit my team to a number of one, myself.

My decision to collect only arousal levels of audience members was further supported by my research of another psychologist's work, the studies of GSR by Celine

Latulipe. She and her team developed devices that can be used by audience members during a performance to rate both valence and arousal levels. These devices were comprised of sliding knobs placed under the hand of subjects during a performance and hooked up to a computer that recorded its movement. On one of the slider devices the ends of the slider's path were labeled low arousal and high arousal, indicating strength of emotional response. On a second device, the extremes were labeled "Love it" or "Hate it", corresponding with the extremes of the valence spectrum. Half of the subjects rated their experience during a performance by using the arousal slider, while the other half used the valence slider. All audience members studied were also strapped to a typical GSR monitoring device, electrodes placed on two fingers on the hand opposite of the slider hand during the same performance that they were rating using whichever slider device. After analyzing all three forms of data, the slider responses of arousal or valence and the raw GSR signal, Latulipe's team presented the choreographers/directors of the performances with the audiences responses and interviewed them about their thoughts on the analysis. Latulipe and her team found that the majority of the directors and choreographers of the performance they studied preferred to know the arousal results of the experiment collected via GSR or the arousal slider rather than the response collected from the valence slider. And this was because they considered valence to be subjective. Arousal level indicates unconscious engagement, an irrefutable and objective form of data, whereas positive or negative response to a performance can be affected by subjective factors such as personal aesthetic taste. (Latulipe 1849) Furthermore, in a recent email from Latulipe, I learned that in her most recent studies, audience members have expressed that manipulating a slider during a show is distracting and cumbersome, whereas the electrodes strapped to their fingers sending signal to a GSR monitor are low-impact and minimally distracting.

My design of experiment is low-cost and uses inexpensive technology in order to provide a method for GSR analysis that can be executed by one person in a low-impact

and stream-lined fashion. This makes the process an easily affordable and accessible service that could potentially reveal the impact of the work of theatre-makers on audiences.

Chapter 3: Design of Experiment

My design of experiment is a combination of several similar GSR experiments. Its main components include the use of a GSR device that records only the arousal levels of subjects rather than the valence (positive or negative) response levels. Some research teams chose to test subjects watching a pre-recorded performance and not a live performance, but my experiment consisted of the audience members watching a full theatre production live. I also chose to conduct post-experiment interviews with my subjects and creative team (director/designers) in order to better understand the valence response to the tested performances and to determine how useful my findings were for the makers of the theatre piece.

In order to conduct these experiments on a University campus, the University of Texas at Austin, I was required to complete an IRB (Internal Review Board) application, which essentially described my study and its impact on my subjects. Below is my design of experiment as submitted to the IRB.

A. Recruitment

1. Audience members are recruited based on their availability to participate, their excitement and willingness to participate, and their age and gender in order to provide the experiment an available and cooperative subject population. The age range was within the 20s and 30s to create a tighter control and the experience level of viewing theatre of each of these subjects was noted.
2. The design team, director, and the performers of the theatrical production that will be studied will be asked to participate in the study. All subjects of the study are given a Informed Consent Form, customized to their role in the project. The participants are divided into three categories: performers, design team members/director, and audience member subjects.
3. This release allows the primary researcher to use the information recorded for the study in a final thesis document provided that all subjects remain anonymous by name. The consent form will also serve as a release form for all audio and still imagery recorded of the theatrical performances.

Dead Man's Cell Phone Subjects:

Subject Name	Age Range	Gender	Theatre Experience
Subject J	30s	M	Low
Subject N	30s	FM	Low
Subject A	30s	M	High
Subject K	30s	FM	Low
Subject S	20s	M	High
Subject T	20s	M	Med

Figure #4: A table cataloging my subjects

B. The Experiment

1. After recruitment, the audience members will be given instructions on how to prepare for and attend the experiment. They will be asked to arrive ½ hour before the theatre performance, *Dead Man's Cell Phone*, to be performed at the University of Texas at Austin's Oscar Brockett Theater, 2/14/2014-2/23/2014. The audience member will be asked to refrain from ingesting any drugs/alcohol before or during the experiment as these substances may skew the results. They will be given free admission to the performance.
2. When they arrive for the experiment, they will be outfitted with small skin conductance sensors (sensors that record electrical conductivity of the skin indicating emotional arousal of the subject) as scene in the figure below. The sensors are placed on two fingers of a subject's hand and then hooked up to a recording device placed under or behind the subject while the subject, seated, watches the theatre performance event. Each event will include performance of a text by actors and the execution of sound, scenic, lighting, costume and video designs: a typical theatrical experience. The subjects of the study will be asked not to interact with any other audience members.
3. The biometric data will then be collected by a recording device, a laptop computer, in real-time so that the data can later be compared to photographs of the same theatre event.



Figure #5: GSR logger sensor NUL-217 , approximately \$120 including device and analysis software, produced by NeuLog

C. Data Analysis

1. After each session with a subject, the primary researcher will edit together the images and audio taken in real time of the performance and the recording of the subject's biometric response to the play.
2. The researcher will then review the results and take note of the spikes in biometric response indicating emotional arousal during the performance. The researcher will then schedule a time to meet with the subject to review the key moments of arousal and/or non-arousal and ask for their response to the findings. They will be asked to judge accuracy of the results as well as to explain their reactions to the play itself during the key arousal moments. These interview sessions with the subjects will be recorded using an audio recording device for convenient collection of information and none of the audio recorded will be used in the final document. Only transcriptions of the subjects' responses to the interview questions will be used.

D. Follow-Up Interviews

1. After analysis of the data, the primary researcher will arrange for a time to meet with the creative team of the production. The analyzed biometric data and the subjects' transcribed responses to interview questions will be explained to the design team and director. Screenshots of the significant events in the study of each subject will be presented to the creative team members in conjunction with the interview responses, as shown in the figures below.

2. The design team and director will be asked to respond to the results, explaining any findings that are surprising, expected, or helpful. These interview sessions with the design team and director will be recorded using an audio recording device for convenient collection of information and none of the audio recorded will be used in the final document. Only transcriptions of the subjects' responses to the interview questions will be used.

- 1 Start of play, lights out
- 2 Gradual drop as phone rings and rings
- 3 Ring get's louder
- 4 Jean: "Excuse me!"
- 5 Jean touches Gordon
- 6 Jean touches Gordon with spoon
- 7 Jean: "I already have one!"
- 8 Jean: "Gordon, I'm Jean."
- 9 Siren

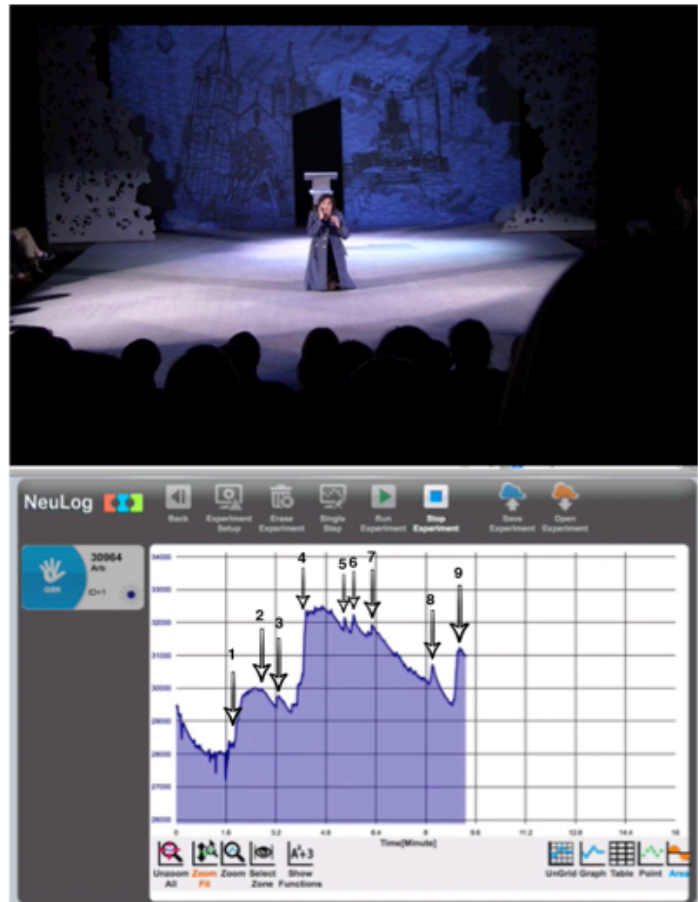


Figure #6: A slide from the collection of data presented to the creative team. Subject N's response to the beginning portion of the play. Each Number corresponds with a spike in the subject's arousal level.

Gordon describes lentil soup

3 Subject's responded to moment

Interview Comments:

"Personal interest in lentil soup.... I eat a lot of soup and people give me a lot of shit about it."

"I have a positive association with lentil soup. So I thought that was such an ugly description of lentil soup. I was like "I love lentil soup!"



Figure #7: Subject N's response to a description of lentil soup in the play. This and one other subject were asked to comment on these moments of arousal during the post-show interview.

Chapter 4: Analysis of all data/interviews

To present my data and subject interview responses to the creative team, I composed a power-point presentation, which included the screenshots of the raw GSR data and recordings of the performances viewed by audience members, and the interview comments given in response to the moments of arousal depicted in the screenshots.

The first section of the presentation described moments where noise or external or physical stimuli might have compromised the data.

