THE EFFECTS OF MEDIA VIOLENCE ON ANXIETY IN EMERGING ADULTS

by

ANJANA MADAN

SYLVIE MRUG, COMMITTEE CHAIR
EDWIN COOK
REX WRIGHT

A THESIS

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Media violence exposure is associated with anxiety among children and younger adolescents, but less is known about its effects on anxiety in emerging adults. This experimental study examines whether media violence exposure affects state anxiety and physiological reactivity (as measured through systolic blood pressure, diastolic blood pressure, heart rate, and mean arterial pressure) in emerging adult college students, as well as whether these effects are moderated by previous violence exposure (both in real life and through media). In the present study, participants viewed either violent or nonviolent high-action movie clips, had their physiological reactivity monitored while viewing the clips, and completed questionnaires on state anxiety and previous violence exposure. Change scores on state anxiety and each index of physiological reactivity were compared between the two conditions. Results indicated that participants who watched the violent movie clips showed greater increases state anxiety relative to those who watched the nonviolent clips, but there were no differences in physiological reactivity between the two conditions. Previous media violence exposure was related to a trend toward lower heart rate among participants when watching both the violent and nonviolent movie clips. Finally, real-life violence exposure moderated the relationships between media violence exposure and physiological activity. Specifically, individuals exposed to high levels of real-life violence had lower reactivity when exposed to violent vs. nonviolent clips, whereas the opposite pattern appeared for those with low levels of real-life violence exposure.
posure. These findings suggest that young adults with high levels of real-life violence exposure may become desensitized to the effects of violent movies, compared to those with low levels of real-life violence exposure. Likewise, young adults with a history of low real-life violence exposure may be more vulnerable to the negative effects of media violence exposure.

Keywords: media, violence, anxiety, reactivity, emerging adults
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<td>DBP</td>
<td>diastolic blood pressure</td>
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<td>HR</td>
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THE EFFECTS OF MEDIA VIOLENCE ON ANXIETY IN EMERGING ADULTS

Violence portrayed through various forms of media, especially television and film, has become a major public health problem (Huesmann, 2007). Media violence has been linked with increased anxiety in several age groups, including young children and early adolescents (Singer, Slovak, Frierson, & York, 1998; Cooley-Quille, Boyd, Frantz, & Walsh, 2001). Yet, few studies have examined the effects of media violence exposure on anxiety in older adolescents and young adults, despite their higher levels of exposure.

On average, individuals 18 to 24 years old watch 210 minutes of television and 34 minutes of media on DVD or VCR daily (Center for Research Excellence, 2009), compared to 159 minutes of television and 41 minutes of DVD/VCR use daily for children and adolescents ages 8-18 (Rideout, Foehr, & Roberts, 2010). Thus, it is important to determine whether young adults, like children and adolescents, experience greater anxiety in response to exposure to violence through these media outlets.

Anxiety negatively affects functioning among young adults through impaired concentration and interference with everyday activities (Vitasari, Wahab, Othman, & Awang, 2010). This may be especially problematic for young adults in college, because their studies are more academically rigorous than in high school. Thus, they require greater concentration and focus to successfully complete their academic work, which may be negatively affected through experiences of anxiety. Additionally, they are expected to be more independent after they transition to the college environment. Many young people attend college away from the individuals who have provided them with social support.
throughout their lives (e.g., parents, siblings, and longtime friends). This decrease in access to social support may make it more difficult for young adult college students to manage anxiety and other stressful events.

In addition to documenting the effects of media violence on young adults’ anxiety, it is also important to understand if individuals with certain exposures are more susceptible to the negative effects of media violence than others. Specifically, previous levels of violence exposure (both in real life and through media) may affect individual levels of sensitivity to subsequent media violence. However, few studies have examined these factors as moderators of the effects of media violence. To address these gaps in the literature, this experimental study will investigate the effects of media violence on anxiety in emerging adults attending college and examine whether previous violence exposure moderates this effect.

Developmental Changes and Transitions in Emerging Adulthood

Emerging adulthood is the period between adolescence and adulthood (roughly between the late teens and early twenties) during which individuals make gradual transitions to the responsibilities of adulthood (Schwartz, Côté, & Arnett, 2005). During adolescence, the amount of parental involvement in individuals’ everyday lives decreases from middle (9th and 10th grades) to late (11th and 12th grades) adolescence (Chen, Dornbusch, & Liu, 2007). This process of increasing independence then typically leads to separation, or moving away from home, in emerging adulthood. For many emerging adults, going to college marks the first time being away from home (Ahern & Sole, 2010) and spending little time with parents.
In addition to moving away from home, emerging adults have relatively more freedom than at other periods of life to explore alternatives related to identity formation (e.g., decisions dealing with occupation, romantic relationships, and personal worldview) without having to make long-lasting commitments (Schwartz, Côté, & Arnett, 2005). Emerging adults who attend college encounter and experiment with numerous ideas, values, and beliefs as they explore possibilities for major life decisions, all of which collectively impact their identity development (Luyckx, Goossens, & Soenens, 2006). However, in spite of the greater freedom afforded in making identity choices, some emerging adults may rely on external help in navigating the extended period of identity development (Schwartz, Côté, & Arnett, 2005). Thus, as emerging adults become less dependent on parents for socialization, other influences on their identity and worldview development may become more salient as socializing agents, including media.

In fact, research indicates that media exposure plays a major role in adolescent socialization (Arnett, 1995; Roberts, Foehr, & Rideout, 2005). The messages obtained through television tend to form the foundation for one’s overall worldview. As such, television becomes a major source of perspectives, values, and ideologies (Gerbner, 1998), as well as gender-role behavior, occupational identity, and political worldview, all of which contribute to identity development (Arnett, 1995). For instance, television influences the occupational socialization processes (e.g., attitudes, aspirations, and values related to work) of first-year college students (Hoffner, Levine, & Toohey, 2008). In another study, college students aspired to adopt the qualities of television characters they viewed as successful, admired, intelligent, and attractive (Hoffner & Buchanan, 2005). Additionally, among high school and college students, greater exposure to sexually sug-
gestive television genres (such as soap operas) is related to more casual attitudes about
sex and beliefs of greater prevalence of sexual activity (Ward, 2003). Finally, emerging
adults who were able to identify with “teen movies” (which often portray negative fea-
tures of female friendships such as relational aggression) held stereotypical beliefs re-
garding friendships between females, less positive attitudes towards women in general,
and beliefs that individuals who are more socially aggressive are more popular (Behm-
Morawitz & Mastro, 2008). These findings suggest that media portrayals influence
emerging adults’ values and aspirations in various domains of identity development.

The socializing role of television may be amplified by the large amount of time
young people spend with this medium. Specifically, 18- to 24-year-olds spend an average
24.5 hours per week watching television and 4 hours per week watching television or
movies on DVD or VCR (Center for Research Excellence, 2009). Because young people
spend more time using media than interacting with parents or educators, these outlets
may exert greater influence on the development of their beliefs about the world and their
role in it (American Academy of Pediatrics, 2001). Watching television in the company
of their friends, common among college students (Porter & Sapp, 1996), and the resulting
social bonding with peers through this medium, may further contribute to its prominent
influence in students’ everyday lives.

Media Violence

A substantial portion of television programs and movies contain media violence,
defined as “visual portrayals of acts of physical aggression by one human against anoth-
er” (Huesmann & Taylor, 2006, p. 395). For instance, 61% of television programs con-
tain such violence (Anderson et al., 2003). Only 4% of the programs that contain violence also incorporate anti-violence messages, so that 96% of programs with violence use aggressive behavior for entertainment. Additionally, violence is a component of 91% of the films shown on television (Worth, Chambers, Nassau, Rakhra, & Sargent, 2008). During primetime television viewing, when people are most likely to watch television (Smith, Nathanson, & Wilson, 2002), three to five violent acts are shown per hour (Browne & Hamilton-Giachritsis, 2005). Given the high prevalence of violence on television and in movies, it is likely that emerging adults have substantial exposure to this content.

