

# CASE STUDY 5510 & 5510-B: Psychophysiology in The Context of Electronic Media

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## ABSTRACT

*Psychophysiology is the study of emotional experience with cognition, exploring the intricate interface of mind, brain and body. This field of study is concerned with how mental events, such as feelings and thoughts, may have pronounced effects on bodily processes. In other words, psychophysiology is the study of the correlation between the psychological and the physiological domains.*

*In the field of psychophysiology there is a strong emphasis on the importance of physiological responses in both cognitive and emotional processes. The objective of this paper is to research the parallel between psychophysiology and interactive 3-D electronic works of art that provoke both virtual and real experiences. I will reference one particular work of art that provides a 3-D model to exemplify scientific theories. The work probes brain activity in response to perceived danger and offers a method for clinical observation of the facial expressions of the human subject in real time.*

*It is my intent to merge science, culture and technology into the realm of art making. It is this mergence that provides an awareness of the physical and psychological aspects of the human interface in the context of interactive electronic media.*

## CASE STUDY 5510 & 5510-B

This paper addresses one specific case study: CASE STUDY 5510 & 5510-B, a contemporary version of a dual guillotine that is coin-activated. CASE STUDY 5510 & 5510-B is a video-kinetic sculpture installation consisting of two guillotines measuring 8 ft high mounted on a platform (see Figures 1 and 2).

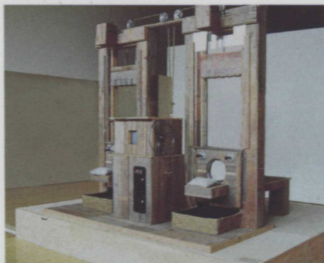


Figure 1 CASE STUDY 5510



Figure 2 CASE STUDY 5510

Two people participate. They select one of two viewing positions: face down viewing a 19-inch monitor that plays a video tape of the inside of an empty basket, or face up viewing a chopping block (see Figures 3 and 4).



Figure 3 CASE STUDY 5510



Figure 4 CASE STUDY 5510

The guillotines operate by inserting a quarter, activating a 3.5 minute performance. The performance begins with a video image displayed on a 13-inch monitor depicting a 3/4" rope unwinding (virtually appearing to unwind). The monitor is positioned between the two guillotines, a frontal view designed for the audience. A 3-D metal wheel spins with the synchronization of the video image of the rope in motion. The spinning wheel enhances the realism and builds a degree of anticipation (see Figure 5).

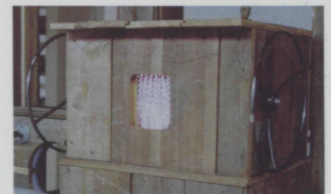


Figure 5 CASE STUDY 5510

After the video image of the rope unwinds (a 90-second segment), spikes protrude from the chopping blocks. The spikes drop 1.5 seconds later. Synchronized with the fall, a concealed air compressor forces air around the necks of each subject. As the spikes return to their original position, a second wheel spins simultaneously with the video image of the rope rewinding.

CASE STUDY 5510-B is an extension of CASE STUDY 5510. With two surveillance cameras mounted on the top of each guillotine, CASE STUDY 5510-B captures a unique visual language (perhaps, a pure language): the facial gestures of the two subjects as they experience the simulation of a beheading machine. Their expressions are depicted on two 13-inch monitors mounted on a wall in a remote location of the gallery. The monitors show a live video image (a close-up view) of each subject, capturing their facial expressions as the spikes fall (see Figures 6 and 7).



Figure 6 CASE STUDY 5510



Figure 7 CASE STUDY 5510

CASE STUDY 5510 & 5510-B applies elements of danger and anticipation of a near death experience as initial stimulants to encourage audience participation. CASE STUDY 5510 & 5510-B are 3-D models that exemplify scientific theories in the field of psychophysiology. The work additionally offers multiple perspectives and dialogues: the historical context of guillotines and the promotion of a social gathering; the issue of control insofar as technology becomes the executor, replacing the human administrator; the monetary value of 25 cents reflecting the worth of a human life, including the topic of entertainment at the expense of another's vulnerability. For the purpose of this paper, the focus is on the facial expressions of the participants (subjects). CASE STUDY 5510-B records these

expressions, collecting data in the form of “visual information.” The visual data explores the elements of human behavior in a controlled virtual setting, suggesting that the art of simulation produces similar bodily responses as in non-virtual settings.

## PSYCHOPHYSIOLOGY

Sternbach (Hugdahl, 1995, p. 8) defines psychophysiology as a study whereby the interrelation between the physiological and psychological aspects of behavior are researched. The discipline typically employs humans as subjects and the stimuli presented in the context of the experiment influences the mental, emotional or motor behavior of the subjects.

Hugdahl, author of *Psychophysiology: The Mind-Body Perspective*, points out that psychophysiology offers information for the intensity and for the quality of a response (p. 27).