Noise and External Stimuli

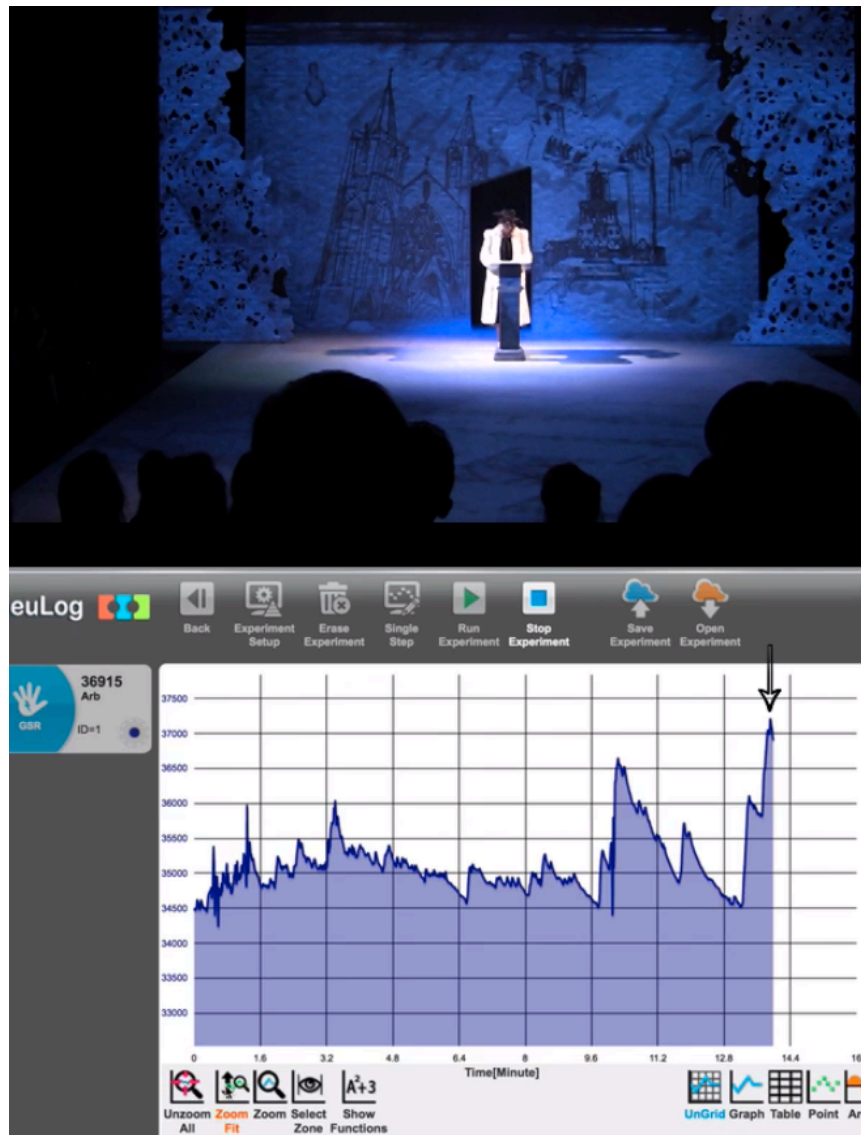


Figure #8: This slide shows a moment in the play when the subject raised their hand during the performance when the character asked the audience to raise their hands if they “had ever answered the phone while on the toilet.”

Personal movement causes spikes in arousal level, such as crossing one’s legs, touching the face, etc. The subject was emotionally aroused by raising his hand, nervous

that he was interacting with the performer, but the physical act of raising his hand undoubtedly contributed to the spike in response as well.

Another example of audience being stimulated by something outside of the performance.

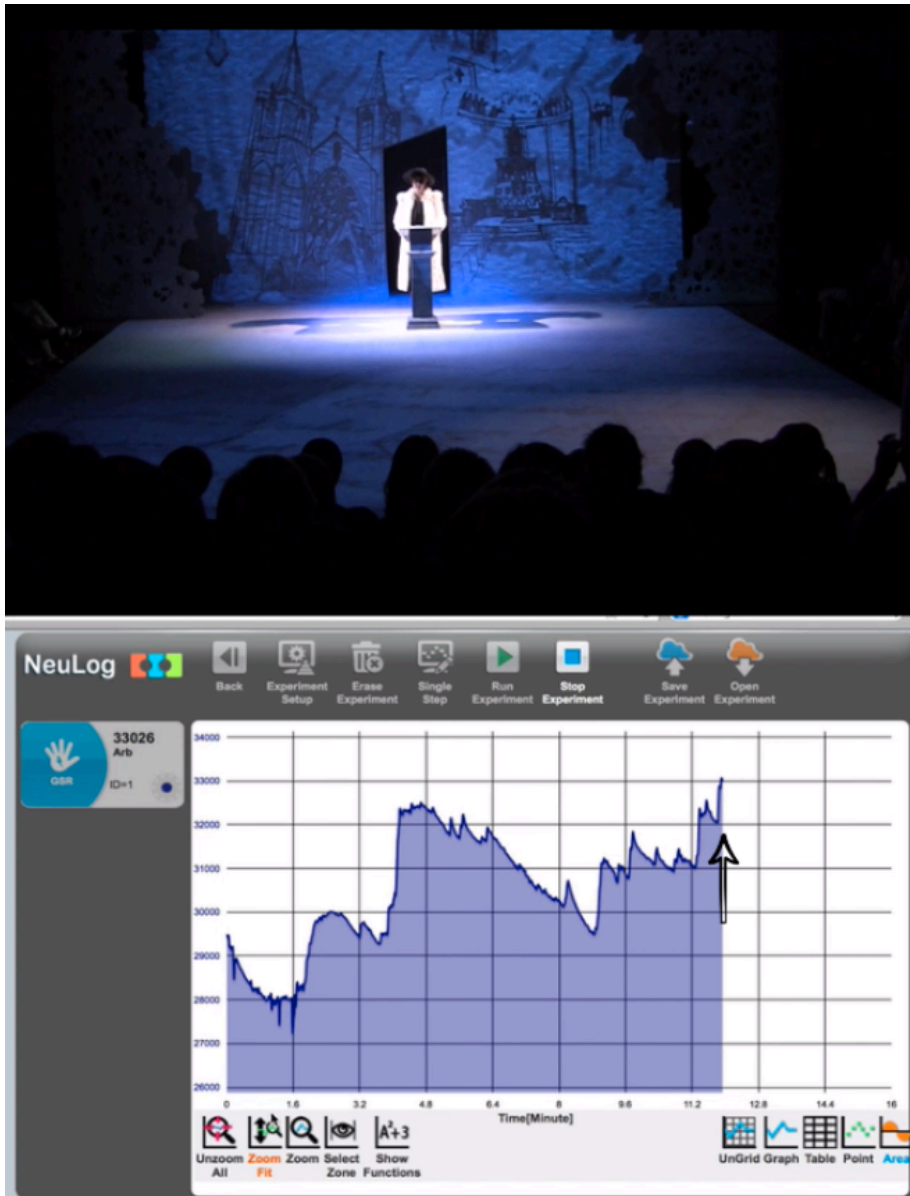


Figure #9: During this moment in the play, the audience member turned to their partner in the audience and spoke with them.

The second section of my presentation included all universal responses- responses that were similar for all participants.

Universals

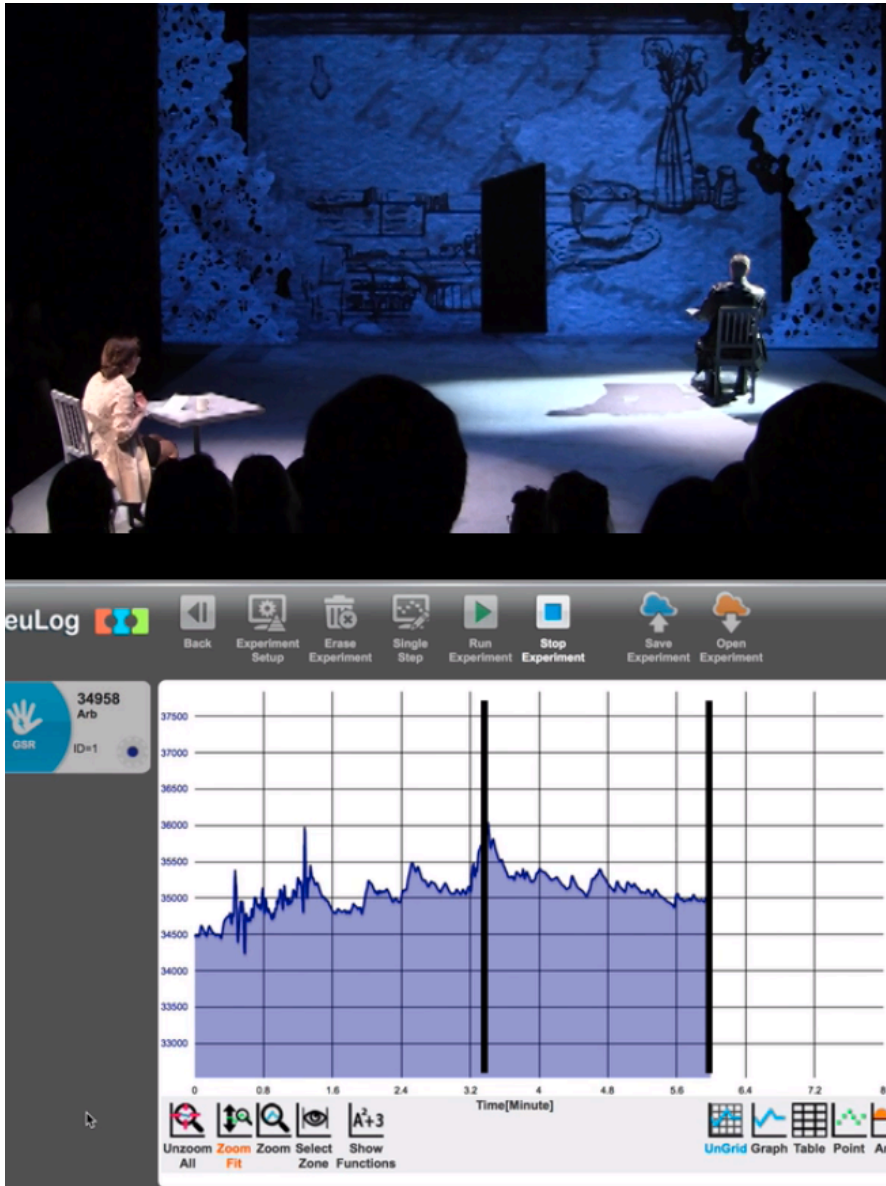
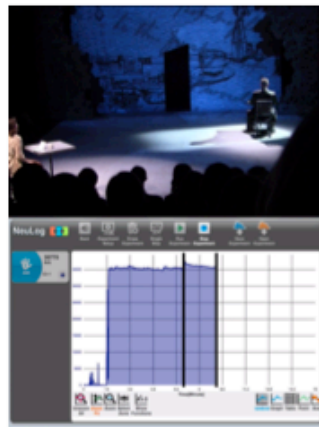