Violence on television and in movies contains multiple qualities that may amplify its negative effects on viewers. For instance, much of the aggression portrayed on television is made attractive, with 44% of violent interactions involving individuals who exhibit attractive qualities (Anderson et al., 2003). Furthermore, in an analysis of 77 films rated PG-13, over half of the violent acts by major characters were perpetrated by individuals portrayed as likeable and generally “good,” thus serving as would-be role models for viewers. Only 33% of these lead characters portrayed as “good” actively condemned violence in the films (Webb, Jenkins, Browne, Afifi, & Kraus, 2007). Importantly, 73% of the violent acts were portrayed realistically, yet the harmful consequences to the victims (e.g., injury or death) were either not shown or portrayed unrealistically. This disconnect may mislead viewers to erroneously think that violent acts of such magnitude have few, if any, real-life consequences (Webb et al., 2007). While these findings are indicative of the unrealistic messages about violence portrayed through PG-13 movies, these films contain substantially less violence than R-rated movies (Motion Picture Association of
America, 2010), to which emerging adults have greater unrestricted access. Given emerging adults’ greater exposure to media violence, it is important to examine the effects of this exposure on various outcomes, including anxiety.

Anxiety

This study focuses on the effects of media violence on anxiety. Defined as a response to stimuli perceived to be harmful or dangerous, general anxiety may be classified into two major types: State anxiety and trait anxiety. State anxiety is characterized as an emotional state in which individuals feel tense and anxious. It is often accompanied by arousal of the autonomic nervous system (ANS). State anxiety is not temporally stable; rather, it arises in response to specific situations. In contrast, trait anxiety is overall proneness to anxiety, or the tendency to experience increased state anxiety due to psychological stress (Papay, Costello, Hedl, & Spielberger, 1975). Anxiety reaction is typically characterized by avoidance of an anticipated stimulus, worry, and muscle tension (Craske et al., 2009). Symptoms of anxiety may be physical or cognitive in nature. Physical symptoms may include trembling, muscle aches and soreness, fatigue, nausea, and shortness of breath. Physiologically, the body responds as if it were facing a threat: Blood flow increases to muscles, heart rate and blood pressure increase, and sweating increases. Cognitive symptoms include worry, difficulty concentrating, blank mind, irritability, and restlessness (American Psychiatric Association [DSM-IV-TR], 2000). Thus general anxiety can manifest itself through a variety of physical and cognitive symptoms.

Although anxiety is adaptive in situations when it helps one evade harmful stimuli, it may become maladaptive and lead to impairment in everyday functioning when it is
excessively frequent or persistent (Beesdo, Knappe, & Pine, 2009), such as in situations where there is no impending danger. At its extreme, excessive anxiety may qualify for a diagnosis of an anxiety disorder, with specific disorders distinguished by the characteristics of the anxiety response (e.g., specificity). For instance, posttraumatic stress disorder (PTSD) develops after exposure to a traumatic event and involves re-living the traumatic experience through flashbacks or unwanted thoughts, emotional numbing or avoidance of situations reminding the victim of the trauma, and hyperarousal (Seedat, Stein, & Carey, 2005). Generalized anxiety disorder (GAD) is marked by extreme and unmanageable worry about multiple concerns (Grillon et al., 2009), while panic disorder (PD) is characterized by repeated, unanticipated panic attacks reflecting different cognitive, somatic, and physiological symptoms (Kircanski, Craske, Epstein, & Wittchen, 2009).

Anxiety symptoms and disorders are fairly common in the general population, as well as among college students. For instance, the prevalence of PTSD is approximately 8% in both the general population and among college students (Schnider, Elhai, & Gray, 2007). Lifetime prevalence of GAD is approximately 4.1% in the general population (Grant et al., 2005), with 2.9% of college undergraduates screening positively for GAD (Eisenberg, Gollust, Golberstein, & Hefner, 2007). Lifetime prevalence of PD is 3.7% among adults 18 and older (Kessler et al., 2006), with approximately 1.8% of college undergraduates screening positively for PD (Eisenberg et al., 2007). Once anxiety disorders are diagnosed in childhood, they tend to continue across development, especially for GAD (Degnan, Almas, & Fox, 2010).
Anxiety and Physiological Arousal: Theoretical Background

One pathway that may theoretically link media violence exposure to anxiety is the experience of threat. When watching violent movies that are highly realistic, individuals may feel a sense of threat. This threat typically causes one to experience fear (Bear, Connors, & Paradiso, 2007). Fear differs from anxiety in several aspects. First, fear stems from apprehension and unease upon sensing an immediate, recognizable, specific threat to the self (Kreibig et al., 2007). This threat stimulus is generally specific (Grillon, 2008b), ranging from physical objects (such as a gun) to anticipated consequences of exposure to an object (e.g., the pain felt upon being shot; Kreibig et al., 2007). Upon experiencing this fear, individuals engage in behaviors that allow them to escape that threat (Kreibig et al., 2007). Fear is short-lived, as it only lasts as long as the threatening stimulus is present (Grillon, 2008a).

In contrast to fear, anxiety is characterized by prolonged apprehension regarding possible harm at a later time. Contrary to the immediate threat characterizing fear, individuals with anxiety are generally concerned with threats that are merely possible, symbolic, or otherwise not readily apparent. As such, anxious individuals often experience worry, insecurity or tension (Grillon, 2008b) for a more extended period of time compared to fear (Grillon, 2008a). Thus, anxiety can often be maladaptive when such a response is not necessary for survival.

Physiologically, experiences of threat and subsequent fear are typically accompanied by the stress response. This stress response consists of heightened arousal, activation of the sympathetic nervous system (SNS) of the autonomic nervous system (ANS), and cortisol secretion by the adrenal glands. The hypothalamic-pituitary-adrenal (HPA)
axis largely controls this cascade of events, in conjunction with the amygdala and hippocampus. When an individual senses threat and feels fear, the central nucleus of the amygdala becomes activated; this begins the cascade of events comprising this physiological arousal. Activation of the amygdala triggers the bed nucleus of the stria terminalis (BNST) to activate the HPA axis in the hypothalamus, from which corticotropin-releasing hormone (CRH) is secreted. Increasing CRH levels trigger the release of adrenocorticotropic hormone (ACTH) by the pituitary gland, which then activates the adrenal cortex to release cortisol (Bear, Connors, & Paradiso, 2007) and the adrenal medulla to release catecholamines (epinephrine and norepinephrine; Schneiderman, Ironson, & Siegel, 2005). This SNS activation is also known as the fight-flight response (Kreibig, Wilhelm, Roth, & Gross, 2007). The release of these catecholamines causes changes in various cardiovascular indices, such as blood pressure, heart rate, and vessel constriction (Taylor, 2010), leading to increased heart rate, cardiac output, vagal withdrawal, and increased blood pressure. These adaptations serve to mobilize energy resources to enable individuals to escape dangerous situations and protect themselves (Kreibig et al., 2007).

Therefore, if individuals feel threatened when watching violent movie presentations, they may exhibit some characteristics of the stress response (such as elevated heart rate and blood pressure from resting levels). Likewise, they may also experience anxiety, as the threat presented (a violent movie) does not present a real, physical danger to viewers. Instead, it may induce worry or apprehension of encountering similar situations in the future.

