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Fear: A Psychophysiological Study of Horror Film Viewing

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Abstract

The horror film industry brings in viewers from all over the world and from every caste of life. But, people differ greatly in their enjoyment of horror movies. The primary purpose of this research was to look at the individual differences in people's horror film viewing behavior; furthermore, whether certain personality traits predicted physiological reactions to horror film viewing. This research was divided into two conditions. The questionnaire-only condition was reserved for individuals that indicated a dislike for horror films. Those in the questionnaire-physiology condition also completed the questionnaires and were presented a film consisting of horror clips while physiological variables (heart rate, blood pressure and skin conductance) were examined. In between groups analysis, a non-significant trend for increased Fearlessness in the questionnaire-physiology condition relative to the questionnaire-only condition. Systolic blood pressure (SBP) was the only physiological indicatory that increased significantly from the baseline to the film. Furthermore, increases in SBP were inversely correlated with Fearlessness and positively correlated with Coldheartedness. These results suggest personality differences in people that watch horror movies and people that do not. Furthermore, it suggests physiological differences within and between those that watch horror films.

Fear: A Psychophysiological Study of Horror Film Viewing

Aristotle (335-322 B.C.) explained that fear is experienced when humans are threatened by something perceived to be more powerful than they are. This fear lasts until the realization of no escape; at which point, the fear is reduced due to the understanding of failure. If fear is linked to harmful situations, events or objects that terrorize us, why are humans as a society so intrigued with the things that scare them? Many children worry about the boogey man at night, the monster under their bed, and/or the man that lives in the closet. Most people know that monsters aren't real, yet they still believe that they exist at night once the lights go out. The human mind is fascinated with the unknown, and to most, the unknown is terrifying. What if it's huge? What if it's green? What if it's a ghost or monster? The search for these answers has intrigued humanity for centuries.

Fear is described by Alex Chamberlain (1899) as "an experience." He stated that fear in its root meaning is from the Anglo-Saxon word *fáer*, which means "a sudden peril, danger, panic or fear." Fear is seen as an evolutionary necessity which can help notify a person whether they should proceed in their current direction, or find another course in order to increase likelihood of survival (Cannon, 1914; Ohman & Mineka, 2001). But, excessive fright can create a state of cognitive dissonance where anxieties manifest themselves into phobias creating a condition of debilitation when in the presence of a causal object or situation (DSM-IV, 1994). The person knows that the object of their fear cannot harm them, and yet they are still afraid.

Oscar worthy horror films such as *The Exorcist*, *Interview with the Vampire*, *Psycho* and *Alien* drew in audiences from every type of background, all over the world.

So what is it about these films and stories that create such a massive fan base? Why do people want to scare themselves by viewing these movies? In order to understand fear, it is important to understand its physiology and how it is mediated by individual differences.

Physiology of Fear

When we as humans become scared, we can feel it throughout our entire body. It is that sinking feeling you get in the pit of your stomach. It is the feeling that you can't move and the sweaty palms you get. To truly gain a perspective on fear, electrophysiological correlates, the amygdala, and other forebrain areas must be considered.

A conglomerate of physiological organs that must be considered is the hypothalamic-pituitary-adrenal (HPA) axis. The hypothalamus, the pituitary gland and the adrenal gland make up the system that constitutes the HPA axis. Between these three organs, this neuroendocrinological system is a control center for many emotional anxieties. The hypothalamus works alongside the amygdala in fear processing by activating the sympathetic nervous system. When a person perceives a situation as being scary or threatening, the corticotropin releasing factor (CRF) is released by the anterior pituitary glad, which stimulates the adrenal glands on the kidneys. There in turn releases adrenaline and cortisol, increasing blood pressure and increasing the metabolic rate needed to react appropriately to survive. Cortisol is the primary glucocorticoid of the HPA axis and is implemental in the fear process (Buss, Davidson, Kalin & Goldsmith, 2004). The experience of fear and its physiology is a group effort provided by multiple systems within the body and in the brain.

Electrophysiological Correlates of Fear.

In response to fear, humans react in many different ways. Everyone has seen the person frightened so badly at the movie theater that he is perspiring or someone who covers their eyes. But, you can feel your heart rate increase during an intense scene and your muscles tighten right before the movie's killer strikes. These are all physiological responses to a fear inducing situation. Ax (1953) examined the physiological differences between fear and anger. In his research, he created a situation that elicited these two emotions from participants. There was a central element of deception due to the fact that he needed them to act naturally. The patients, while connected to an electroencephalogram, a ballistocardiogram, a respiration monitor, skin temperature and conductance monitors, blood pressure monitor and an integrated muscle potential index, were given a small, non-irritating, shock from an electrode. The researchers then proceeded to act like it was a glitch and the equipment was malfunctioning, causing them to fear further shock. They proceeded to tell the participants that the technician had previously been fired, but had to be temporarily employed for this one day and that the subject would have to continue working with them, thus creating more fear. The results of this study showed that there are physiological changes during such duress. Fear, in particular, resulted in higher face temperature and skin conductance, muscle potential and respiration rates. This research opened the doors to other researchers hoping to better understand the electrophysiological origins of fear.

The further presence of fear's involvement in anxiety disorders includes Post-Traumatic Stress Disorder (PTSD) and General Anxiety Disorder (GAD). Roemer, Salters, Raffa & Orsillo (2005) confirm that fear may be a very important part of an

individual's personality with GAD. Shin et al. (2005) looked at the variation between happy and fearful facial expressions and found that PTSD patients present over-responsive amygdalae and reduced prefrontal cortex responses along with diminished habituation of the expressions in the right amygdala. Cuthbert et al. (2003) examined the psychophysiology of fear memory imagery, specifically in phobias, social-anxiety disorder, panic disorder with agoraphobia and PTSD. They looked at the participant's heart rate, skin conductance, muscle conduction and cardiac output, across a wide array of fears, including imagery exemplifying the participant's personal, social, and physical fears. As hypothesized, participants showed evidence of higher arousal levels in response to fear memory retrieval relative to controls. More specifically, the phobic patients showed higher levels of arousal while the panic disorder patients presented the least. These results are consistent with those of Cook et al. (1988) who concluded that phobic patients react more viscerally (SCR) to fear/emotional imagery than other anxiety patients.