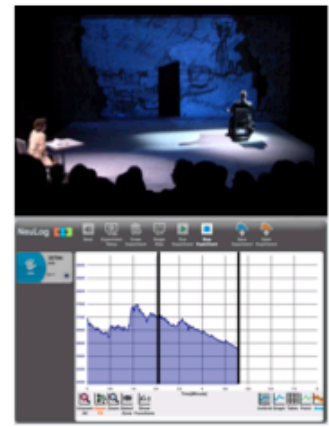
Figure #10: Almost all subjects dropped in arousal during the opening of the play: between when the house lights went down to start the show and the first part of dialogue. During these several minutes, characters were seated and a phone was ringing and slowly getting louder; very little happening on stage.



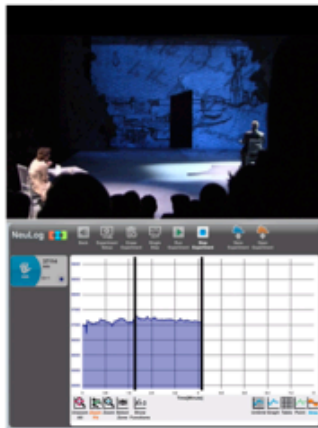
Subject A



Subject J



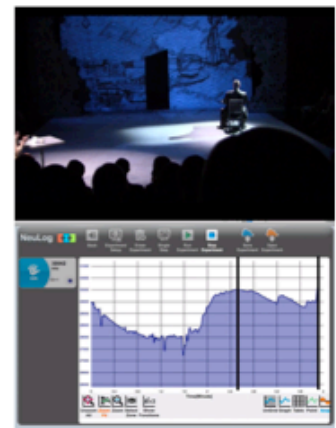
Subject K



Subject T



Subject S



Subject N

Figure #11: A slide from the presentation presented to the creative team showing consistent drops in arousal during the opening of the play.

The majority of the highest levels of arousal during the play across all subjects was during the Hermia scene where she meets Jean in a bar and talks about her relationship with Gordon.

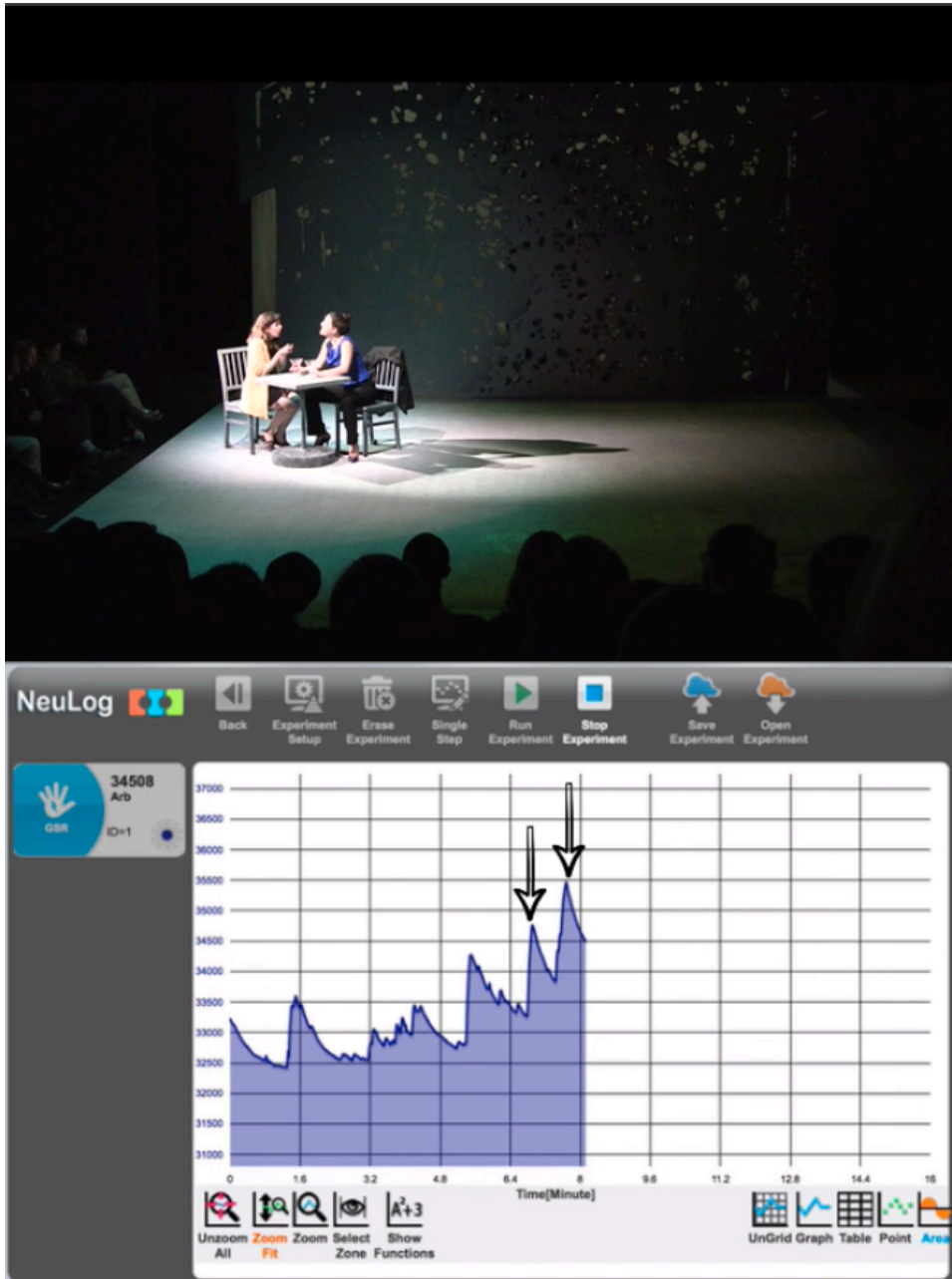


Figure # 12: This figure shows where Subject S responded to character Hermia’s line: “We all know Gordon had affairs.” And “Ripping it out”, referring to her husband tearing her panties off during sex.

During my interviews with creative team members, one person responded that: “The line is actually ‘ripping it off’ and the actor, for whatever reason, kept saying ‘ripping it out’ and I kept correcting her. I wonder if it would have been as high [of a response] if she’d said the line right.”

Another audience member responded to Hermia’s line: “You must hear some dim echo”, referring to phones being so prevalent in our culture we always hear a phone going off, no matter how faint. He explained his high reaction by saying, “Deep thought, good acting. Made me think of how many times I’ve woken to my phone. Nice connection of not being away of the physical noise because its happening around me so much. What am I not able to hear because of [cellphone] noise.”

Another scene that received consistent results was the first love scene, Act 1, between characters Dwight and Jean. Audience members had the most consistent, low-to-medium arousal levels during this scene.