While many studies have attempted to classify the physiological stress response as definitively reflective of fear, anxiety, sadness, disgust, or other emotions, it is im-
Important to note that the experience of the stress response is not necessarily indicative of a particular emotion. For instance, in a laboratory setting, changes in heart rate (HR) may not be due to the experimental manipulation itself, but rather due to other external circumstances of the experiment (Obrist, 1981). Additionally, different emotions are processed by the brain through distinct pathways. For instance, the central nucleus of the amygdala is chiefly involved in mediating fear-related information, while the BNST is primarily involved in mediating anxiety-related information. Yet, the neural processing of both emotion results in similar physiological and behavioral manifestations (Grillon, 2008b). Similarly, in a study investigating physiological responses among male undergraduates performing a gambling task, positive excitement was accompanied by increased heart rate, a sign of physiological arousal (Wulfert, Roland, Hartley, Wang, & Franco, 2005). Yet, in terms of valence, positive excitement differs markedly from fear or anxiety. As such, it may be difficult to differentiate whether physiological arousal in response to a threatening cue arises from fear, anxiety, or another emotion altogether.

Additionally, indicators of cardiovascular reactivity are affected by a multitude of factors. For instance, systolic and diastolic blood pressure (SBP and DBP) are influenced by vascular mechanisms and myocardial mechanisms, both of which include neural information and hormonal influences. Blood pressure (BP) is also influenced by the renal system. As such, it is difficult to isolate a single factor responsible for variations in SBP or DBP (Obrist, 1981). Thus, the attribution of changes in heart rate or blood pressure to specific emotional responses is not necessarily warranted. In light of these considerations, we will not attempt to interpret heightened physiological arousal as indicative of any particular emotion; instead, we will investigate overall physiological arousal in re-
sponse to exposure to movie violence, as well as subjective perceptions of emotions, including anxiety. The following sections review studies examining fear- and anxiety-related correlates of exposure to violence, as well as physiological consequences of violence exposure. Because of their similar nature and effects, we consider research on both real-life violence and media violence.

Fear- and Anxiety-Related Correlates of Violence Exposure

Both media and real-life violence have been linked with multiple negative outcomes, including anxiety. Documented consequences of real-life violence exposure in children and adolescents include anxiety, depression, aggression, attachment problems, delinquency, and dating violence (Finkelhor, Turner, Ormrod, Hamby, & Kracke, 2009). Rosenthal (2000) also found that the cumulative exposure to community violence (both as a witness and victim) during high school was associated with anxiety, depression, and anger during the first year of college. This suggests that individuals exposed to environments in which their physical safety may be threatened (such as being a witness to or victim of violence) may be more likely to experience higher levels of anxiety or even develop anxiety disorders.

The effects of media violence on anxiety have been addressed mostly in younger children and adolescents, with fewer studies having been conducted with young adults. Among studies conducted in younger populations, Singer et al. (1998) found that exposure to violent television was linked to increased anxiety and PTSD in young children. Additionally, Walma van der Molen and Bushman (2008) reported that among children ages 8 to 12 years old, heavy television viewing was associated with less fear reactions,
which may be due to desensitization to violence and other frightening events portrayed on television.

Among adolescents, media violence exposure has been associated with difficulty sleeping, school avoidance, and anxiety (Cooley-Quille et al., 2001), which are consequences similar to those experienced following real-life violence (Margolin & Gordis, 2000). These findings suggest that images of aggression and violence, both witnessed in reality or fictitiously, can have negative effects on anxiety levels in adolescents. One study that examined young adults’ fears stemming from past media violence exposure found long-lasting negative memories resulting from such exposures (Harrison & Cantor, 1999). Among 153 undergraduate students, 90 percent reported that they had watched a film or television show that scared them so much that they experienced fright effects even after the program’s conclusion. Of these students, over 25 percent indicated that these fear effects had continued for over a year and were still occurring at the present time. More than 50 percent of students said they experienced sleep disturbances and other deviations from their normal behavior. Nearly 40 percent avoided the feared situation portrayed onscreen, and nearly 20 percent avoided experiences related to the portrayed frightening experience. However, fewer studies have actually investigated the relationships between recent media violence exposure (i.e., not in the distant past) and resulting anxiety in emerging adults.

Due to the lack of studies examining these relationships in emerging adults, it is important to assess whether media violence directly influences levels of anxiety. Another limitation of existing research is that most studies examining the relationships between media violence and anxiety in all age groups are correlational in nature. Thus, an experi-
mental design is needed to investigate whether a causal relationship exists between media violence and anxiety.

Physiological Correlates of Fear and Anxiety

Because anxiety is a more generalized reaction that arises in situations when there is no immediate, realistic danger, the experience of anxiety may lead to more chronic activation of the stress response. One potentially negative long-term impact of chronic activation of this stress response is damage to the hippocampus, which typically regulates cortisol levels. Hippocampal damage, in turn, lowers the ability of the HPA axis to regulate cortisol levels and therefore diminish the stress response (Bear, Connors, & Paradiso, 2007). Given the long-term impacts of sustained anxiety and this physiological arousal, it is important to investigate whether exposure to violent movies can elicit state anxiety in viewers. If these acute exposures induce negative immediate effects, then accumulation of these acute exposures over time may lead to chronic stress and its previously-described damaging effects. The effects of each pattern of stress (acute vs. chronic) are described below.

Acute stress, such as sudden fear or increase in state anxiety, triggers the fight-flight response, in which individuals feel a sense of danger or suspect a possible threat toward themselves (Kreibig et al., 2007). During such periods of acute stress, when the body’s energy needs are high, catecholamines and cortisol break down sources of energy in the body into readily-usable forms of energy. To transport this energy to body tissues and muscles, two different mechanisms work in tandem to both constrict and dilate blood vessels, with a net effect of increasing blood pressure. The myocardial mechanism in-
creases cardiac output, which increases heart rate and stroke volume in the process. The vascular mechanism constricts blood vessels. Both processes contribute to an overall increase in blood pressure during times of acute stress (Schneiderman et al., 2005).

Chronic stress, such as exposure to violence over long periods of time, can lead to excessive activation of the SNS response (Schneiderman et al., 2005). Over time, in addition to the previously mentioned hippocampal damage (Bear, Connors, & Paradiso, 2007), excessive release of catecholamines can cause hemodynamic changes, including increased blood pressure and heart rate (Taylor, 2010). Additionally, continual SNS activation can lead to a thickening of the left ventricle of the heart, which serves to constrict blood vessels. This thickening increases the chances of responding to subsequent stressors with the vascular mechanism, which can lead to long-term increases in blood pressure (Schneiderman et al., 2005). Thus, chronic exposure to violence may induce long-term increases in blood pressure.

Exposure to Violent Stimuli in Real Life vs. the Laboratory

A number of studies have linked violence exposure with cardiovascular functioning, but findings vary across exposure in real life vs. the laboratory.

Real-Life Violence

Some studies assessing the cardiovascular functioning of youth exposed to real-life violence have examined general levels of cardiovascular functioning (i.e., levels of blood pressure or heart rate under resting conditions), while others have investigated cardiovascular reactivity (i.e., changes in blood pressure and heart rate in response to stress-
ful events or tasks). Regarding general cardiovascular functioning, studies have found increased resting HR in violence-exposed children ages 5 to 13 (Saltzman, Holden, & Holahan, 2005), as well as increased resting HR, SBP, and DBP among adolescents ages 16 to 19 (Murali & Chen, 2005) in comparison to same-aged peers with lower levels of such exposures.

In contrast, cardiovascular reactivity to stress is lower in youth exposed to chronic stressors, such as violence. For instance, Murali and Chen (2005) linked overall higher levels and frequency of violence exposure to lower cardiovascular reactivity to novel stimuli. In a sample of African-American early adolescents (mean age 11.5), Clark and colleagues (2006) found that higher levels of violence exposure were related to lower reactivity of SBP and DBP to stressor tasks (digit-span forward and backward). These findings support a hypoarousal interpretation of the relationship between stress and cardiovascular reactivity, such that with repeated exposure to a stressor, the sensitivity of the sympathetic nervous system to stress decreases (Clark, Benkert, & Flack, 2006). This physiological desensitization may arise as adolescents develop coping mechanisms to deal with the negative effects of past violence exposure (Murali & Chen, 2005).