## AUTONOMIC NERVOUS SYSTEM

The autonomic nervous system (ANS), which includes the heart and the sweat glands, is a primary focus of psychophysiology. The core of a psychophysiological approach to the mind-body interface is the ANS activity that mediates stress responses and emotional arousal (Hugdahl, 1995, p. 84). From a biological perspective more blood is supplied to the area of the brain that is actively engaged in neuronal activity, such as processing information (Hugdahl, 1995, p. 311). Another biological response involves the muscles. I argue that facial muscles not only respond to physical stimuli but are also subjective to responses that are virtually *perceived*, such as the perceived danger in CASE STUDY 5510. Hugdahl (1995) clearly articulates the effects of muscles from both the inner (psychological) and the outer (physical) environments when he states:

In a general sense, the most direct means of communication between the ‘inner’ and ‘outer’ environment of an individual is through the muscles and the efferent motor systems. Not only do muscle tensions [e.g., facial expressions] occur in response to physical motor demands; they are also intimately linked to emotional and cognitive activation—that is muscles are sensitive to changes in internal states and moods. (p. 336)

In *The Story of Psychology*, Hunt, a science writer specializing in psychology, quotes philosopher Democritus, “We know nothing for certain, but only the changes produced in our body by the forces that impinge upon it” (p. 17).

CASE STUDY 5510 was consciously designed to activate the participants’ ANS, muscle reflexes and to increase blood flow. Data from these biological responses can be measured and scientifically reported with the aid of biofeedback and high-tech imaging equipment, however. The data collected from CASE STUDY 5510-B only gathers empirically results with the aid of visual information from the recorded facial expressions of the subjects.

## EMOTIONS, ATTENTION AND AROUSAL

To attract and hold the attention of viewers and participants, the stimuli must have emotional significance. Hugdahl (1995) notes:

Several studies have suggested that subjects orient their attention toward stimuli that have emotional meaning for them[.] . . . The major hypothesis was thus that response time after a cue with emotional significance would be greater than the response time following a cue with no significance. (p. 6)

Schachter and Singer (Hugdahl, 1995, p. 10) suggest that emotional experiences result from an interaction between physiological arousal and cognitive interpretation of environmental cues.

James-Lange is credited with comprising a theory of emotion. Hugdahl (1995) states, “James’s actual claim was that the sensation of physiological changes is a necessary condition for an emotion to occur” (p. 92).

It can be argued that the emotional attraction produced in CASE STUDY 5510 is based on the memory trace of the viewer on the historical usage of the guillotine as well as the aesthetics of the massive presence of and within the sculpture itself. Both the aesthetics and the historical content create an emotional meaning. If the stimulus has an emotional significance and activates the associative memory, the input causes amplification in selective areas of the brain, thus sending the signal to a higher cortical (cognitive) system (Hugdahl, 1995, p. 137). CASE STUDY 5510 activates the associative memory thus creating an emotional significance which boosts the appropriate signals in the brain, activating the element of arousal.

## STIMULUS AND RESPONSE

In creating CASE STUDY 5510 & CASE STUDY 5510-B, I was aware of the stimulus probability from the perspective of the viewer. Hugdahl states that more information is offered to the subjects with infrequent or unexpected stimulus, as opposed to frequent and expected stimulus (Hugdahl, 1995, p. 295). To avoid visual predictability, I interjected two concealed stimuli: vibrating motors mounted under each bench; and an air compressor which blasted air around the necks of each participant. The concealed stimuli are experienced only by the participants and not revealed or known by the audience.

## PAIN AND PLEASURE / SOMESTHETIC

In *Visual Culture: An Introduction*, Walker and Chaplin state:

Aristotle believed art could provide *catharsis* [italics theirs], that emotions such as fear and pity could be *purged* [italics theirs] by witnessing tragic plays. Centuries later Freud recast this idea by arguing that we tend to repress traumatic feelings and we enjoy tragic art because it facilitates the release of such feelings. (p. 160)

Hunt (1994) cites philosopher Diogenes Laertius as stating: “[The Epicureans] say there are two passions, pleasure and pain, which affect everything alive” (p. 32). CASE STUDY 5510 extends Laertius’s theory to include a conceptual perspective of a *perceived* danger with the concept of pleasure. In many cases, the participant’s facial responses induced social laughter among the members in the audience.

Another field of study that explores pain and pleasure is somesthetic. Somesthetic is a combination of “soma,” meaning body, and “esthetic,” which means “to feel” (Coon, 1994, p. 177). Somesthetic senses include receptors of the skin (touch), kinesthetic (movement), and vestibular senses (balance).

