# Affective and Bio-signal Reactions to Environmental Public Service Announcements

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**Abstract-** Environmental public service announcements (PSAs) employ different message delivery techniques that elicit responses within viewers. Often, these videos are not tested on how the viewer has received the message. Visceral and affective reactions to environmental PSA videos are measured to determine how the viewer responds to select PSAs. A viewer's heart rate and pupil dilations are measured to report on arousal as well as their eye movements to better pinpoint their gaze. The viewer also self-reports on their subjective feelings of pleasure, control, and arousal. Because the study is still ongoing, more data must be collected to draw conclusions.

## Introduction

The aim of this study is to determine how viewers react to certain types of environmental public service announcements (PSAs) in order to measure the affective and visceral responses of the viewer. Different PSAs convey their information in positive, negative, or neutral ways to appeal to the viewer's emotions. Whether or not they actually make the viewer feel this way, is unknown. Many studies link people's biological responses to their emotional states, thus, we collect data to measure both the viewer's affective and visceral reactions to the PSAs.

### *Visceral and Affective Reactions to Stimuli*

The autonomic nervous system, specifically a person's heart rate and pupil dilations alter when viewing visual stimuli. When exposed to pleasant and unpleasant stimuli pupils dilate at a faster rate and to a larger size in comparison to when viewing neutral stimuli (Bradley, Miccoli, Escrig & Lang 2008). Although the pleasantness of the stimuli was at opposite ends of the valence spectrum, pupil size dilated to a similar size. Heart rate was also affected by the pleasantness of the stimuli presented. When presented an unpleasant image, the heart rate of a viewer decelerated (Palomba, Angrilli & Mini 1997; Bradley, Miccoli, Escrig & Lang 2008). As pleasure increases, so does the viewer's heart rate (Lang, Reenwald, Bradley & Hamm 1993). Further, auditory stimuli are also seen to significantly affect a viewer's emotional and physiological experience (Partala and Surakka). Since the PSAs we are testing are videos which include both auditory and visual stimuli, we can take the later as assumption when for gathering meaningful data during the study.

## Method

### *Subjects*

Because of the timing of the study, a demographic of undergraduate computer science, and wildlife ecology and conservation University of Florida undergraduate students was chosen. A similar demographic was chosen for the pilot of the study, consisting of 18 undergraduate students taking a wildlife ecology and conservation class at University of Florida.

### *Video Stimuli Selection*

We met with a team of Wildlife Ecologists and Preservation specialists to select the videos for the study. We looked for videos containing different message-framing techniques, looking if the message had a positive, negative, or neutral mood. Videos that conveyed their message in highly positive or negative ways, were favored over those that were more neutral.

After compiling the list, an online pilot was launched in which the viewer watched the videos and rated how they felt immediately after. A better knowledge was gained about the framing of the videos from a source outside the study team (table 1). Table one shows the average ratings each video received from the 15 students who participated in the pilot. They were asked to rate the videos on a scale from one to ten. This was used as a guide to decide which videos to remove from the study in order to maintain our time allowance.

### *Measuring Visceral and Emotional Reactions*

The SMI RED-m eye tracker and the BITalino Board heart rate monitor were used for the study.

| Video Name | Pleasure | Intensity | Control | Money Donation | Time Donation |
|---|---|---|---|---|---|
| Org N | 8.7 | 3.3 | 7.1 | 5.5 | 4.5 |
| Org O | 6.3 | 3.2 | 6.6 | 4.3 | 3.8 |
| Org P | 3.5 | 4.7 | 3.5 | 2 | 2.2 |
| Org Q | 6.2 | 5.3 | 5 | 3.2 | 3 |
| Org R | 2.2 | 5.5 | 3.7 | 2.2 | 2.2 |
| Org S | 5.1 | 3.8 | 6 | 4 | 3 |
| Org T | 3.2 | 4.3 | 4.8 | 3.5 | 3.3 |

**Table 1.** Message-Framing Average Ratings
Note: To preserve the integrity of the ongoing study, the names of the videos have been omitted.