Laboratory Stimuli

Within the realm of laboratory studies examining cardiovascular responses to stress, different types of stressors have yielded different physiological reactions. For instance, active stress tasks require active coping or effort (Wright & Kirby, 2003). Such tasks, which may include public speaking, mental calculations, and the Stroop task, have been found to increase sympathetic activity (Lee & Watanuki, 2007) or draw upon the
myocardial mechanism (Schneiderman et al., 2005). On the other hand, passive stress tasks require the tolerance of a stressor (rather than the exertion of effort) to withstand it (Wright & Kirby, 2003), such as viewing an emotion-inducing film. Such passive stress tasks are primarily related to parasympathetic activation (Lee & Watanuki, 2007) or vascular mechanisms (Schneiderman et al., 2005).

In fact, several researchers using passive stress laboratory tasks have used fear-inducing film clips to investigate cardiovascular functioning. Fear-inducing films have been associated with both lower cardiovascular responses (Jönsson & Hansson-Sandsten, 2008), as well as higher cardiovascular responses (Hayashi et al., 2009; Kreibig et al., 2007; Weidmann, Conradi, Gröger, Fehm, & Fydrich, 2009). These differences may be explained by different features of the films. One distinguishing feature between these studies is the level of action in the fear-eliciting films. For instance, in the study by Jönsson & Hansson-Sandsten (2008) demonstrating low cardiovascular reactivity, participants were exposed to low-action film clips designed to elicit fear. They found that HR during fear-associated films (portraying snakes and spiders) was lower than HR during both positive films (showing kittens and puppies) and neutral films (showing landscapes and nature). Thus, this low cardiovascular reactivity is possibly due to the low action of the fear-eliciting clip.

In contrast, participants were exposed to high-action fear-inducing film clips in the two studies demonstrating high cardiovascular reactivity. For instance, Hayashi and colleagues (2009) found that in comparison to a baseline period, their sample of eight women had higher HR and MAP values while watching clips from a fear-inducing, high-action horror film. Similarly, Weidmann and colleagues (2009) showed a film depicting
a fictional rape, finding increased HR and greater distress during the film in comparison to clips depicting real-life natural disasters or news. Similarly, Kreibig et al. (2007) showed participants fear-eliciting clips from a horror movie featuring anticipation of bodily harm or threat of death at the hands of a pursuer, which likely contained high-action sequences. They found that in comparison to neutral film clips, exposure to these fear-eliciting clips was accompanied by increased HR, SBP, and DBP; this finding is consistent with the findings of Weidmann et al. (2009). Thus, the level of action appears to play a key role in cardiovascular reactivity to fear-eliciting stimuli.

In making predictions about the effects of media violence on cardiovascular reactivity, one needs to consider the level of action present in violent media. In fact, research shows that media violence is often comprised of high-action visual sequences, which can lead to physiological arousal in youth in the form of increases in heart rate and blood pressure (Bushman & Huesmann, 2006). However, it is not clear whether increased cardiovascular reactivity to high-action media violence clips arises in response to the violence itself (which, in many cases, is a fear-eliciting stimulus) or simply in response to the high level of action in the scene. To disentangle these effects, this study will compare participants’ cardiovascular reactivity to violent vs. nonviolent media clips that both include comparably high levels of action.

Previous Violence Exposure: A Potential Moderator

Studies have indicated that the effects of media violence, as well as other media contents, vary depending on individuals’ different exposures. Although few studies have focused on examining these individual differences, doing so would help determine which
individuals are at higher risk of adverse effects following exposure to media violence. The moderator that will be examined in this study is previous exposure to violence, both in real life and through media.

Repeated past exposure to violence over time, both in real life and through media, can desensitize an individual to the emotional effects of subsequent exposures. Several studies of youth exposed to high levels of community violence examined the moderating role of previous violence exposure. Kliewer (2006) reported that, in a sample of youth ages 9-13, greater exposure to community violence was related to lower resting cortisol levels and lower cortisol response to viewing a video clip portraying community violence. Since cortisol is a marker of the major (HPA) stress response system, lower basal cortisol levels may reflect an adaptive response to community violence, while the overall lack of cortisol reactivity to the video clip may indicate desensitization to community violence and thus a lack of arousal to media representations of violence.

With regard to past media violence exposure, Fanti, Vanman, Henrich, and Avraamides (2009) found that among 96 college students exposed to a short montage of comedic and violent movie scenes, participants initially expressed less enjoyment of the violent portrayals and greater concern for victims’ pain and suffering. However, continued exposure to the violent scenes led to greater enjoyment of violence in those scenes and less sympathy for victims’ suffering. These results suggested that repeated, short-term exposure to media violence emotionally desensitized observers to the negative effects of media violence and led to greater enjoyment of violence. While initially participants felt some internal distress at viewing characters’ pain and suffering in violent scenes, this distress decreased over time as they were exposed to such scenes repeatedly.
Thus, greater previous exposure to media violence may lead to emotional desensitization to subsequent media violence exposures. In light of these studies, it is important to examine both previous real-life and media violence exposure as moderators of the effects of subsequent media violence exposure.

Current Study

Given that emerging adults have considerable freedom and independence from parents to make identity-related choices, it is possible that they will rely more on other sources of socialization, including media, as they explore these choices. Because violence is a component of a substantial portion of television programs and movies to which emerging adults are exposed at high levels, it is important to determine the effects of this media violence exposure on anxiety levels. Anxiety may be especially problematic for college students because it can lead to difficulties in concentration, which may negatively impact their academic work.

However, previous research on the relationships between media violence and anxiety has focused little on the emerging adult population. Additionally, most studies performed in all age groups have used correlational designs. Thus, an experimental design is greatly needed to understand the causal effects of media violence on anxiety. This study aims to fill these gaps in the literature by experimentally examining the effects of media violence exposure on anxiety in emerging adult college students, using both self-report measures of anxiety and direct assessment of physiological arousal. Additionally, this study will examine the effects of previous exposure to real-life and media violence as potential moderators of these relationships.
Specifically, the current study aims to answer the following questions:

1) Does media violence exposure affect state anxiety?

2) Does media violence exposure affect cardiovascular reactivity, such as heart rate (HR), systolic and diastolic blood pressure (SBP and DBP), and mean arterial pressure (MAP)?

3) Are these effects moderated by participants’ previous violence exposure?

These questions will be addressed with an experimental design evaluating the effect of high action violent vs. nonviolent movie scenes on state anxiety, HR, SBP, DBP, and MAP. We hypothesize that individuals exposed to violent media scenes will report increases in state anxiety and show increases in HR, SBP, DBP, and MAP after exposure. In addition, we expect that these effects will be moderated by previous violence exposure. Specifically, participants in the violent condition with higher past violence exposure (both real-life and media) will report lower increases in state anxiety and show lower increases in HR, SBP, DBP, and MAP.
METHOD

Participants

Participants were recruited through introductory psychology classes in the UAB Department of Psychology. The sample consisted of 152 young adults (mean age 18.66, SD .87, range 18-21 years old; 75% female; 53% Caucasian, 31% African American, 9% Asian, 3% Hispanic, and 5% other).

Design and Procedure

This experimental study employed a pretest-posttest control group design. Participants were randomized into two groups consisting of 76 participants each. The experimental group was shown violent movie scenes, whereas the control group was shown nonviolent movie scenes. Previous studies have found that media violence is more likely to induce fear among viewers when the violence portrayed is both graphic (Riddle, Eyal, Mahood, & Potter, 2006) and realistic in nature (Grabe & Drew, 2007). Based on these findings, the violent and nonviolent scenes for this study were selected to reflect these characteristics. As noted earlier, we also aimed to equate the two types of clips on high level of action.