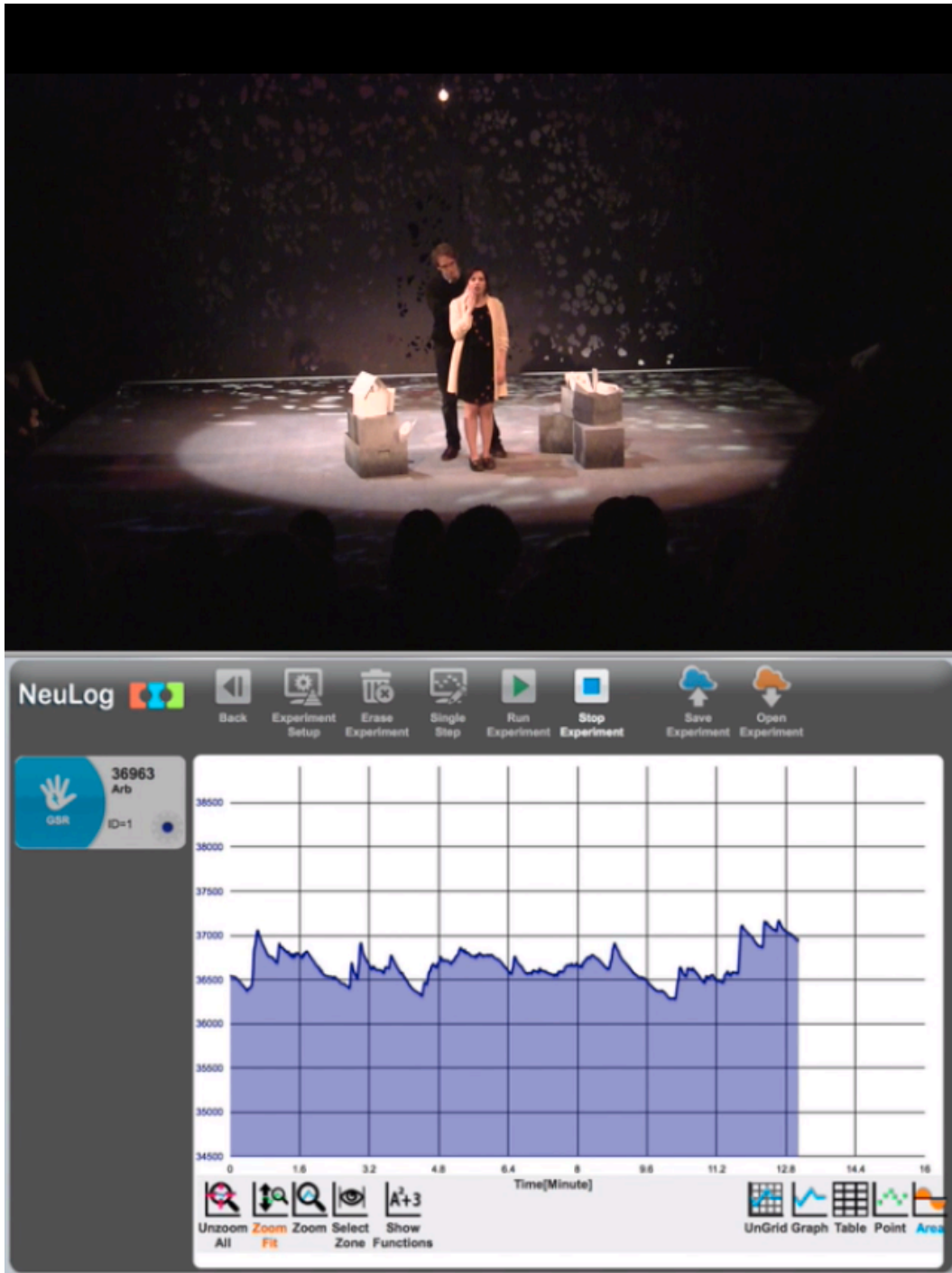


Figure #13: In this slide the arousal level of the Subject is consistent and low, similar to all other subject responses.

Similar to the drop in arousal during the beginning of the play when the pace of the action on stage dropped, the arousal level of subjects dropped during the Cell Phone Ballet scene in Act 2. This is attributed to the relaxing quality of the music, which was slow, melodic, and matched the slow choreography.

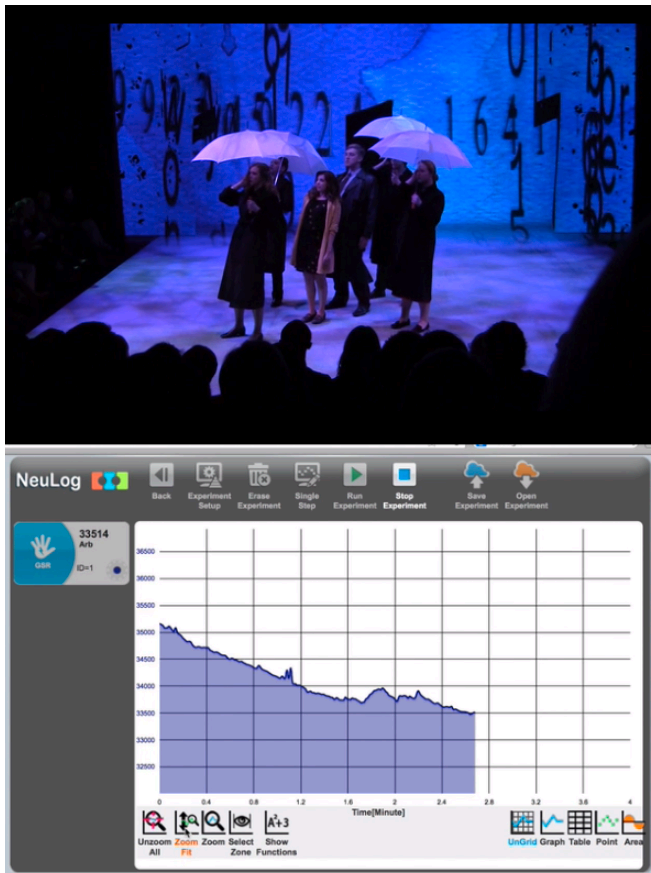


Figure #14: Cell Phone Ballet scene in Act 2

Subject comments about this scene included:

Subject J: One subject thought it lasted too long.

Subject N: One subject enjoyed the music, thought it would fit in an indie film.

Subject T: One subject “totally loved it.”

Subject N: "I was liking the commentary on how everyone is together but not really together. They may be closer in proximity, but not together really."

Subject S: "I enjoyed it, but was also really confused by the... ballet. Was she seeing these things happening because she was a ghost?" Subject also thought it was confusing that the cast members were part of the ballet.

Laughter caused another consistent response in subjects.

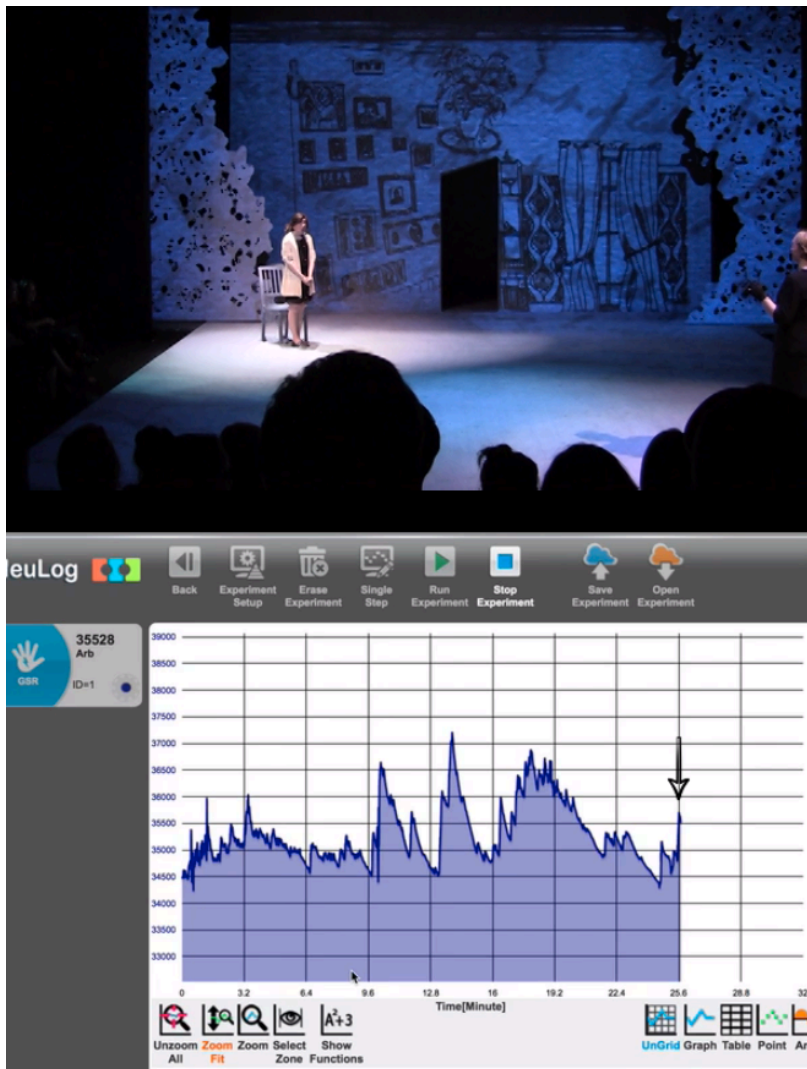


Figure #15: During this dialogue, a line delivered by the mother received the highest response stimulated by laughter. All subjects peaked at this comic moment when the mother compared the character Jean to a casserole.

The next section of the presentation included examples of majority stimuli- moments where most audience response peaked.