In another study, Palomba et al. (2000) examined the physiological reactions in people to negative film viewing; in particular, a video that involved 'threat' and one that involved 'surgery.' During these videos electrophysiological data recordings were taken in the form of: Electrocardiographic (ECG) recordings in order to watch the rate and accuracy of the heartbeats along with how electrical activity spreads across the muscles of the heart; T-Wave Amplitude (TWA); Respiratory Sinus Arrhythmia (RSA); Skin Conductance Levels (SCL); and vertical electrooculograms (EOG). The 'threat' film produced consistent sympathetic responses of cardiac acceleration, decreased TWA and increased SCL. During the 'surgery' film however, TWA increased, SCL raised even

higher than in the 'threat' film, and heart rate increased very quickly. A similar study looked at physiological reactions (SCL and HR variability) based on fear inducing clips, in children (Gilissen et al., 2007). Their results showed that during the fear stimuli, the children's SCL increased, while they experienced a drop in heart rate variability. In addition, there were correlations between the level of reactivity and the child's relationship with at least one of their parents. The closer bond the child experienced at home, the more attenuated the fear reaction (Gilissen et al., 2007).

Neurological Correlates of Fear

The amygdalae are a collection of nuclei in the medial temporal lobes of the brain and have been identified by many as the fundamental basis and center for the processing of fear in the human emotional complex. How the brain, particularly via the influence of the amygdala, processes emotion affects how the body will react. The amygdala receives the information and the central nucleus of the amygdala coordinates physiological and behavioral emotional responses (LeDoux & Muller, 1997). Expanding on Pavlov's classical conditioning research, other studies have examined the response expression during fear conditioning in rats and established the significance of the amygdala's role in fear conditioning (Cheng, Knight, Smith & Helmstetter, 2006). Not only is the amygdala involved in fear response but according to Knight, Nguyen, & Bandettini (2005), it is also involved in generating autonomic fear expression. Their fMRI study showed amygdala activation during learned fear response which was significantly correlated with SCR. Other research, such as response patterning to fear and anger (Sinha & Parsons, 1996; Calder, Lawrence & Young, 2001) and its role in positive and negative emotions (Hamann, Ely, Hoffman & Kilts, 2002) has surfaced to exemplify the importance of the

amygdala and its role in fear.

Adolphs and colleagues (1994, 1995, 1999, 1999, 2007) have extensively studied a rare patient who has permanent damage to her bilateral amygdala due to Urbach-Wiethe disease. The result of this has been the loss of most fear processing and recognition. Research as well suggests that the impairment might be limited to facial recognition (Atkinson, Herberlein & Adolphs, 2007). Their results confirmed that S.M. could recognize fear when it came to body movements and posture. However, it has been demonstrated that the amygdala and hippocampus are essential in the memory of fearful events and stimuli (Strange & Dolan, 2006). They found that there is overlapping work occurring within this system; the anterior hippocampus engages the fearful events while the amygdala is involved in responding to novel stimuli. In addition, Petrovich et al. (2000) postulated that the hippocampus and the amygdala work together as a single system to organize fear expression, among other things. These studies suggest a strong need for cooperation between the hippocampus and the amygdala in processing fear/emotional memory. This is corroborated by Dolcos, Labar and Cabeza (2004) who found that retrieval of emotional memory as opposed to neutral memories illicit a significantly greater response within the amygdala, entorhinal cortex and the hippocampus.

Difficulty with recognizing and processing fear has been linked in many studies to the hippocampus and the anterior cingulate cortex (ACC). Along with the amygdala and hippocampus, the affective, rostral division of the ACC has been linked to several affect related tasks, specifically dealing with patients with anxiety disorders (Rauch et al, 1994, 1995, 1996). One study examined startle response by phobic fear among a population

with snake or spider phobias (Pissiota et al., 2003). Exposing the participants to picture stimuli along with startling acoustic stimuli, they were able to confirm that the phobic pictures elicited a stronger reaction than the neutral stimuli. In other results, they showed significant regional cerebral blood flow in the left amygdaloid-hippocampal area along with the medial ACC. Deficits in fear recognition have also been demonstrated in three patients with ACC lesions (Baird et al., 2006). One of these patients with a unilateral right ACC lesion showed significantly less ability to recognize fear. Although it is difficult to generalize due to the small sample sizes, it is possible that the ACC is involved in processing fear.

Fear and Psychopathy

As mentioned previously, there are individual differences that come into play when dealing with fear. But, when looking at fear, there is one population is of particular interest. Those diagnosed as clinical psychopaths possess specific criteria: lack of empathy, superficial "charm," and a lack of fear of consequences are among their many attributes (Cleckley, 1988). Hare (1991) established the Psychopathy Check List - Revised (PCL-R) as a means for diagnosing psychopathy in individuals. A lack of emotional response to specific conditions is the basis for much of Hare's clinical diagnosis and fear is an essential emotional response to societal conflicts. Contrary to many beliefs, psychopaths are not just serial killers and rapists. Not all research has focused on criminal populations, but also has focused on psychopathic personality traits in individuals within the general population. This is important psychopathic traits vary along a continuum in non-clinical individuals and may have an effect on behavior, including movie preferences.

Blair et al. (2003) looked at the ability of psychopathic individuals to recognize different facial expressions. Among their findings in psychopaths was a deficit in fear recognition. Blair and his colleagues (2003) speculated that psychopath's inability to recognize this fear in facial expressions was possibly linked to an amygdala dysfunction. Related to this notion, Birbaumer et al. (2005) hypothesized that psychopathic behavior and personality could be a result of deficient fear conditioning. Birbaumer et al. (2005) examined the peripheral, cerebral and subjective correlates of fear conditioning in 10 diagnosed psychopaths and compared them to 10 mentally healthy, comparable, males. Fear conditioning in the healthy males resulted in activation within the limbic-prefrontal circuit; including the amygdala, orbitofrontal cortex, insula, and anterior cingulate. The results from males diagnosed with psychopathy showed no activation in these areas. In this study, the SCL and emotional valence as well displayed limited activation in the psychopaths, therefore exemplifying a reduced fear response (Birbaumer et al., 2005).