To determine which movie clips were to be used, a sample of 14 violent and 11 nonviolent clips were created for pilot testing. The clips were selected to reflect different types of violent and nonviolent scenes with main characters being diverse in their race, age, and gender. In individual pilot testing sessions, 10 undergraduate and graduate
psychology students viewed and rated each clip along several dimensions (level of action, violence, realism, distress, and engagement of the clip; as well as the viewer’s feelings of being active, alert, anxious, engaged, excited, fearful, and threatened while watching each clip). A rating scale from 1 (not at all active, alert, etc., in response to the clip) to 5 (extremely active, alert, etc., in response to the clip) was used. Clips were ultimately selected for the study based on students’ ratings of action and violence levels. Five violent clips were chosen based on high violence ratings, and five nonviolent clips were chosen based on low violence ratings. However, the clips ultimately selected for both conditions were matched on action, in order to prevent high action from confounding the effects of violence on anxiety. To verify that clips reflected the two dimensions as intended, ratings for action and violence were averaged across the selected violent and nonviolent clips for each participant. Paired-samples t-tests confirmed that the violent clips were perceived as more violent than the nonviolent clips (M=4.56 vs. M=1.40, t=-16.80, p<.001), but comparably high on level of action (M=3.94 vs. M=3.70, t=-1.14, p>.05), as intended.

The violent clips that were selected came from the following movies: *Man on Fire* (2004), *Platoon* (1986), *Precious* (2009), *Leon: The Professional* (1994), and *Saving Private Ryan* (1998). The nonviolent clips were chosen from the following movies: *Speed* (1994), *Twister* (1996), *Crash* (2004), and *Castaway* (2000). Some of the nonviolent clips exhibited the main character performing a helping behavior, as a contrast to the violent clips. The total duration of the clips in each condition was 11 minutes 34 seconds, with each clip lasting between 2 and 3 minutes each. The clips and all questionnaires were presented to participants on a computer, using the program MediaLab (Jarvis,
2010). This program allowed participants to run through the entire experiment independently, with minimal interruptions from research assistants.

In the main study, participants were randomly assigned to either the experimental or control groups. Upon providing written informed consent, participants completed self-report questionnaires (including state anxiety) independently in the testing room, without the presence of the research assistant. After participants completed these questionnaires, the research assistant returned to the testing room to connect the participant to the cardiovascular monitoring equipment. Then, participants sat quietly for 10 minutes, while baseline cardiovascular measures were taken. Then, participants viewed the video clip sequence specific to their randomly-assigned condition, during which cardiovascular functioning was still measured. Immediately after viewing the clips, cardiovascular measurement was discontinued and participants completed another self-report questionnaire of state anxiety. Finally, all participants watched a five-minute nonviolent video clip (recovery period), in order to allow the experimental group to recover after viewing any emotionally intense scenes. After the recovery period, participants were disconnected from the cardiovascular monitoring equipment, debriefed on the goals of the study, thanked, and allowed to leave.

Measures

Demographic and Control Variables

Participants completed items assessing demographic information (age, gender, ethnicity, and highest education level completed by both parents) and the number of movie clips from their assigned condition that they had seen in the past. Age and number of
movie clips seen were coded continuously. For gender, males were coded ‘0’ and females ‘1’. For ethnicity, participants were coded as either non-white (‘0’) or white (‘1’). Parent education was coded on a 6-point scale: 1-Less than high school; 2-High school diploma or GED; 3-Some college, no degree; 4-Associate’s degree; 5-Bachelor’s degree; 6-Graduate degree.

_Psychophysiological Assessment_

HR, SBP, DBP, and MAP were measured with a Medwave Fusion monitor. A wrist cuff containing an internal sensor was situated on the left wrist of participants, such that the sensor was placed above the radial artery. The sensor then measured the amplitude of the radial pulse. HR was estimated based on the number of radial pulses, and SBP, DBP, and MAP were estimated based on pulse wave-form properties (Hui et al., 2009).

Starting from the eighth minute of the 10-minute baseline period, HR, SBP, DBP, and MAP were measured continuously at 30-second intervals through the end of the baseline period (for a total of five baseline measurements for each variable). Occasionally, the sensor would not pick up any readings from participants, but when there was at least one measurement during baseline, measurements were averaged for each variable to create an average baseline HR, SBP, DBP, and MAP for each participant.

Then, during the manipulation/control portion of the study, HR, SBP, DBP, and MAP were measured at 30-second intervals starting from the beginning of each video clip, for a total of four measurements for each of the five video clips. All measurements across movie clips were averaged to create an average manipulation/control HR, SBP,
DBP, and MAP for each participant. Then, change scores from baseline to the movie period were calculated by subtracting baseline measurements from the manipulation/control measurements of the corresponding variables.

*State Anxiety*

State anxiety was assessed using the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1970). The STAI was intended for use in individuals ranging in age from adolescence (Grade 9) through adulthood (age 69). It consists of 40 items divided into two 20-item scales assessing for current anxiety (State scale) and relatively stable anxious responses to stressors, or proneness to anxiety (Trait scale). Items for each scale assess worry, tension, apprehension, and nervousness. An example item from the State scale is “I feel at ease.” Responses for each scale range from 1 (not at all) to 4 (very much so). Only the State scale was used in this study, as we were primarily interested in changing levels of anxiety based on momentary exposure to violent movies. Scores were obtained by summing the responses for individual items. Change scores from pre-test to post-test were obtained by subtracting pre-test scores from post-test scores. Internal reliability was .90 for the State scale in previous research (Ramanaiah, Franzen, & Schill, 1983; Spielberger et al., 1970). In the present study, reliability for the State scale was .86 at pre-test and .95 at post-test.

*Media Violence Exposure*

Media violence exposure was assessed through three items inquiring about exposure through video/computer games, television, and movies (example item: “How often
do the TV shows you watch show physical fighting, shooting, or killing?"). Possible responses were 1 (almost never), 2 (sometimes), 3 (often), 4 (almost always), or 5 (I don’t engage in this activity). The last response option (I don’t engage in this activity) was set to missing and all available items were averaged. The reliability of the scale was .72.

Real-Life Violence Exposure

The Community Experiences Questionnaire (CEQ; Schwartz & Proctor, 2000) was used to assess lifetime violence exposure. It consists of two subscales: One assessing community violence exposure by direct victimization (11 items), and the second assessing community violence exposure by witnessing (14 items). This instrument was initially designed for use in children (mean age 10.3 in the original study); however, it has been modified and used in young adult populations with good reliability (Cronbach’s alpha of .88; Brady, 2006). Similarly, few modifications have been made to this measure to make it more appropriate for use with emerging adults in this study. Example items include “How many times has somebody broken in or tried to force their way into your home?” (victimization) and “How many times have you seen somebody else get hit, punched, or slapped?” (witnessing). Possible responses ranged from 1 (never) to 4 (lots of times). Cronbach’s alphas were .81 for the victimization subscale and .89 for the witnessing subscale in the original child population (Schwartz & Proctor, 2000). Because the current study focuses on overall exposure to violence as a moderator of reactions to media violence (rather than effects of specific types of violence exposure), items across the two subscales were summed to obtain a total score for overall violence exposure. Previous studies have also used the sum of both subscales to create an overall violence expo-
sure variable (e.g. Brady, 2006; Brady, 2007). Additionally, the witnessing and victimization subscales were strongly correlated (r=.57, p<.01), justifying combining the two scales. In the present study, the reliability of the overall real-life violence exposure scale was .86.