Majority Responses

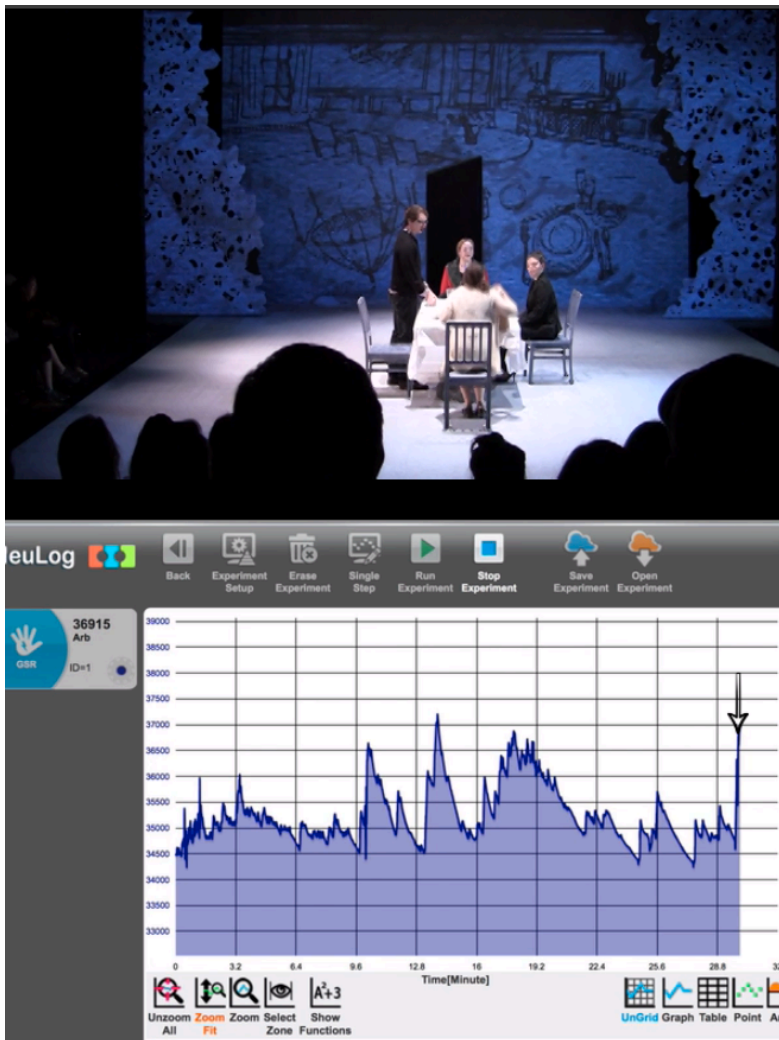


Figure #16: 3 out of 6 subjects peaked at character Dwight's cutting the steak during the dinner scene.

Interview responses to this moment included:

Subject A: "I knew that his mother was trying to embarrass him. She was really putting him on the spot and trying to make him feel embarrassed and terrible."

Subject T: "I kept thinking he has never carved before and this is the first time she is asking him to cut the steak. I thought that was really touching and also kind of scary."

A creative team member responded to these subject interview responses by saying: "That's what we wanted."

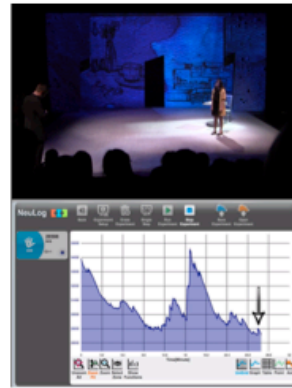
Another moment that received majority response to the theatrical piece was when the character Gordon was dying in Act 2, Scene 1. The only audience member that was not affected by this moment was an audience member that was generally disappointed by and apathetic towards the actor's performance, Subject T.

**Gordon's organ
removal moment**

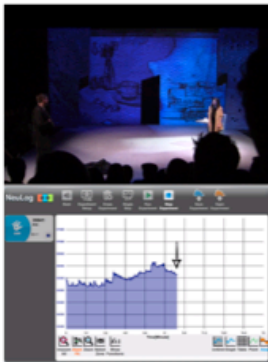
All subjects except for
Subject T responded
to this moment.



Subject J



Subject K



Subject T



Subject S



Subject A

Figure #17: Subject T was the only audience member unaffected by the character Gordon's death.

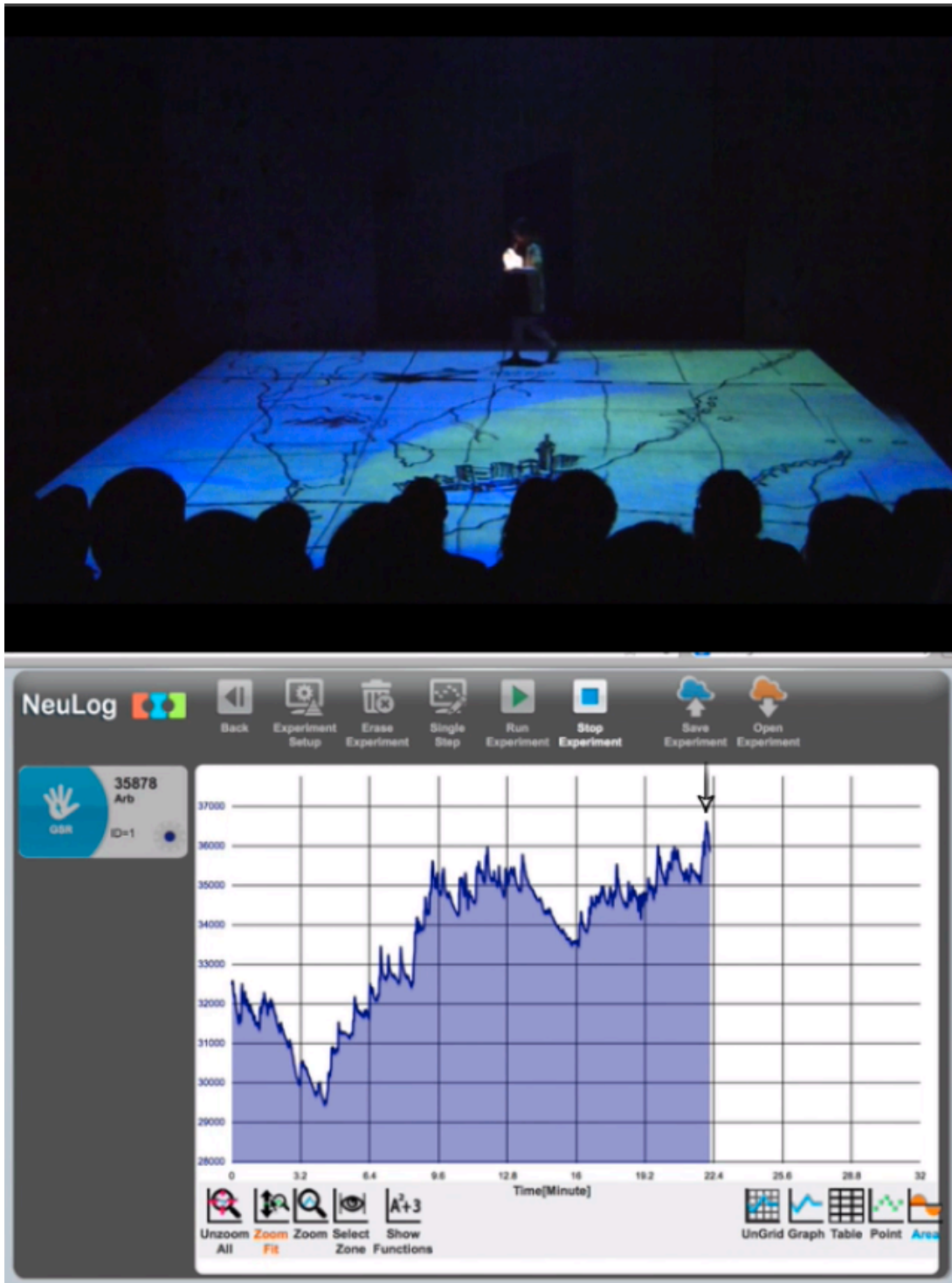


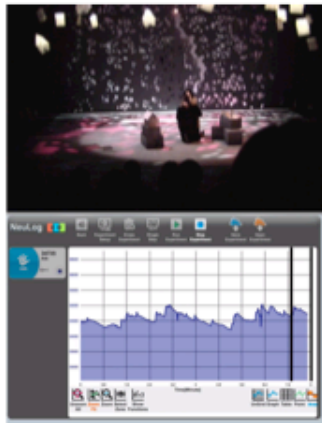
Figure #18: Most audience members responded to the moment when projections spilled over the floor of the stage to illustrate a character's travel across the globe.

Light Houses, end of Act 2

All subjects except for Subject N dropped in arousal during this moment, probably indicating relaxation from the music/sound.



Subject K



Subject J



Subject S



Subject A

Figure #19: All subjects except for Subject N dropped in arousal during the moment when light houses dropped into the space at the end of Act 1, probably indicating relaxation from the music/sound.