The examination of the amygdala and its role in fear processing has yielded important insight concerning the brains of psychopathic individuals. Kiehl et al. (2001, 2004, 2006) used functional magnetic resonance imaging (fMRI) to study hypothesized abnormalities throughout the limbic system and temporal lobes of a psychopath, therefore branching out from a focus on the amygdala. In their results, the criminal psychopathic conditions showed less affect related activity in the amygdala and several more abnormalities in the temporal lobes than did the non-psychopathic control groups. Blair et al. (2006) as well implicated the amygdala in its involvement in the development of psychopathy. A missing link in the literature on psychopathy is how individual differences in this personality trait are manifested, behaviorally and

psychophysiologically, in a non-criminal population. How individual differences in psychopathic traits might affect the behavior of non-criminal populations are not well understood.

Horror Movies

One of the largest challenges with measuring reactions to film is the array of individuality – every person's response to movies is completely different. Some people enjoy watching horror movies, while others become scared by watching only the trailer of the film. Johnston (1990) identifies four main areas of motivation for viewing horror films in adolescents: gore watching, thrill watching, independent watching, and problem watching. These motivations were predictors for responses to graphic films and were related to the participant's cognitive and affective responses to the films. Walton (1978) once stated that it is not fear when people view a movie, due to the fact that they consciously know that they cannot be harmed. To Walton (1978), the only way to be in true fear is to believe that you are in harm's way. He called this his Make-believe Theory because of the fact that they, like said before, are not really in harm's way. Morreall (1993) did not accept this. To Morreall (1993), fear can take many more inanimate forms – we do not have to physically see a tornado to be afraid of one. In addition, we can be afraid for others, which is the common case for moviegoers. They do not usually fear for their own life, unless they suffer from some form of psychosis, but they fear for the life of the character on the screen.

Cantor (2004) examined 530 descriptions from people describing their experiences of watching different horror films and the effects the movies had on their lives, whether it be sleeping or awake. Over 1/3 of the people reported having present

continuous effects based on the films they watched. This report attests to the effect of emotional memory and the phobia movies can create. From there, Cantor and colleagues (2007) interviewed 90 kindergarten through second graders and 129 third through sixth graders asking them questions concerning frightening media. Of these children, 76% responded saying that they had experienced fear due to a form of media, and the majority was movies. Another 40% reported continuing symptoms of sleep disturbances and apprehension (Cantor et al., 2007).

Sparks, Spirek, and Hodgson (1993) looked at arousability (increased skin temperature and SCR) in connection with immediate fright in response to a frightening film and its relationship with scores on the Multiple Adjective Affect Checklist (MAACL) – Fright, Anxiety, Upset, Scary, Suspenseful, and Feel body. When considering males and females together, all of the subscale scores were correlated significantly to arousability. But, when compared individually by sex, the females presented significant arousability in correlation with the questionnaire, while males did not. However, both sexes did report feeling their body react to the film. Sparks (1989) reported that those people that reported being the least scared of a media stimuli were, on average, the most scared based on physiological responses. He reported that in order to deal with the unpleasant circumstances, participants would repress their negative emotions (Spark, 1989). It is also possible that the participants were not aware of their negative reactions because they have chosen to suppress them so much. Furthermore, they could just be untruthful as to not come off scared / frightened to others.

Academy Award winning director and “Master of Horror”, John Carpenter states that as a human race, people are all afraid of the same things: death, disfigurement, pain,

loss of loved ones, etc. (Personal Communication, 2008). Comedy films are received differently in each and every culture, but a film that is scary, scares in all societies. In addition, he says that in cinema, fear is additionally about the suspense of the situation; whether or not the car will go off the cliff or if the hero will fall. All of these elements contribute to the dread or fright. But what about those that want to watch such fear-inducing films? For many individuals, considered 'fear seekers', it is a sensation/novelty-seeking personality that drives the desire to watch such films. Sensation seeker personalities have become a good way of predicting the high-risk (low fear) behaviors within people (Bevin, 2001).

Rationale

The operational definition of fear in this research was that of situation responsive fear, adaptive fear or a state of anxiety that can be reduced by non-clinical means as opposed to clinically diagnosed anxiety disorders, or phobias (Rosen & Shulkin, 1998). The primary purpose of this research was to look at the individual differences in people's horror film viewing behavior; how people who enjoy watching horror movies differ from those that do not. What personality characteristics differentiate between people who enjoy watching horror movies and those who don't? We hypothesized that relative to people who did not report watching horror films, individuals who enjoyed watching horror movies would score higher on the Psychopathic Personality Inventory™-Revised subscales and UPPS subscales; specifically when dealing with the subscales of Fearlessness, Coldheartedness, Machiavellian Egocentrism, Rebellious Nonconconformity and Social Influence (PPI™-R, Lilienfeld & Andrews, 1996), Urgency, Sensation Seeking, and Premeditation (UPPS, Whiteside & Lynam, 2001).

Furthermore, of those who did report enjoying horror movies, was it possible to attribute the individual differences in reactivity (arousal) to the movies themselves? Based on the previous literature, we predicted that during the film condition, there would be a significant increase in SCL and BP from baseline to film. But, we predicted that the heart rate would either decrease or increase from the baseline to the film. Also, there would be a relationship between a low response report of premeditation, low sensation seeking, and low urgency and a higher physiological response (SCR and BP) to the fear stimulus as compared to those that rate high in impulsivity, sensation seeking and urgency. Furthermore, we predicted that those who have a reduced fear response to horror movies will score higher on the Psychopathic Personality Inventory™-Revised subscales and UPPS subscales; specifically the subscales of Fearlessness, Coldheartedness, Machiavellian Egocentrism, Rebellious Nonconconformity and Social Influence, Urgency, Sensation Seeking, and Premeditation.