Participants were seated approximately 64 cm away from the screen, optimizing the eye tracker data. The viewer's electrocardiogram (ECG) and eye gaze (where their eyes were looking on the screen) were recorded throughout the video. The ECG data was continuously recorded, yielding a heart rate reading every 650 milliseconds. The eye tracker had a sampling rate of 60 Hz.

Two monitors were used in the study. The proctor had control equipment on a laptop away from the participant's view. The participant viewed the videos on a separate monitor with the eye tracker positioned at the bottom of the screen. In order for the eye tracker to sense their eyes, the participant's chair was to be adjusted so that they could see the center of the screen when their head was relaxed and center.

In order to measure their emotional reactions, the participant answers 3 questions after each video. They are asked to self evaluate their feelings and rate them on a scale from 1 to 9 based on how pleasurable, in-control, and intense they felt after viewing video. To minimize nervousness or any bias from the study proctor, the answers were input on a keypad away from the proctor's view.

As a measure of whether or not the message was effective, the participants are also asked how much time and money they would donate to help the cause that the PSA was advocating.

***Designing the Study***

The study was modeled after a previous study, which used MatLab to screen videos, and record the viewer's heart rate, pupil dilations and eye gaze coordinates. This previous code was used as a sort of skeleton for implementing the experiment.

Modifications to the existing code were needed to implement our study. The demographic questions section was expanded to better suit the needs of this study. Since we were to include the subject's ethnicity, classification, and major. Their race/ethnicity, gender and race are also recorded. The proctor inputs the answers to the questions on a pop-up screen on their monitor. The discussion questions after each video were also added. The question slide pops up on the participant's monitor asking them to input an answer on the keypad. Their answer gets automatically recorded in a text file containing all of the subjects' answers. The heart rate and gaze were recorded to contain more meaningful information like heart rate and the time of the occurrence within the video.

After the data is collected, it has to be checked to make sure that it was stored correctly. All the files are opened to make sure they are non-zero. A plotting function is called from the command line in MatLab. This function prompts you to choose two files, one with the heart rate information just gathered and one with the gaze data, both from the same video. It reads the data from the text file and plots the gaze points along with a red rectangle. If all the points lie within the rectangle, they are valid coordinates within the screen dimensions. Otherwise, the data has outliers.

The heart rate is plotted as a line graph. The experimenter must verify that it does not reach above 110 or below 70, which is an average range of BPM. If the data has major outliers, they must then choose if it is reliable data and if they should trust it. It must be recorded within the findings.

***Procedure***

Before the participant arrives, the experimenter must set up and label the heart rate electrodes, make sure the appropriate programs are opened, connect the eye tracker to the power source, and set up the consent form and payment information.

When the participant arrives, they come in to the user study room and sit down in front of the monitor. They are familiarized that they will be watching a collection of wildlife public service announcements while their heart rate and eye gaze is recorded as well as answering a few questions after each video. They read and sign the consent

form if they still wish to participate. The participant puts on the electrodes for the heart rate. We test that the ECG is being read correctly and makes sure that the eye tracker is sensing their eyes. They can adjust their seat accordingly if not. We run a sound check to make sure that they can hear the video.

We run the experiment code and calibrate the eye tracker and ask the participant not to move too much anymore after this point. As the participant answers the demographic questions are answered by the participant, a baseline heart rate records for reference. After the demographics, the participant reads the instruction slides asking them to watch the videos and afterword respond a couple questions about how they feel about the video.

Once they have finished reading, the video portion of the study begins. The proctor leaves the room when each video is playing. After each video is over, they come back in and once the participant finishes answering the questions, they verify that the program can move on to the next video if their heart rate has returned to the baseline. They also run another validation for the eyetracker to make sure that the equipment is still working correctly.

Once all the videos play, the study is over and the participant is paid for their time. They sign a payment verification form and are free to leave. The data is then verified with the data verification programs.

***Discussion/Results***

During my time at University of Florida, I was able to complete 2 full runs of the study. During these two runs, we found that the study was consistently taking about 35 minutes to complete. We decided that we should cut 2 videos from the list since we were only paying the participants for 30 minutes of their time.

Because this study is still not completed, the results are yet to be published. After my experience working on this project, I helped a student learn the procedures and guidelines for running the experiment and verifying the data. She will run the test subjects and report the findings.

**References**

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