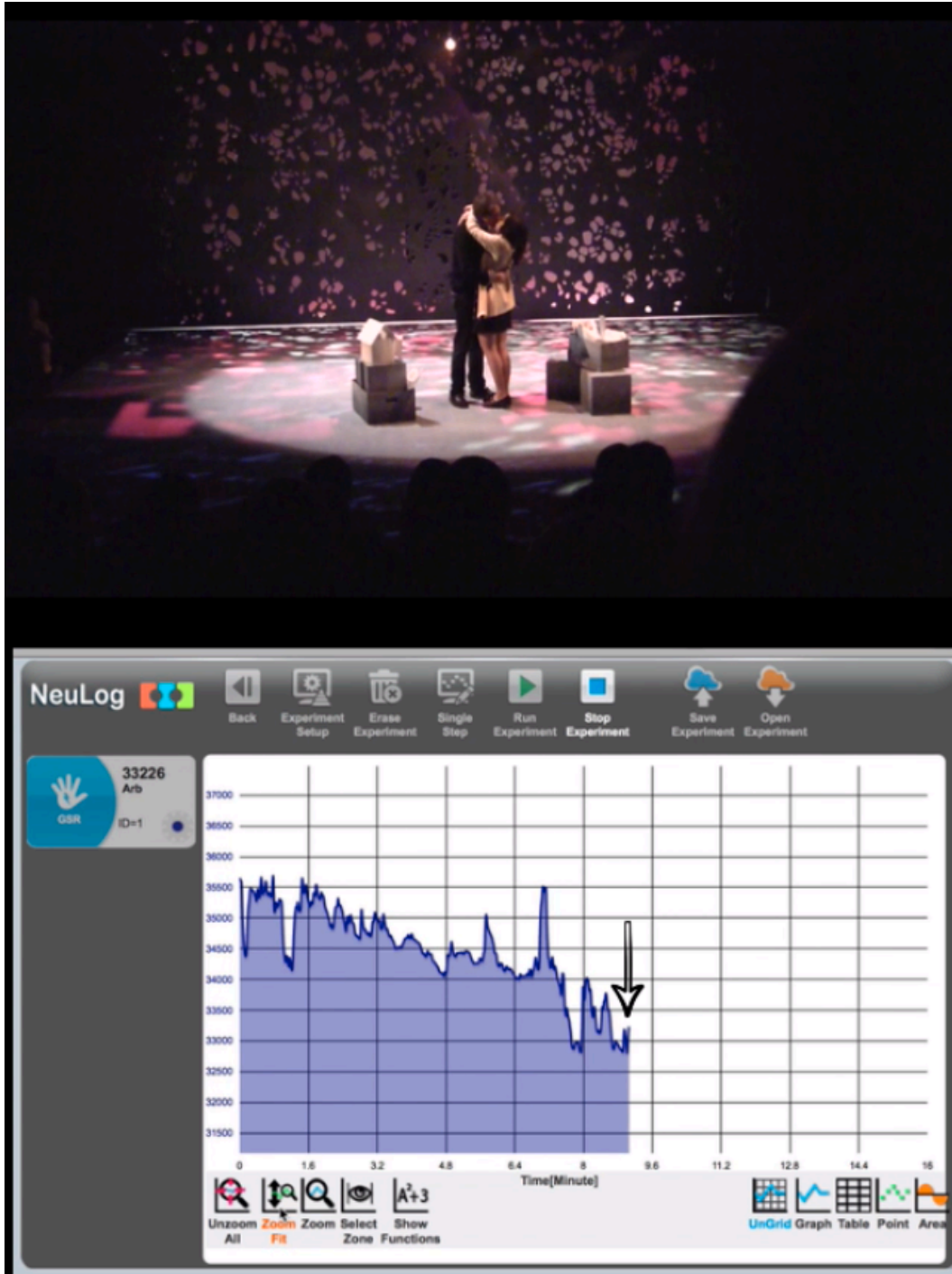


Figure #20: Subject N was the only subject to spike in arousal during the light houses moment of the play. She explained in her post-performance interview that she responds intensely to music.

The next section of the presentation included moments where peaks in response were subjective or personal.

Subjective or Personal Responses

An example of subjective response includes a moment in the play where an audience member was shocked by a character describing his distain for lentil soup.

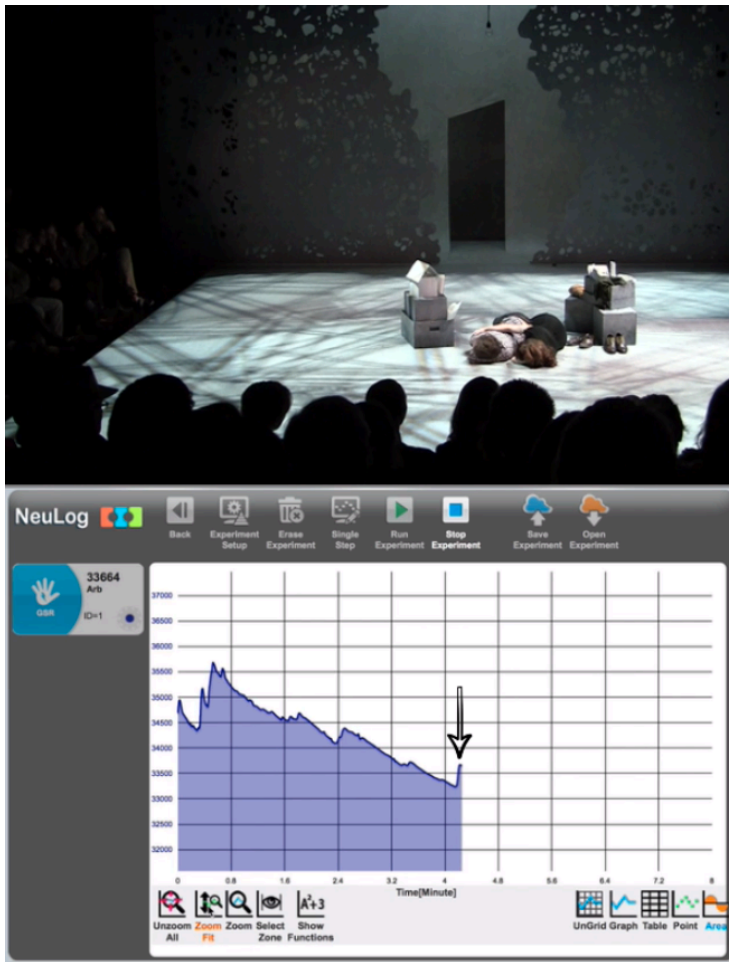


Figure #21: Subject N explained that she responded heavily to Gordon's description of lentil soup because she has, "a positive association with lentil soup so I thought that was such an ugly description of lentil soup. I was like "I love lentil soup!" "

Another section of the presentation of my analysis included listing the highest and lowest overall responses for all subjects.

Highest and Lowest Responses

Most of the highest responses existed in the scene where character Hermia meets Jean in a bar.

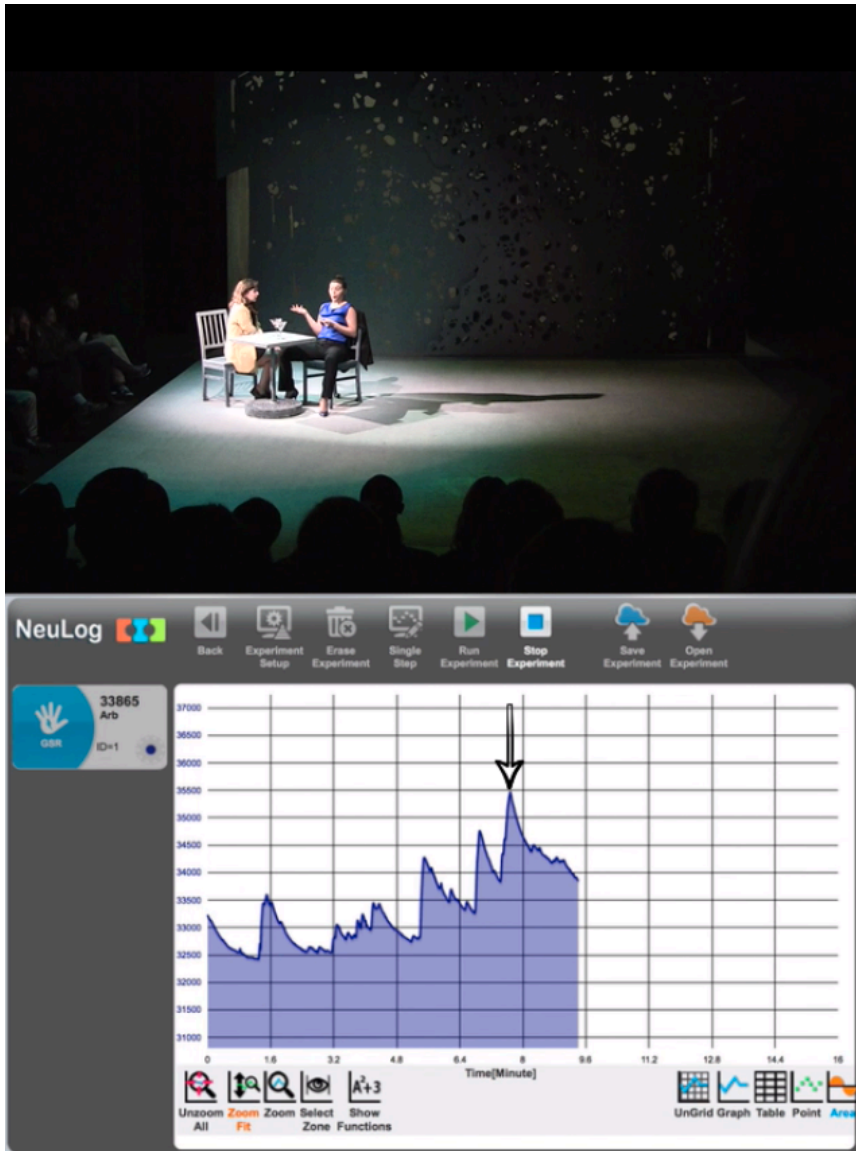


Figure #22: Subject T responded to Hermia’s line: “Like two mirrors facing each other.”
Two other subjects also responded to the emotional depth of this line.

Other characters responded to a Hymn played during the church scene in Act 1.