Finally, we were interested in the emotional effects of viewing horror movies. To observe this interest, we monitored positive and negative emotions from before and after the film. We specifically predicted that the negative emotions would increase after the film had concluded. The objective of this research was to identify personality differences in people's sensation seeking behavior through horror film viewing and create a basis for understanding individual differences in processing fearful stimuli.

Methods

Participants

The experimental sample consisted of 35 participants, 12 males and 23 females with an age range of 20-33 years, $M = 22.4$. The sample consisted of 23 Caucasians, 5

Hispanics, 1 Asian, 3 African Americans, 2 Mixed Hispanic/Caucasian and 1 Other. Of these participants, 17 indicated that they enjoyed watching horror films and 18 did not. Potential participants were recruited primarily from Texas State University Psychology courses, and received extra credit for participation. Additionally, participants were recruited by word of mouth. This study and its procedures were approved by the Institutional Review Board at Texas State University.

Stimulus Materials

The video was a 10:33 minute compilation of scenes from horror movies and films. The software used to create the video was the Magic DVD Ripper Software© (2003-2007). The video depicted scenes from several horror and scary films (Appendix 1). Clips were and edited to create fear and anxiety within viewers.

Questionnaires.

Several questionnaires were administered: A screening questionnaire, the Positive and Negative Affect Scale (PANAS, Watson, Clark & Tellegen, 1988), the Psychopathic Personality Inventory™-Revised (PPI™-R, Lilienfeld & Andrews, 1996) and the UPPS Impulsivity and Sensation-Seeking scale (Whiteside & Lynam, 2001).

The PANAS is a 20 question, self-report tool used to assess levels of positive (10 questions) and negative affect (10 questions). The PANAS is measured on a 1 to 4 scale: 1 representing “not at all” and 4 representing “very much so” in reference to the suggested feeling. Higher scores represent higher positive and negative emotions, respectively.

The PPI-R is a 154 item self-report inventory used to assess the probability of a psychopathic personality. The PPI contains eight subscales: Machiavellian Egocentricity

(20 questions); Social Influence (18 questions); Coldheartedness (16 questions); Carefree Nonplanfulness (19 questions); Fearlessness (14 questions); Blame Externalization (15 questions); Rebellious Nonconformity (16 questions) and Stress Immunity (13 questions); Validity Scales: Virtuous Responding (13 questions) and Deviant Responding (10 questions). Lilienfeld and Andrews' initial test-retest reliability of 57 undergraduate students between a mean, 2 day interval resulted in a test-retest *r* of .95, providing strong initial evidence for the PPI's reliability. The PPI-R was not used as a diagnosis tool.

The UPPS Impulsivity and Sensation-Seeking scale is a 4-Factor, 45 item scale. The factors include: Premeditation (11 Questions), Urgency (12 Questions), Sensation Seeking (12 Questions) and Perseverance (10 Questions). Internal consistency coefficients for the four scales were 0.91 (Premeditation), 0.86 (Urgency), 0.90 (Sensation Seeking), and 0.82 (Perseverance).

Psychophysiological Recordings.

The BIOPAC MP150 workstation was used for the electrophysiological data collection, running Acknowledge V.3.8.1 (BIOPAC, 2006). All data were recorded at a sampling rate of 200 Hz and were notch-filtered at 60 Hz.

Heart rate was measures with the ECG 100 amplifier set at a gain of 100. Electrodes were filled with an electrolyte (Gel 100, BIOPAC) and placed on the right and left forearms. Prior to the electrode placement, skin was prepped using NuPrep to exfoliate the skin and then cleaned over with generic rubbing alcohol to help facilitate conductance. Heart rate was calculated online from the ECG signal.

The SCL (GSR100C amplifier) was recorded at a gain of 10μmhos/V. The sensors were placed on the fore and middle intermediate metacarpals of the participant's

non-dominant hand in order to measure eccrine gland activity levels. Prior to application of the SCL sensors, intermediate metacarpal areas were prepared with NuPrep.

Blood pressure was monitored continuously with the NIBP100A, which was placed at the distal end of the radius on the participant's non-dominant wrist. Readings were taken every 14 seconds. Systolic and diastolic blood pressure were calculated online separately for analysis.

Procedure

After obtaining informed consent, the demographics questionnaire was first administered to determine condition qualification (movie vs. no movie). If the participant indicated in the demographics that they enjoyed watching horror or scary films, they then qualified for the Questionnaire-Physiology condition, but if they reported that they did not enjoy them, they were assigned to the questionnaire-only condition. The participants were screened for anxiety disorders and chronic nightmares. Thus, participants were assigned to conditions by selecting only those reporting enjoying horror films and selecting them for the physiological measurement condition. Those who reported any history of anxiety disorders or chronic nightmares were placed in the questionnaire-only condition.

The dependent variables in this study were skin conductance level, blood pressure (systolic and diastolic), and heart rate. The independent variables were selected personality constructs indexed by the subscales included in the PPI-R and UPPS, specifically: Machiavellian Egocentricity, Rebellious Nonconformity, Coldheartedness, Fearlessness, Social Influence, Urgency, Sensation Seeking, and Premeditation.

Questionnaire-Only Condition.

In the Questionnaire-Only condition, the subjects filled out a demographics questionnaire, the PANAS, the PPI and the UPPS Impulsivity and Sensation-Seeking scales. This condition took approximately 45 minutes to complete. Once finished with the Demographics and consent forms, the participants were given the UPPS questionnaire, immediately followed by the PANAS, which were filled out on one scantron sheet. After completion, the PPI-R was administered to all participants. The Questionnaire-Only condition concluded at the end of the PPI-R questionnaire.

Questionnaire-Physiology Condition.