*Ratings of Subjective Emotional Responses Between Movie Clips*

Immediately after each clip in the manipulation/control portion of the study, participants answered six questions assessing their subjective emotional responses to the clips. Specifically, participants rated how anxious, distressed, fearful, threatened, engaged, and alert they felt while watching the last movie clip. An example item includes: “How anxious did you feel while watching the previous clip?” Responses ranged from 1 (not at all) to 5 (extremely). The items were presented in random order after each clip to prevent order effects on responses. Ratings for each emotion were averaged across the five movie clips, creating a composite score for a particular emotional response to the overall condition.

**Data Analytic Plan**

*Preliminary Analyses*

To analyze differences between cases with any missing data and those with no missing data, t-tests were conducted for continuous variables of interest, while chi-square tests were performed for categorical variables. Then, univariate and bivariate distributions of all variables were examined. Outliers for heart rate, systolic blood pressure, and diastolic blood pressure were truncated at 3.5 SD from the mean. Prior to main analyses,
dependent variables were examined on each assumption of multiple regression, including linearity, normality, homoscedasticity, and independence of errors. Non-normal distributions of variables were corrected using square-root transformations.

Then, descriptive statistics and correlations among variables were examined. T-tests (for continuous variables) and chi-square tests (for categorical variables) were also conducted to examine differences between the two conditions on each independent and dependent variable. Additionally, a mixed procedure conducted with SAS PROC MIXED tested whether participants’ subjective emotional responses and physiological reactivity to each clip differed as a function of condition, movie clip, and the order in which movie clips were presented. The procedure analyzed emotional responses and physiological reactivity for each individual movie, with movies nested within condition and participants, and participants nested within condition. Baseline values were included as covariates in the analyses of physiological variables (SBP, DBP, MAP, and HR). The clips within each condition were numbered 1-5, with each number corresponding to a specific clip. Because clips were presented in random order for each participant, the order in which each clip was viewed was included as another predictor in the model. Because these analyses revealed more differences among the clips than between the conditions, additional correlations examined relationships between emotional ratings and physiological variables at the level of each individual and movie clip.

**Main Analyses**

Following these preliminary analyses, a multiple regression was used to compare post-test scores between the two conditions on self-report state anxiety. The regression
controlled for pre-test scores of state anxiety, as well as demographics (age, gender, ethnicity, highest education level of either parent) and number of movies previously seen in the assigned condition. Also, a series of multiple regressions was used to compare cardiovascular change scores between the two conditions. Each regression controlled for average baseline levels of the outcome measure, as well as demographics (age, gender, ethnicity, highest education level of either parent) and number of movies previously seen in the assigned condition. Specifically, separate analyses were conducted for HR, SBP, DBP, and MAP.

The moderating effects of previous violence exposure (both real-life exposure and media exposure) on the relationship between condition (experimental vs. control) and the change score for each dependent variable (state anxiety, HR, SBP, DBP, and MAP) were examined by adding previous violence exposure (real-life or media) to Step 2 of the each regression analysis, and its interaction with condition to Step 3. Separate multiple regressions were conducted for each dependent variable and each type of violence (real-life vs. media). Real-life violence exposure and media violence exposure were analyzed in separate regressions in order to examine the total contributions of each variable to the outcomes of interest. Because real-life violence exposure was significantly correlated with media violence exposure (r=.39, p<.01), analyzing them in separate regressions eliminates the problem of their overlap. Prior to computing the interaction terms, the condition variable was dummy-coded and the moderator variable was centered in order to reduce collinearity between the interaction terms and lower-order effects. Significant interactions were further examined using simple slopes analysis following procedures recommended by Aiken and West (1991).
RESULTS

Preliminary Analyses

Three participants had missing data for HR, SBP, DBP, and MAP during the baseline portion of the study; four participants had missing data for HR, SBP, DBP, and MAP during the manipulation/control portion of the study; and two participants had missing data for age. T-tests and chi-square tests revealed no differences on any variable between cases with any missing data and those with no missing data. Upon examination of univariate distributions of data, four cases had values greater than 3.5 standard deviations from the mean for DBP and MAP; these outliers were truncated at 3.5 standard deviations.

Descriptive statistics for each predictor and dependent variable are displayed in Table 1. Of note, participants had seen an average of 2.31 of the five movies from which clips were presented in their condition. Because previous exposure to these movies may have affected their reactions to them, we controlled for the number of movies previously seen in all analyses. Additionally, participants reported a mean score of 40.41 (SD 8.67, range 26 to 80) on previous real-life violence exposure. Thus, the distribution showed a positive skew, with more participants experiencing lower levels of previous real-life violence exposure. Participants also reported relatively high scores on media violence exposure, with a mean score of 2.42 (SD=.81, range 1 to 4). For state anxiety, participants scored an average of 31.10 (SD=7.10, range 20 to 56) on pre-test state anxiety, while they scored an average of 8.62 points higher at post-test (SD 10.59, range -13 to 43). Thus,
overall participants reported higher state anxiety at post-test than pre-test (paired samples \(t=10.03, p<.001\)). Similarly, paired samples t-tests indicated that all cardiovascular measures increased from baseline to the movie period (SBP: \(t=4.55, p<.001\); DBP: \(t=2.53, p<.05\); MAP: \(t=3.31, p<.01\), with the exception of HR, which decreased (\(t=-8.85, p<.001\)) (see Table 1 for descriptives).

Table 1

Descriptive Statistics of All Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (SD)</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>18.66 (.87)</td>
<td>18</td>
<td>21</td>
</tr>
<tr>
<td>Female gender, N (%)</td>
<td>114 (75)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian ethnicity, N (%)</td>
<td>80 (53)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest education level of parents</td>
<td>4.22 (1.49)</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Number of movies previously seen</td>
<td>2.31 (1.57)</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Real-life violence exposure</td>
<td>40.41 (8.67)</td>
<td>26</td>
<td>80</td>
</tr>
<tr>
<td>Media violence exposure</td>
<td>2.42 (.81)</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Pre-test State Anxiety</td>
<td>31.10 (7.10)</td>
<td>20</td>
<td>56</td>
</tr>
<tr>
<td>State Anxiety change score</td>
<td>8.62 (10.59)</td>
<td>-13</td>
<td>43</td>
</tr>
<tr>
<td>Baseline SBP</td>
<td>115.77 (13.91)</td>
<td>81.40</td>
<td>155.00</td>
</tr>
<tr>
<td>SBP change score</td>
<td>2.11 (5.66)</td>
<td>-13.45</td>
<td>14.40</td>
</tr>
<tr>
<td>Baseline DBP</td>
<td>62.16 (10.32)</td>
<td>36.80</td>
<td>93.60</td>
</tr>
<tr>
<td>DBP change score</td>
<td>.94 (4.51)</td>
<td>-14.35</td>
<td>14.55</td>
</tr>
<tr>
<td>Baseline HR</td>
<td>78.25 (11.27)</td>
<td>56.00</td>
<td>109.60</td>
</tr>
<tr>
<td>HR change score</td>
<td>-3.23 (4.44)</td>
<td>-22.95</td>
<td>10.40</td>
</tr>
<tr>
<td>Baseline MAP</td>
<td>81.04 (12.00)</td>
<td>51.40</td>
<td>120.60</td>
</tr>
<tr>
<td>MAP change score</td>
<td>1.33 (4.89)</td>
<td>-14.80</td>
<td>15.70</td>
</tr>
</tbody>
</table>

Note: Parent education was coded on the following scale: 1-Less than high school; 2-High school diploma or GED; 3-Some college, no degree; 4-Associate’s degree; 5-Bachelor’s degree; 6-Graduate degree. Change scores indicate the change from pre-test/baseline measurements to post-test/manipulation measurements.

Correlations between predictors and dependent variables are displayed in Table 2, and correlations between demographics and dependent variables are shown in Table 3. Violent condition was positively related to post-test state anxiety and negatively related to
the number of movies previously seen, but was not related to any other constructs of interest (e.g. previous real-life or media violence exposure) (Table 2).