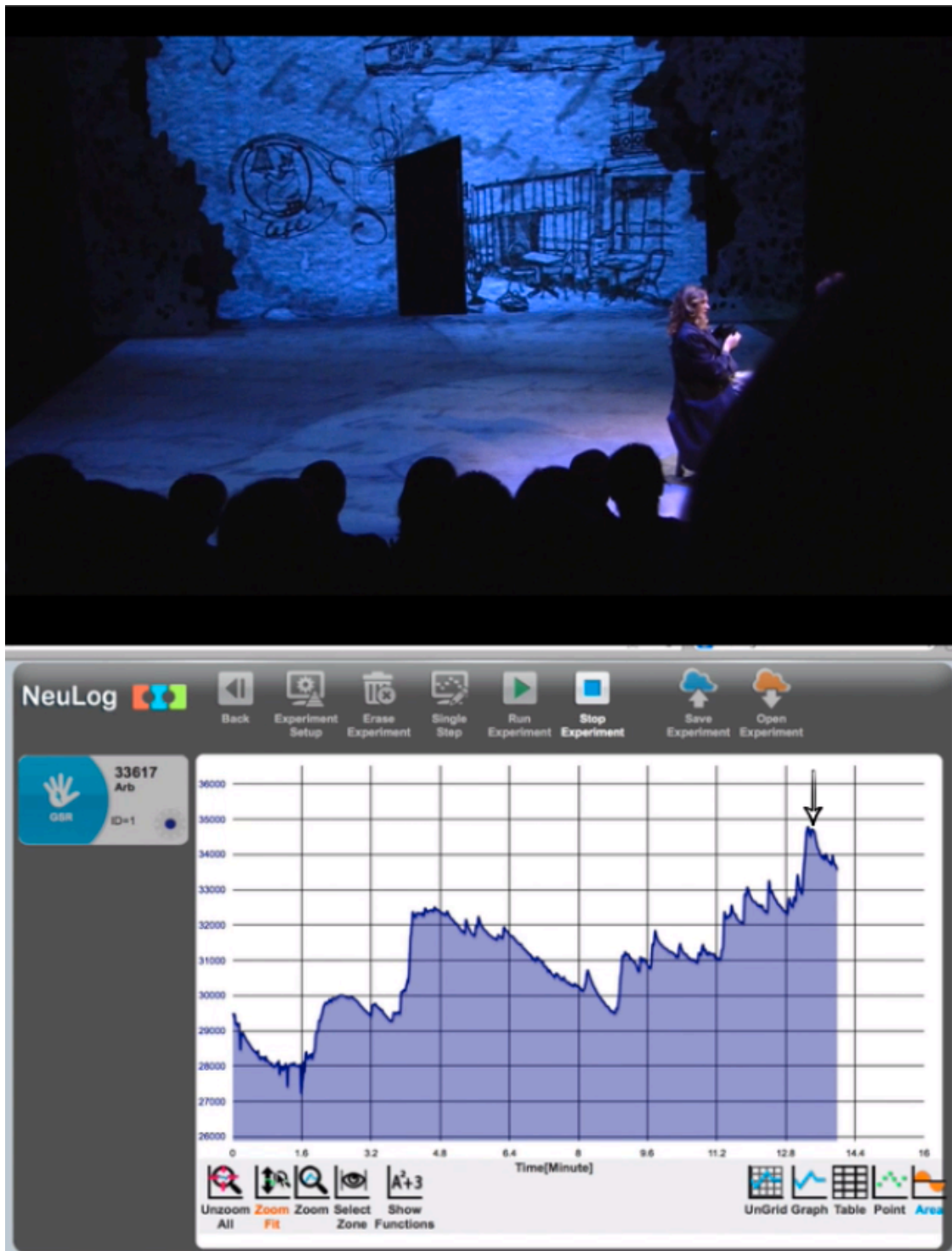


Figure #23: Subject N responds to the organ music played in the church scene.

The lowest arousal moments occurred during the character Gordon's monologue at the top of Act 2.

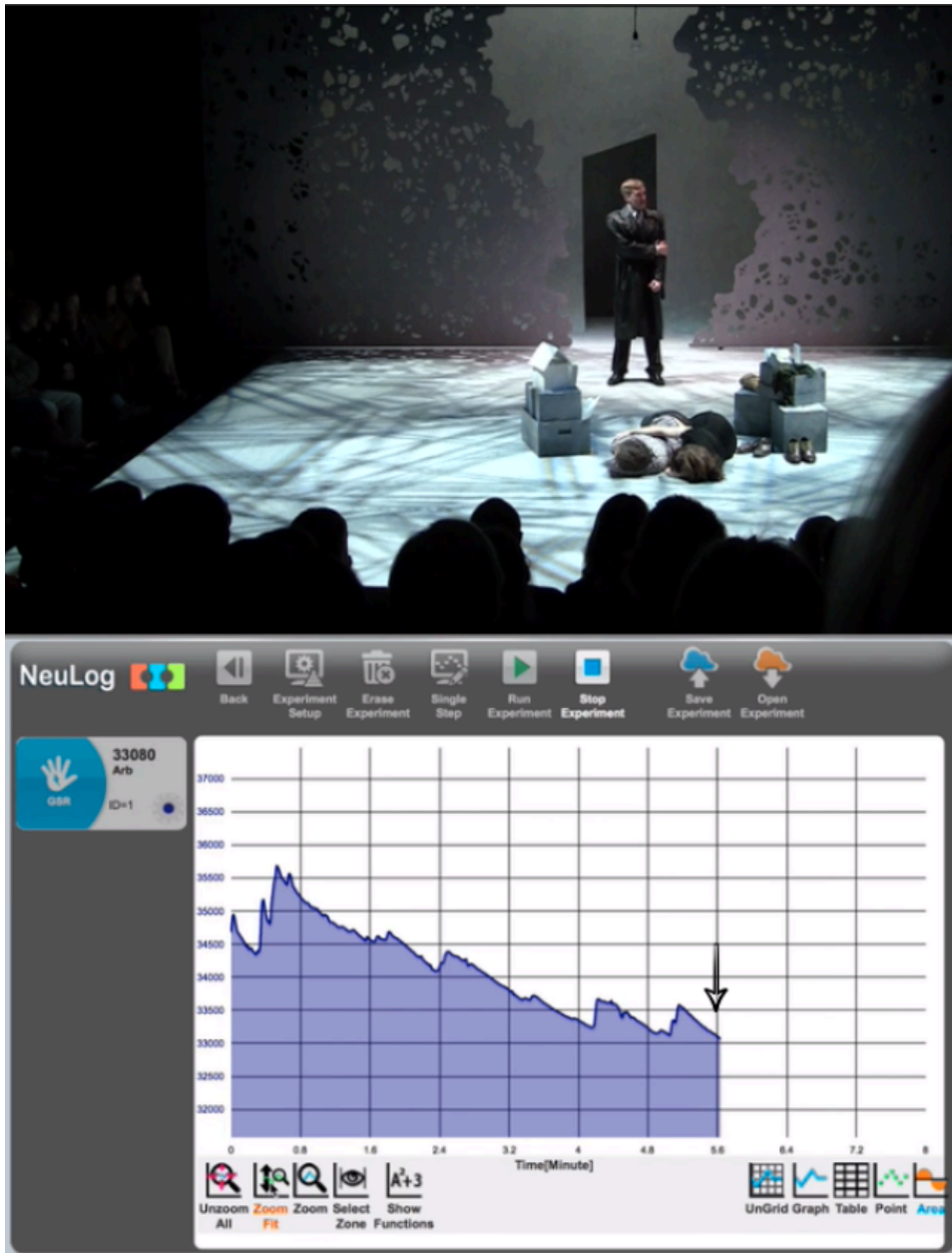


Figure #24: Subject K's arousal level drops during Gordon's monologue.

Chapter 5: Conclusion

After the analysis of the subject data and the interviewing of subjects, the findings were relayed to the creative team of *Dead Man's Cell Phone*. The director and designers found the information useful, especially in regards to timing of transitions between scenes.

One creative team member responded by saying, "The audience response in a bunch of places highlight dramaturgical questions about the text. I don't think it's a problem play, I think a play with problem areas." The creative team member gave examples of this including, "that scene in Act 2, the fast switches, [the 2nd love scene as Jean pulls away from Gordon- a moment where some audience members felt the plot development was weak], and the end." Members of the creative team were also surprised by drop in arousal during the first love scene, the Cell Phone Ballet, and the beginning of the play when Jean and Gordon sat in near silence for several minutes. One team member was particularly interested in the low response to the love scene as she expected audience members to enjoy it more. The team was also surprised that not a single audience member understood the correlation between the paper houses dropping in at the end of Act 1 and the little paper house made by character Dwight previously in the scene. Audience members enjoyed the moment, thinking the houses were an attractive production element, but they did not understand the reintroduction of the symbol of Dwight and Jean's love.

Considering the responses of the director and designers to the results of my study, I conclude that the project was successful in aiding in the understanding of the emotional response of audience members to *Dead Man's Cell Phone*. That being said, this is by no means a hard science. There are many variables that can disrupt accurate reporting on audience response including physiological changes, personal bias, and potentially change in arousal due to the awareness of being tested.

Regardless, the GSR results served as a catalyst for in depth interviews with subjects. In tandem with the GSR data collected, audience interview responses were found to be the most useful aspect of the study for determining arousal levels of the six subjects tested.