The Questionnaire - Physiology condition began by following the same procedures as the Questionnaire – Only condition. However, after the questionnaire session finished, participants proceeded into the physiological recording room. The participants were then connected to the electrophysiological recording equipment. Once connected, the participant sat in the chair approximately 4 feet in front of a 15 inch computer screen. The experiment began with a 10 minute baseline reading at which point the principle investigator (PI) left and the participant sat still. At the conclusion of the baseline, the PI reentered the room, turned out the lights, started the video, and left the room again. Once the video had finished, there was a 10 minute recovery period, while the lights had been turned back on. After the recovery period, the electrodes were removed. Subjects were given the PANAS a second time.

Data Analysis

All physiological data was averaged offline across 10 and 10:33 minutes segments. For the Film condition, the data was analyzed for 10:33 because this equaled the duration of the film and the baseline and recovery were averaged over 10 minutes

because this equaled the entire duration of each. The data averaged per 10/10:33 segment was based on the ECG recordings. If there was a disturbance in the ECG wave, then the length of the artifact was rejected from the data. The remaining sections were then averaged out across the designated time periods. The Blood Pressure monitor took recording every 15-25 seconds, on average. The ECG and SCR were taken continuously throughout its recording.

Results

To compare the personality constructs between the questionnaire and physiology conditions, independent samples t-tests were run. These compared Machiavellian Egocentricity, Social Influence, Fearlessness, Rebellious Nonconformity, Coldheartedness, Premeditation, Urgency and Sensation seeking between those that enjoyed horror films and those that reported that they did not. There were no significant differences although, fearlessness was marginally different between the two groups, $t(33) = 1.961$, $p = .058$.

For the sample reporting that they enjoyed viewing horror movies, we predicted that most of the physiological variables would be affected by viewing the movie. Specifically, that SCR and BP would increase while watching the film, and that HR would decrease or increase. These predictions were tested with 4 planned comparisons (paired-samples t-tests) comparing values for the physiological variables from the baseline period with the corresponding variables obtained while watching the film. Changes in SCR during the baseline, movie and recovery periods are shown in Figure 1a. The change in SCR from baseline to movie was not significant, $t(16) = -1.791$, $p = .092$, $M = -.026$ and $SD = .06$. Changes in HR during the baseline, movie and recovery periods

are shown in Figure 1b. The HR difference between baseline and film was not significant, $t(16) = .425$, $p = .677$, $M = .928$ and $SD = 9.008$. Changes in SBP are shown in Figure 1c. SBP values changed significantly between the baseline and movie conditions, $t(16) = -2.525$, $p = .023$, $M = -9.463$ and $SD = 15.452$. Lastly, the changes in DBP during the baseline, movie and recovery periods are shown in Figure 1d. The DBP changes from baseline were not significant, $t(16) = -1.791$, $p = .931$, $M = -.456$ and $SD = 21.538$. Physiological differences between the Recovery and Film conditions were also examined, but no significant differences were observed (all p's > .05).

Because SBP was the only variable that changed significantly from baseline to film, we only examined the personality constructs to the film/baseline difference of systolic BP. In a multiple regression analysis, the dependent variable was the change in SBP (SBP Film – SBP Baseline) while the selected independent variables were: Machiavellian Egocentricity, Rebellious Nonconformity, Coldheartedness, Fearlessness, Social Influence, Urgency, Sensation Seeking, and Premeditation. Theory was used to limit the number of independent variables (subscales) used in the analysis. These subscales were focused on in data analysis due to the population being made of primarily of Texas State University college students. Machiavellian Egocentricity was chosen due to the fact that many college students, because of their academic status, are more prideful than the general population may let on. Coldheartedness was chosen because of several scenes in the film depicting pain and suffering of individuals. Rebellious Nonconformity was chosen because of the propensity in people to try and prove that they aren't scared of things in general. Fearlessness was chosen for the reason that if someone scores high on fearlessness, they should show little or no fear reactions to the film. Social influence was

chosen because it tends to reflect people that see themselves as self-confident. This could reflect someone trying to prove to themselves that they are not scared by films.

Regression analyses returned a model that accounted for 60.4% (R = .777) of the variance in systolic BP change from the baseline to the film condition, $F(2,14) = 10.691$, $p < .05$. Only two subscales emerged as significant predictors of systolic BP. Fearlessness had a significant negative relationship with SBP, $\beta = -.452$, $t(1) = -2.199$, $p < .05$. As shown Figure 2, fearlessness increased, SBP reactivity to the film (relative to baseline) decreased. Coldheartedness had a positive relationship with the change in SBP, $\beta = .424$; however, this effect did not reach significance, $t(1) = 2.060$, $p = .058$. As shown in Figure 3b, as Coldheartedness increased, SBP reactivity to the film (relative to baseline) decreased.

In order to determine whether self-reported positive and negative affect changed as a result of viewing the film, ratings on the PANAS taken before and after the film were compared. As shown in Figure 3, although no differences in negative emotion were observed, positive affect increased significantly after viewing the film, $t(1)=0.022$, $p < .05$. This increase in positive affect could be due to one of two things. First, that they enjoyed the film enough for their positive affect to increase; or secondly, that they experienced relief after cessation of the fear-inducing stimulus.

Discussion

The primary purpose of this research was to examine individual differences in horror film viewing behavior; how do the people differ that enjoy watching them from those that do not. What personality characteristics differentiate between people who enjoy watching horror movies and those who don't? People who reported enjoying horror

movies had marginally higher Fearlessness scores than those who did not enjoy this genre. Individuals scoring highly on this scale are more eager to engage in risky activities such as sky-diving and fast driving, less likely to feel anxiety in anticipation of physical danger (Lilienfeld & Andrews, 1996). This result makes intuitive sense because if a person is less fearful of things in general, then they should be more willing to view horror films. Although this difference was only marginally significant, it does suggest a trend which may have reached significance with a larger sample size.