Table 2

*Correlations between Predictor Variables and Dependent Variables*

<table>
<thead>
<tr>
<th></th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
<th>7.</th>
<th>8.</th>
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</thead>
<tbody>
<tr>
<td>1. State anxiety (post-test)</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2. SBP (during movies)</td>
<td>-.15</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>3. DBP (during movies)</td>
<td>-.15</td>
<td>.96**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. HR (during movies)</td>
<td>.06</td>
<td>.07</td>
<td>.14</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. MAP (during movies)</td>
<td>-.15</td>
<td>.98**</td>
<td>.99**</td>
<td>.09</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>6. Violent condition</td>
<td>.21*</td>
<td>-.09</td>
<td>-.13</td>
<td>-.01</td>
<td>-.11</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Real-life violence exposure</td>
<td>.02</td>
<td>.19*</td>
<td>.14</td>
<td>-.13</td>
<td>.16</td>
<td>-.07</td>
<td>1.00</td>
<td></td>
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<tr>
<td>8. Media violence exposure</td>
<td>-.26**</td>
<td>.12</td>
<td>.08</td>
<td>-.08</td>
<td>.09</td>
<td>-.13</td>
<td>.39**</td>
<td>1.00</td>
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</tbody>
</table>

*Note: * p<.05, **p<.01

Table 3

*Correlations between Covariates and Dependent and Independent Variables*

<table>
<thead>
<tr>
<th></th>
<th>State anxiety (post-test)</th>
<th>SBP (during movies)</th>
<th>DBP (during movies)</th>
<th>HR (during movies)</th>
<th>MAP (during movies)</th>
<th>Violent Condition</th>
<th>Real-life violence exposure</th>
<th>Media violence exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. State anxiety (pre-test)</td>
<td>.51**</td>
<td>-.09</td>
<td>-.09</td>
<td>.09</td>
<td>-.11</td>
<td>-.00</td>
<td>.11</td>
<td>-.18*</td>
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<td>2. SBP (baseline)</td>
<td>-.11</td>
<td>.91**</td>
<td>.86**</td>
<td>.06</td>
<td>.89**</td>
<td>-.06</td>
<td>.20*</td>
<td>.12</td>
</tr>
<tr>
<td>3. DBP (baseline)</td>
<td>-.14</td>
<td>.88**</td>
<td>.90**</td>
<td>.15</td>
<td>.90**</td>
<td>-.10</td>
<td>.14</td>
<td>.10</td>
</tr>
<tr>
<td>4. HR (baseline)</td>
<td>.06</td>
<td>.07</td>
<td>.14</td>
<td>.92**</td>
<td>.10</td>
<td>.00</td>
<td>-.15</td>
<td>-.03</td>
</tr>
<tr>
<td>5. MAP (baseline)</td>
<td>-.13</td>
<td>.91**</td>
<td>.89**</td>
<td>.09</td>
<td>.91**</td>
<td>-.08</td>
<td>.17*</td>
<td>.10</td>
</tr>
<tr>
<td>6. Age</td>
<td>-.08</td>
<td>-.05</td>
<td>-.07</td>
<td>-.09</td>
<td>-.06</td>
<td>-.01</td>
<td>-.07</td>
<td>.04</td>
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<tr>
<td>7. Female gender</td>
<td>.21**</td>
<td>-.03</td>
<td>.01</td>
<td>.14</td>
<td>.02</td>
<td>.06</td>
<td>-.26**</td>
<td>-.36**</td>
</tr>
<tr>
<td>8. Caucasian ethnicity</td>
<td>.15</td>
<td>-.17*</td>
<td>-.19*</td>
<td>.02</td>
<td>-.19*</td>
<td>.11</td>
<td>-.03</td>
<td>-.08</td>
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<tr>
<td>9. Highest education level of either parent</td>
<td>.06</td>
<td>.03</td>
<td>.04</td>
<td>-.04</td>
<td>.03</td>
<td>.11</td>
<td>-.05</td>
<td>-.08</td>
</tr>
<tr>
<td>10. Number of movies previously seen</td>
<td>-.17*</td>
<td>.21**</td>
<td>.24**</td>
<td>.06</td>
<td>.23**</td>
<td>-.51**</td>
<td>.15</td>
<td>.23*</td>
</tr>
</tbody>
</table>

*Note: * p<.05, **p<.01

Real-life violence exposure was positively related to SBP and MAP at baseline, as well as SBP during the movie period. Media violence exposure was negatively related to post-test state anxiety and positively related to real-life violence exposure. SBP, DBP,
and MAP during the movie period were each positively correlated with each other (p<.01), but none were correlated with HR during the movie period. Baseline measurements for each cardiovascular variable (SBP, DBP, HR, and MAP) were all positively related to their respective manipulation/control measurements.

Then, as detailed in Table 4, t-tests and chi-square tests examining differences between the two conditions revealed that participants in the violent condition reported higher changes in state anxiety and were familiar with fewer of the selected movie clips compared to the nonviolent condition.

Table 4

*Differences between Conditions on Predictor Variables, Covariates, and Dependent Variables*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Violent Condition</th>
<th>Nonviolent Condition</th>
<th>(\chi^2(1))</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female gender¹, N (% of condition)</td>
<td>59 (78)</td>
<td>55 (72)</td>
<td>.56</td>
<td>.45</td>
</tr>
<tr>
<td>Caucasian ethnicity², N (% of condition)</td>
<td>44 (58)</td>
<td>36 (47)</td>
<td>1.69</td>
<td>.19</td>
</tr>
<tr>
<td>Age</td>
<td>18.65 (.88)</td>
<td>18.67 (.88)</td>
<td>-.09</td>
<td>.93</td>
</tr>
<tr>
<td>Highest education level of either parent</td>
<td>4.38 (1.51)</td>
<td>4.07 (1.47)</td>
<td>1.31</td>
<td>.19</td>
</tr>
<tr>
<td>Number of movies previously seen</td>
<td>1.51 (1.13)</td>
<td>3.11 (1.55)</td>
<td>-7.23</td>
<td>.00</td>
</tr>
<tr>
<td>State anxiety (pre-test)</td>
<td>31.09 (7.51)</td>
<td>31.11 (6.71)</td>
<td>-.01</td>
<td>.99</td>
</tr>
<tr>
<td>SBP (baseline)</td>
<td>114.93 (13.72)</td>
<td>116.61 (14.14)</td>
<td>-.74</td>
<td>.46</td>
</tr>
<tr>
<td>DBP (baseline)</td>
<td>61.18 (9.96)</td>
<td>63.13 (10.63)</td>
<td>-1.16</td>
<td>.25</td>
</tr>
<tr>
<td>HR (baseline)</td>
<td>78.27 (10.54)</td>
<td>78.24 (12.03)</td>
<td>.01</td>
<td>.99</td>
</tr>
<tr>
<td>MAP (baseline)</td>
<td>80.08 (11.73)</td>
<td>81.99 (12.28)</td>
<td>-.97</td>
<td>.34</td>
</tr>
<tr>
<td>Real-life violence exposure</td>
<td>39.83 (8.24)</td>
<td>41.00 (9.10)</td>
<td>-.83</td>
<td>.41</td>
</tr>
<tr>
<td>Media violence exposure</td>
<td>2.31 (.79)</td>
<td>2.53 (.82)</td>
<td>-1.63</td>
<td>.11</td>
</tr>
<tr>
<td>State anxiety (change score)</td>
<td>11.21 (11.23)</td>
<td>6.03 (9.28)</td>
<td>3.10</td>
<td>.00</td>
</tr>
<tr>
<td>SBP (change score)</td>
<td>1.56 (5.56)</td>
<td>2.65 (5.73)</td>
<td>-1.17</td>
<td>.24</td>
</tr>
<tr>
<td>DBP (change score)</td>
<td>.41 (4.41)</td>
<td>1.45 (4.58)</td>
<td>-1.40</td>
<td>.16</td>
</tr>
<tr>
<td>HR (change score)</td>
<td>-3.38 (4.28)</td>
<td>-3.10 (4.62)</td>
<td>-.38</td>
<td>.70</td>
</tr>
<tr>
<td>MAP (change score)</td>
<td>.81 (4.81)</td>
<td>1.83 (4.94)</td>
<td>-1.27</td>
<td>.21</td>
</tr>
</tbody>
</table>

*Note:* ¹Chi-square test statistics are given instead of t-statistics for these categorical variables.
However, the groups did not differ on any other independent or dependent variable. As noted earlier, the number of previously viewed clips was included as a covariate in the main analyses.