As for my study's impact on my own work as a theatre designer and artist, it was significant in my developing a keener appreciation for certain elements of performance. Comic moments elicited such high responses, some of the highest of the study, which reaffirms my appreciation for comedy. I understand now how significant change of pace of dialogue and position of actors on stage are to the engagement of audiences. I also learned that audience members retained less information about plot and characters from scenes that were less arousing. And lastly, I found music and sound to be highly stimulating to almost all audience members, having the power to relax subjects more than any other action or inaction on stage.

Glossary

Biometrics- the distinctive, measurable characteristics used to label and describe individuals.

Biometric data- the empirical systems used to record biometrics. These include, but are not limited to, heart rate, skin conductance, and frequency of eye-blinking.

Galvanic Skin Response (GSR)- is a method of measuring the electrical conductance of the skin measured by sweat level; a type of biometric data. Sweat glands are controlled by the sympathetic nervous system, therefore indicating that skin conductance measures psychological or physiological arousal. Psychological or physiological arousal directly correlates with emotional arousal- the positive or negative feelings a human has in response to stimuli in their environment.

Arousal- the first of the psychophysiological dimensions of emotional behavior that varies from low to high emotional levels.

Valence- the second of the psychophysiological dimensions of emotional behavior that varies from negative to positive emotional levels.

Affect- refers to the experience of feeling or emotion. Affect is a key part of the process of an organism's interaction with stimuli.

Affective computing- computing that relates to, arises from, or deliberately influences emotion or other affective phenomena” [4]. Thus affective computing aims to detect and influence a person’s emotional state while interacting with the computer. (Hegazy 256)

Phasic response-

phasic (fă·zik),

n a description of motor tone activity in which the muscle is actively used for movement rather than stabilization.

Tonic response- is the baseline level [of response] and occurs in the absence of any environmental events. (Hegazy 257)

Noise- external or internal stimuli that can disrupt the results of a study, i.e. a subject touching their face during a test (physical touch causes high GSR response, but does not indicate emotional arousal).

IRB

1. Title

Response to the Performed Story: Tracking Emotional Response to a Theatrical Performance using Biometric Data

2. Principal Investigator

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3. Purpose

Biometric data (which includes the recording of physiological responses such as skin conductance, heart rate, and eye blinking frequency) has been used by psychologists to analyze the emotional responses of such subjects as students, children with autism, and adults suffering from stress. Biometric data records peaks in energy levels in the body in response to stimuli in one's environment and, if studied in tandem with the stimuli, can help researchers understand what causes stress, pleasure, fear and other emotions in humans. Biometric data has rarely been used to analyze responses to performance arts. This project attempts to apply the processes used by researchers in the fields of biometric study to a theatre play in order to better understand audience response. A better understanding of response will not only educate the creators of the theatre piece on the effects of their existing work, but can inform future play-making processes.

4. Procedure Outline

A. Recruitment

- 4. Audience members will be recruited based on their availability to participate, their excitement and willingness to participate, and their age and gender in order to provide the experiment an available, cooperative, and diverse subject population.**

5. The design team, director, and the performers of the theatrical production that will be studied will be asked to participate in the study.
All subjects of the study are given a Informed Consent Form, customized to their role in the project. The participants are divided into three categories: performers, design team members/director, and audience member subjects.
6. This release allows the primary researcher to use the information recorded for the study in a final thesis document provided that all subjects remain anonymous by name. The consent form will also serve as a release form for all audio and still imagery recorded of the theatrical performances studied.

B. The Experiment

4. After recruitment, the audience members will be given instructions on how to prepare for and attend the experiment. They will be asked to arrive ½ hour before the theatre performance, *Dead Man's Cell Phone*, to be performed at the University of Texas at Austin's Oscar Brockett Theater, 2/14/2014-2/23/2014. The audience member will be asked to refrain from ingesting any drugs/alcohol before or during the experiment as these substances may skew the results. They will be given free admission to the performance.
5. When they arrive for the experiment, they will be outfitted with small skin conductance sensors (sensors that record electrical conductivity of the skin indicating emotional arousal of the subject). The sensors are placed on two fingers of a subject's hand and then hooked up to a recording device placed under or behind the subject while the subject, seated, watches the theatre performance event. Each event will include performance of a text by actors and the execution of sound, scenic, lighting, costume and video designs: a typical theatrical experience. The subjects of the study will be asked not to interact with any other audience members.
6. The biometric data will then be collected by a recording device, a laptop computer, in real-time so that the data can later be compared to photographs of the same theatre event.

C. Data Analysis

3. After each session with a subject, the primary researcher will edit together the images and audio taken in real time of the performance and the recording of the subject's biometric response to the play.
4. The researcher will then review the results and take note of the spikes in

biometric response which indicate emotional arousal during the performance. The researcher will then schedule a time to meet with the subject to review the keys moments of arousal and/or non-arousal and ask for their response to the findings. They will be asked to judge accuracy of the results as well as to explain their reactions to the play itself during the key arousal moments. These interview sessions with the subjects will be recorded using an audio recording device for convenient collection of information and none of the audio recorded will be used in the final document. Only transcriptions of the subjects' responses to the interview questions will be used.

D. Follow-Up

3. After analysis of the data, the primary researcher will arrange for a time to meet with the creative team of the production. The analyzed biometric data and the subjects' transcribed responses to interviews questions will be explained to the design team and director.
4. The design team and director will be asked to respond to the results, explaining any results that are surprising, expected, helpful. These interview sessions with the design team and director will be recorded using an audio recording for convenient collection of information and none of the audio recorded will be used in the final document. Only transcriptions of the subjects' responses to the interview questions will be used.

E. Final Document

1. The procedure and results of the experiment will be described in a thesis document written by the primary investigator and defended in front of a academic thesis committee in the Theatre and Dance Department at UT Austin.
-

a. Location

All parts of the study will be conducted in the University of Texas at Austin Theatre and Dance Department, Winship Building. Audience participation will occur in the Oscar Brockett Theatre. The design team/director interview will occur in another room within the Winship building.

b. Resources

Personal funds (of the primary investigator) will be used to purchase the equipment that will test the skin conductance of the subjects.

c. Study Timeline

The study will take 3 weeks: 2 weeks of data collection during the theatrical performance and 1 week of data analysis and follow-up interviews with subjects and the design team/director.

5. Measures

All of the participants of this study, audience and the design team members and director of the theatrical production, will be interviewed using interview questions specifically written for this project. These interview questions have been written based on research of similar experiments conducted.

6. Participants

a. Target Population

A total of 8 participants will be studied. These will include students and professors of the University of Texas as well as subjects not attending the university. An equal amount of male and female subjects will be tested and the ages of the subject range between 19 and 65 years.

The participants are divided into three categories: 1. performers, 2. design team members and director, and 3. audience member subjects.

b. Inclusion/Exclusion

The only potential subjects that will be excluded are: those that have seen a production of the theatrical performance before and those who are required to take any pharmaceutical drugs on a regular basis (drugs may skew the results).

c. Benefits

The audience member participants will be able to view their biometric response to the theatrical production which can inform them of their emotional state during the performance. These participants will also receive free admission to the theatrical performance that they will be tested during. The design team and director will benefit in that they will gain a better understanding of audience response to their present work as well as inform their future play-making processes.

d. Risks

There are no foreseeable risks of this experiment.

e. Recruitment

Recruitment of audience member subjects will occur via personal communication between subject and investigator initially and then specific information about the study will be sent to the subject via email. The investigator will recruit subjects directly from her collection of acquaintances, friends, and professional associates. The design team, director, and performers of the theatrical production that will be studied are already assembled and cast.

f. Obtaining Informed Consent

Informed Consent will be derived from all participants of the study. A printed copy of the Informed Consent document will be given to each

participant studied to be signed and returned to the investigator by hand. All informed consent document templates have been uploaded to the IRB Access website. Three total documents will be used for each of the three categories of participants: performers, design team members and director, audience member subjects.

7. Privacy and Confidentiality

The names of the participants will not be used in the study notes or the resulting thesis document. The design team members and director of the theatrical production will be indicated in the thesis document using their creative title, for example: director, scene designer, sound designer. The performers will be indicated using their character name. The audience member subjects will be indicated using number or letters, for example: Audience Member B. And these subjects will be described using their age and gender.

Confidentiality of the Data or Samples

- a. The audience member subjects will be outfitted with small skin conductance sensors (sensors that record electrical conductivity of the skin indicating emotional arousal of the subject). The sensors are placed on two fingers of a subject's hand and then hooked up to a recording device placed under or behind the subject while the subject, seated, watches the theatre performance event. Each event will include performance of a text by actors and the execution of sound, scenic, lighting, costume and video designs. The performers will be asked not to interact with any audience members during the performance and to mentally note any time they were significantly distracted from the performance by an outside stimulus.
- b. The investigator will use the first names of the subjects for data collection and personal documentation, but the final thesis document and the results of the experiment shown to the design team/director of the theatrical performance will use pseudonyms to identify the audience member subjects.
- c. All biometric data derived from this experiment will be stored on the primary investigator's personal computer, under password protection.
- d. The data will be kept indefinitely, but always used in the same capacity that it will be used during the experiment and thesis document writing.
- e. No other researchers/investigators will have access to the names and raw data of the experiment and anyone that reads the thesis document will be able to find the names of the design team/director and performers of the theatrical production if they research the specific production. Because of this, the performers have the option to, at any time in the experiment, choose to have their identity completely anonymized by blurring out their figure in all photographic documentation of the performance studied and deleting recordings of their voice taken during the performance studied. All design

team members and the director have the choice to request that their creative title not be used in the study.

8. Compensation

No compensation will be given for participation in this study.

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