Our second question was whether it was possible to account for individual differences in reactivity (arousal) in those who enjoy watching horror movies? The physiological reaction that displayed significant reactivity between the baseline, film and recovery was SBP. Furthermore, SBP reactivity during the film was significantly related to Fearlessness and Coldheartedness. Fearlessness was inversely correlated with SBP; as Fearlessness increased, SBP decreased. Coldheartedness was positively correlated with SBP; as Coldheartedness increased, SBP increased. The relationship of Fearlessness to SBP was to be expected because if a person is not scared easily be things, then they should exhibit less of a physiological reaction to films than others. But, with regard to Coldheartedness, the fact that the higher the level of Coldheartedness, the higher the SBP level suggests that people who are more coldhearted react more to the film, but whether this is a positive (i.e. excited) reaction or a negative (i.e. scared) one is worthy of further examination.

With respect to SBP in particular, Bushman and Green (1990) studied the emotional and cognitive reactions in participants in relation to aggression and violent media. Participants were presented with videos displaying different levels of violence. In

their results, they concluded that hostility and SBP increased significantly in response to the most violent film presented. Marston (1923) also looked at SBP during emotionally driven situations; specifically: fear, anger and sex. He concluded that across all three, SBP significantly rose. Comparatively, Scott (1930) looked into the fluctuations of SBP in dealing with fear, anger and sex, but came up with different results. He concluded that SBP does not change significantly when it comes to fear, anger or sex. These studies all found similar results of changes in SBP to the present study, specifically increases in SBP in response to fear-inducing stimuli.

The lack of reactivity for HR, SCL and DBP found in the present study is surprising and incongruent with much of the extant literature. For example, Mian, Shelton-Rayner, Harkin and Williams (2002) examined leukocyte activation, heart rate and blood pressure in response to viewing a horror film (Texas Chainsaw Massacre, 1974). All three areas (leukocyte activation, HR, DBP and SBP) reported increased significantly in response to the horror film. In addition, Lundgren and colleagues (2002) also examined physiological responses in people with dental phobia's reactions to a video stimulus which was meant to induce this particular fear and also found that HR, EMG and SCR increased as a result of viewing the video.

The results of the present study are also inconsistent with Gilissen and colleagues (2006) who investigated fearfulness and the parent-child relationship in 3 – 4 year old children in response to viewing a fear-inducing television program. In their results, compared to the control group, children that reported higher levels of fearfulness, displayed higher SCR levels. Furthermore, more volatile parental relationships were positively related to the SCR reactivity. The discrepancy between this study and the

present study could have resulted from a much larger sample size, the fact that they allowed children that did not enjoy watching scary films to participate, and possible age factors. Gilissen et al. (2008) completed a similar study with 4 and 7 year olds, and HR was measured along with SCR and compared with parental relationship. Similar results were found, including a significant HR difference between the baseline and the film. Another study by Castaneda and Segerstrom (2003) done with adults examined physiological reactions to fear stimuli comparing actual (a spider), possible (a box with a verbal affirmation of a spider inside) and a recorded script. These predictors were compared to worry, gender and fear level. They found that SCL significantly increased in the actual and box conditions regardless of worry level. All of these studies attempted to elicit reactions by presenting fearful or negative films, but in contrast, our study did not find any significant differences in HR, SCL or DBP. The lack of reactivity in these other variables could be due to a lack of power due to the small sample size used. Future studies should use larger sample sizes in order to rule out this possibility.

Finally, we wanted to examine changes in positive and negative emotions as a result of viewing the film. Interestingly, the participant's negative emotions stayed almost exactly the same but their positive emotions improved significantly. This could have been the result of two things: First, the participants enjoyed watching the film and therefore, their moods improved; or second, since the PANAS was administered after the completion of the film, the participants could have been relieved that it was over. Another point of interest is that negative emotions were higher in pre and post tests. This could be due to being tired from being in school all day or fatigue from the study length.

Problems and limitations with this study limit its generalizability. First was the sample size used in this study was small; therefore, there might not have been enough power to detect significant differences. Furthermore, there was a degree of subjectivity when it came to the development of the film stimulus. The film was created solely by the principle researcher. The clips and movies were chosen at his discretion. It is possible that the film was not effective at eliciting fear. Another problem with the study was in its demographics. Almost all of the participants were students at Texas State University and were mostly female psychology majors, therefore creating a generalizability problem. This could be improved by using a much larger and diverse sample size. In addition, this would have permitted the examination of gender differences, which may have mediated the results (Sparks et al., 1993). Future research should examine the role of gender in the relationship between autonomic reactivity and psychopathy.

The time of day in which the study was administered was not standardized and could have affected the participants in many ways. Several tests were administered in the morning hours, between 8am and noon; which are times that many college students are still not very attentive. A standardized testing schedule of the late afternoon or evening would be preferable because these are the usual times in which people visit movie theaters. Finally, the physiological equipment could also have affected results, since it is unusual to watch a film wearing electrophysiological recording equipment. In the future, this research procedure could be adapted to look at fear processing in a clinical psychopathic population (both criminal and noncriminal).

In summary, the results of this study suggest that people who watch horror movies are less fearful than those who do not. Furthermore, SBP reactivity to the movie was

predicted by both Fearlessness and Coldheartedness. These results suggest that reactions to horror movies are dependent, at least in part, to individual differences in fearfulness/fearlessness. National best selling horror author Anne Rice explains that people, in general, need to work through their fears (personal communication, December 8, 2007). This study suggests that individuals are not motivated to watch horror films in order to work through their fears. In fact, it is fearlessness that appears to be more important. In fact, this study has shown that watching horror films can possibly improve one's mood. Everyone is unique in their interests, fears, and preferences. This research has shed some light on the effects of horror films on individuals, how their personalities affect them, and their reactions to horror films.