Research has discovered that “skin receptors produce at least five different sensations: light touch, pressure, pain, cold, and warmth” (Coon, 1994, p. 178). Because the body has more nerve endings for the sensation of pain, the key stimuli in CASE STUDY 5510 was that of “implied” pain, engendered by elements of perceived risk and danger. The interesting phenomena is the “sense of truth” and realism that results from creating an illusive virtual pain versus real physical pain. The data collected from CASE STUDY 5510-B suggests that the physical body reacts and responds in a similar biological and physiological fashion whether or not the pain is physical or perceptually experienced. The brain triggers the release of a chemical called beta-endorphin (similar to morphine) to combat pain. Receptor sites for endorphins are located in the same area of the brain associated with pleasure, pain, and emotions. Researchers

have concluded that "there is reason to believe that pain and stress cause the release of endorphins. These in turn induce feelings of pleasure or euphoria similar to morphine intoxication" (Coon, 1994, p. 183). I conclude that the physical, facial and emotional responses resulting from the perceived danger in CASE STUDY 5510 caused these receptor sites to release endorphins, thus producing a "peak experience."

## FACIAL EXPRESSIONS

Hollywood films, such as *The Green Mile*, depict convicted prisoners with a cloth hood over their heads or a blindfold over their eyes when they are executed. Horrific methods of execution depicted in films include hangings, firing squads and electric chairs. In films that depict historical practices of hangings, for example, the camera often scans the crowd. The camera captures groups of people, including children, surrounding the staged event with their picnic baskets. The families gathered as if it is a special day for a social outing to be "entertained" by the hanging of a convicted prisoner. Similarly, in *The Green Mile*, the prisoner not only has his head covered with a black hood but the film also depicts the audience as they await in a formal seating arrangement for the instant moment of death. Once again, the execution portrays a center stage and an arena for the audience, much like a theater or entertainment venue. This same staged arena is created in CASE STUDY 5510. Regarding the concealment of the face in public executions, CASE STUDY 5510-B *does* reveal and focuses on the subjects' facial expressions. It is this powerful visual impact and the intensity of the facial expressions that provides the most important visual information of the human interface. The face visually communicates the biological responses and serves as a gateway to the internal (psychological) and external (physical) processes.

Ekman (Hugdahl, 1995, p. 33) suggests that basic facial emotional expressions including fear, anger, surprise, happiness and disgust are common to individuals across cultures.

In a study involving subjects who were asked to view several human faces, the subjects did not recognize the majority of faces because they were presented for such a brief period of time. There was, however, an implicit autonomic memory for the association of one of the faces--that being shock (Hugdahl, 1995, p. 370). This is a unique observation in the sense that it applies to CASE STUDY 5510-B. Shock and surprise were the two most common responses in the majority of the subjects recorded.

Cole (1998), a consultant clinical neurophysiologist at Poole Hospital and Senior Lecturer at the University of Southampton, UK, and an author of *About Face*, claims the face is a "carrier of the senses (vision and taste)" (p. 3). Cole believes "the face discloses an animated self" (p. 7) and is a "defining icon of one's being" (p. 30).

## CONCLUSION

CASE STUDY 5510 and CASE STUDY 5510-B was selected among 700 entries to be exhibited at SIGGRAPH 2001 held in Los Angeles, CA (a major art and technology conference). The conference show cases an international juried art exhibition, a venue for electronic media art. On the average, over 40,000 people from around the world attend this conference.

During the duration of the exhibition at SIGGRAPH, CASE STUDY 5510-B recorded over 200 facial responses from volunteer participants. From the data collected, the majority of volunteers revealed to be Asians and Americans of both genders. Between the two cultures, Asian females were the most willing and intrigued participant (human subject), followed by male Asians and third by male Americans. This data is not a surprisingly response since Asian counties have a strong interest in technology and are known to manufacture a vast majority of electronic equipment. Their eagerness to participate could also be based on the lack of the historical knowledge of the guillotine.

American females were the least willing participant, in fact, they had to be coaxed by their friends, This observation suggests that Americans are extremely image conscious. It also suggests that America females need to be heavily persuaded to place themselves as victims in a vulnerable, dangerous, and humiliating position in a social arena, however. The American female's responses were both visually and vocally pronounced. Their reactions, above all participants, created the most impact and social kinetic energy (displayed in the form of laughter) among the audience. This observation of communal laughter reflects the studies of Konrad Lorenz, one of three recipients to share a Nobel prize for work on behavior: "Laughter produces, simultaneously, a strong fellow feeling among participants. . . . Heartily laughing together at the same thing forms an immediate bond" (Levine, 1994, p. 12). CASE STUDY 5510 & CASE STUDY 5510-B creates an interesting irony whereby pleasure (displayed in the form of laughter, uniting multiple cultures) is induced by the perception of death.

The American male appeared to be the most boring subject (as perceived by the audience) among all the participants. This is not a surprisingly response since the image of males in American culture are typically known to control emotional expressions. Their emotionless responses portrayed an element of bravery, perhaps to communicate among the audience a macho image. Additionally, the American male subjects were the only participants that complained that the guillotine actually didn't work--(I felt this to be a non-sense comment since I, the artist, would be sued if such an event would occur.)

I have touched on several facets and applications of psychophysiology. The most important element is the face as a form of visual information. As Cole (1998) states, the "hidden agenda is expressed not through words but through various other forms of expression, both in facial expression and body language" (p. 19). He also cites Charles Bell as saying: "The thought is to the word as the feeling is to the facial expression" (p. 19).

## REFERENCES

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