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Author's Note

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Appendix 1: Film List

- *Begotten*
- *White Noise*
- *28 Weeks Later*
- *The Ring*
- *Saw II & III*
- *The Cell*
- *The Exorcism of Emily Rose*
- *The Descent*
- *13 Ghosts*
- *Silent Hill*
- *The Exorcist*
- *Halloween*

Figure Caption

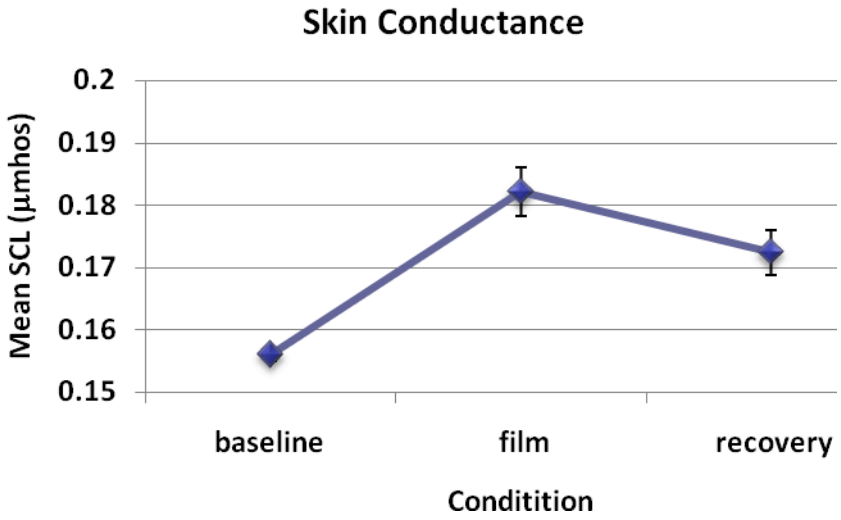
Figure 1: Physiological reactivity across the baseline, film and recovery conditions for a) Skin Conductance (SCR), b) Heart rate (HR), c) Systolic blood pressure (SBP), and d) Diastolic Blood Pressure (DBP).

Figure 2: Two scatter plots displaying the relationship between the change in SBP and a) Fearlessness and b) Coldheartedness.

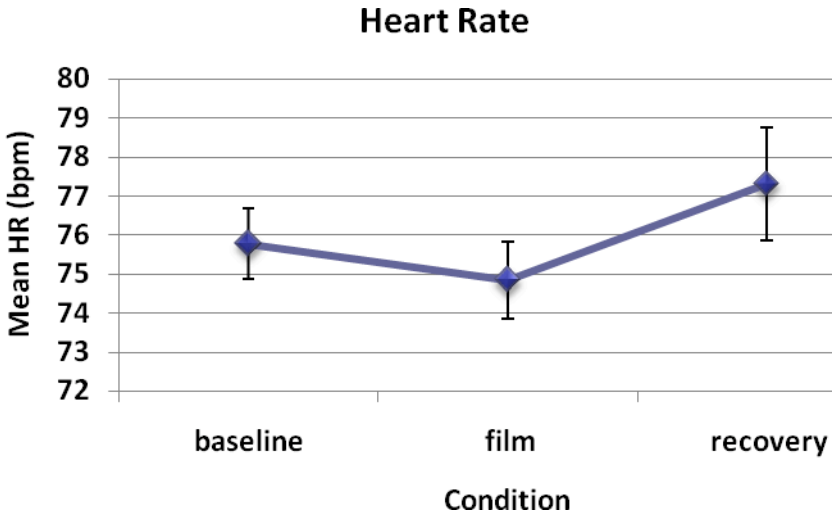
Figure 3: A bar graph comparing reported positive and negative affect of the pre-film PANAS to the post-film PANAS scores.

Figure 1:

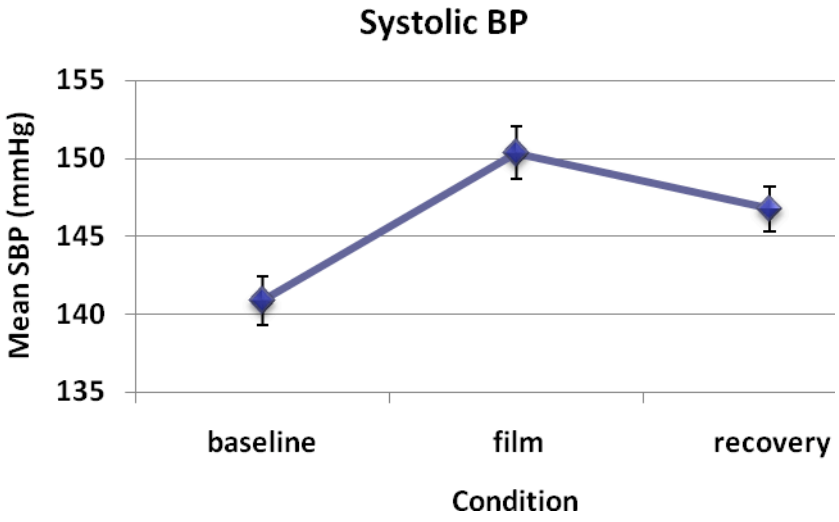
a)


Skin Conductance
Mean SCL (µmhos)
0.2
0.19
0.18
0.17
0.16
0.15
baseline
film
recovery
Conditition

b)


Heart Rate
Mean HR (bpm)
80
79
78
77
76
75
74
73
72
baseline
film
recovery
Condition

c)


Systolic BP
Mean SBP (mmHg)
155
150
145
140
135
baseline
film
recovery
Condition

d)

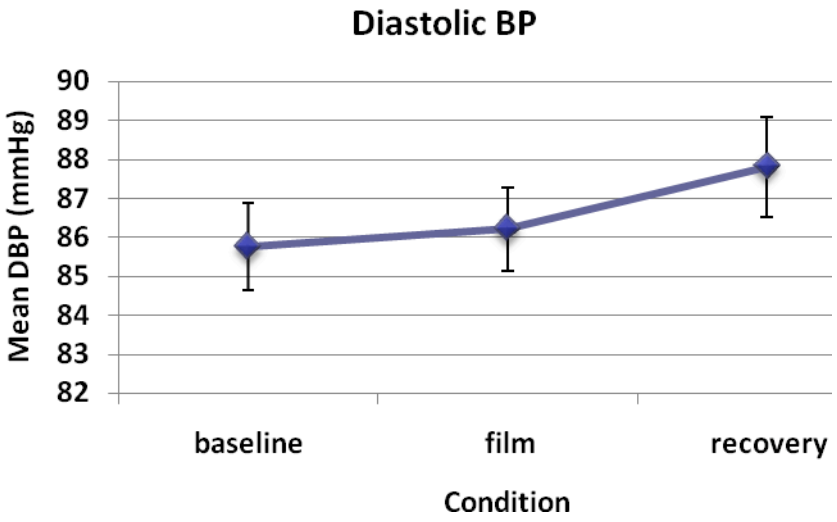
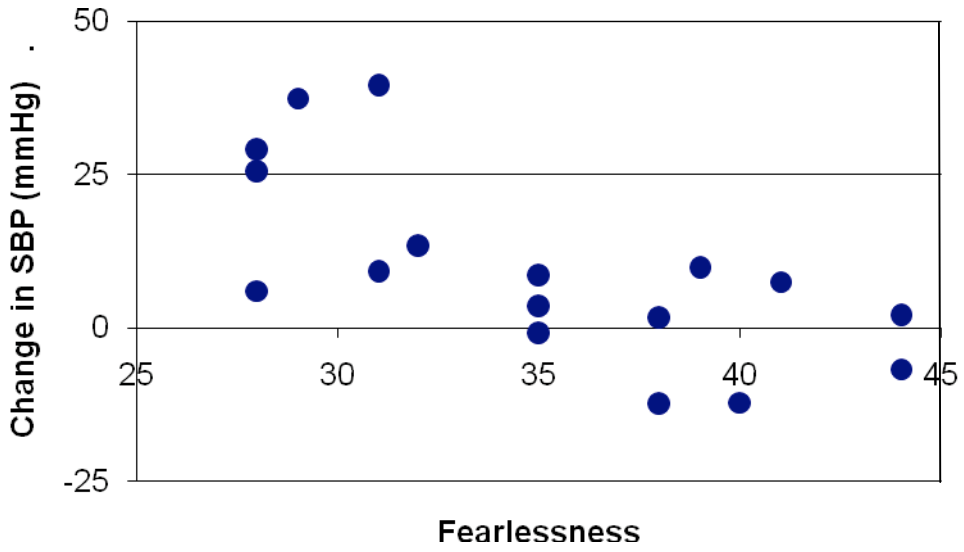

Diastolic BP
Mean DBP (mmHg)
90
89
88
87
86
85
84
83
82
baseline
film
recovery
Condition

Figure 2:

a)


Change in SBP (mmHg)
50
25
0
-25
25
30
35
40
45
Fearlessness

b)

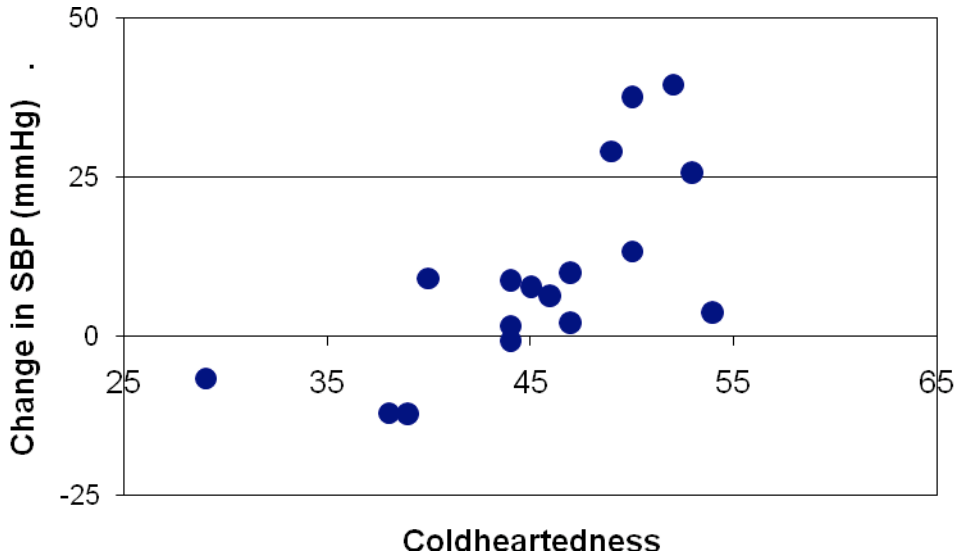
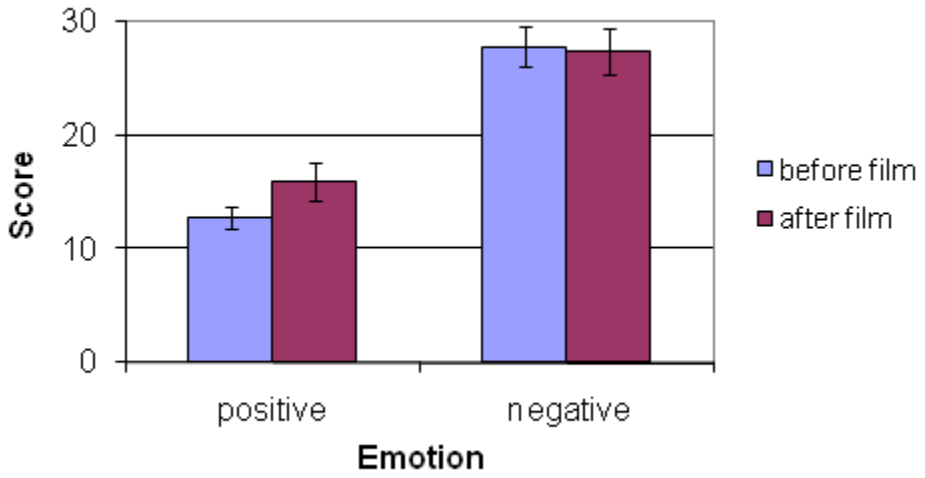

Change in SBP (mmHg)
50
25
0
-25
25
35
45
55
65
Coldheartedness

Figure 3:


30
20
10
0
Score
positive
negative
Emotion
before film
after film