Then, mixed procedures were conducted to compare the conditions on subjective emotional ratings of each clip as well as physiological responses during each clip. Means and test results for responses as a function of condition, movie, and movie order are displayed in Table 5 for the subjective ratings of each clip and in Table 6 for the physiological responses during each clip (HR, SBP, DBP, and MAP). There were differences between the violent and nonviolent conditions on feelings of anxiety, fear, and engagement, as well as on SBP, DBP, and MAP. For each of these variables, participants in the nonviolent condition reported higher mean levels of each rating/reactivity than individuals in the violent condition. Effect sizes for these differences were medium in size: -0.36 for anxiety, -0.38 for fear, -0.51 for engagement, -0.38 for SBP, -0.42 for DBP, and -0.39 for MAP. Additionally, ratings for distress approached significance, with participants in the violent condition reporting higher mean levels of distress than those in the nonviolent condition. Ratings for threat and alertness and heart rate reactivity did not differ by condition. In addition, there was a significant main effect of movie clip for each subjective emotional rating and for HR, but not SBP, DBP, or MAP. These results indicated that all emotional responses and heart rate varied across the individual movie clips. Additionally, there were no significant effects of movie order for any variable, indicating that the order in which movie clips were presented did not affect participants’ emotional ratings or physiological reactivity.
Table 5

Subjective Emotional Ratings Based on Condition, Movie, and Order of Movie Clips

<table>
<thead>
<tr>
<th>Subjective Emotional Response</th>
<th>Mean (SD)</th>
<th>Condition t(151)</th>
<th>Movie F (8, 595)</th>
<th>Movie Order F (4, 595)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Movie 1</td>
<td>Movie 2</td>
<td>Movie 3</td>
<td>Movie 4</td>
</tr>
<tr>
<td>Anxious Violent</td>
<td>2.67 (.15)</td>
<td>3.20 (.13)</td>
<td>3.03 (.15)</td>
<td>3.11 (.15)</td>
</tr>
<tr>
<td>Nonviolent</td>
<td>3.08 (.15)</td>
<td>2.40 (.13)</td>
<td>3.09 (.15)</td>
<td>3.32 (.15)</td>
</tr>
<tr>
<td>Distressed Violent</td>
<td>2.25 (.15)</td>
<td>3.08 (.14)</td>
<td>2.43 (.14)</td>
<td>3.00 (.16)</td>
</tr>
<tr>
<td>Nonviolent</td>
<td>2.42 (.15)</td>
<td>1.74 (.14)</td>
<td>2.07 (.14)</td>
<td>2.75 (.15)</td>
</tr>
<tr>
<td>Fearful Violent</td>
<td>1.97 (.15)</td>
<td>2.55 (.14)</td>
<td>2.09 (.13)</td>
<td>2.49 (.15)</td>
</tr>
<tr>
<td>Nonviolent</td>
<td>2.45 (.15)</td>
<td>1.66 (.14)</td>
<td>2.38 (.13)</td>
<td>2.95 (.15)</td>
</tr>
<tr>
<td>Threatened Violent</td>
<td>1.74 (.13)</td>
<td>2.07 (.13)</td>
<td>1.68 (.11)</td>
<td>2.12 (.15)</td>
</tr>
<tr>
<td>Nonviolent</td>
<td>1.87 (.13)</td>
<td>1.37 (.13)</td>
<td>1.57 (.11)</td>
<td>1.86 (.15)</td>
</tr>
<tr>
<td>Engaged Violent</td>
<td>2.95 (.14)</td>
<td>3.58 (.13)</td>
<td>3.74 (.12)</td>
<td>3.72 (.11)</td>
</tr>
<tr>
<td>Nonviolent</td>
<td>3.51 (.14)</td>
<td>3.24 (.13)</td>
<td>3.79 (.13)</td>
<td>4.11 (.12)</td>
</tr>
<tr>
<td>Alert Violent</td>
<td>3.25 (.14)</td>
<td>3.74 (.13)</td>
<td>3.75 (.13)</td>
<td>3.87 (.12)</td>
</tr>
<tr>
<td>Nonviolent</td>
<td>3.46 (.14)</td>
<td>3.08 (.13)</td>
<td>3.67 (.13)</td>
<td>3.86 (.12)</td>
</tr>
</tbody>
</table>

Notes: +p<.10; *p<.05; **p<.01; ***p<.001
Table 6

Physiological Responses Based on Baseline Measurements, Condition, Movie, and Order of Movie Clips

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Condition</th>
<th>Mean (SD)</th>
<th></th>
<th></th>
<th></th>
<th>Baseline t(146)</th>
<th>Condition t(146)</th>
<th>Movie F (8, 572)</th>
<th>Movie Order F (4, 572)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Violent</td>
<td>Movie 1</td>
<td>Movie 2</td>
<td>Movie 3</td>
<td>Movie 4</td>
<td>Movie 5</td>
<td>All</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SBP</td>
<td>Violent</td>
<td>116.50</td>
<td>117.00</td>
<td>116.87</td>
<td>117.76</td>
<td>116.99</td>
<td>116.95</td>
<td>51.39***</td>
<td>-2.27*</td>
</tr>
<tr>
<td></td>
<td>Nonviolent</td>
<td>(1.63)</td>
<td>(1.64)</td>
<td>(1.67)</td>
<td>(1.59)</td>
<td>(1.65)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Violent</td>
<td>118.40</td>
<td>118.22</td>
<td>119.93</td>
<td>119.60</td>
<td>120.29</td>
<td>119.26</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nonviolent</td>
<td>(1.63)</td>
<td>(1.64)</td>
<td>(1.67)</td>
<td>(1.59)</td>
<td>(1.65)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DBP</td>
<td>Violent</td>
<td>61.03</td>
<td>62.29</td>
<td>62.21</td>
<td>62.13</td>
<td>61.85</td>
<td>61.92</td>
<td>47.52***</td>
<td>-2.55*</td>
</tr>
<tr>
<td></td>
<td>Nonviolent</td>
<td>(1.22)</td>
<td>(1.21)</td>
<td>(1.27)</td>
<td>(1.24)</td>
<td>(1.25)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Violent</td>
<td>63.75</td>
<td>63.77</td>
<td>65.48</td>
<td>64.72</td>
<td>65.50</td>
<td>64.58</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nonviolent</td>
<td>(1.22)</td>
<td>(1.21)</td>
<td>(1.27)</td>
<td>(1.24)</td>
<td>(1.25)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HR</td>
<td>Violent</td>
<td>74.54</td>
<td>75.79</td>
<td>75.30</td>
<td>73.39</td>
<td>73.95</td>
<td>74.89</td>
<td>51.23***</td>
<td>-1.00</td>
</tr>
<tr>
<td></td>
<td>Nonviolent</td>
<td>(1.24)</td>
<td>(1.23)</td>
<td>(1.28)</td>
<td>(1.24)</td>
<td>(1.24)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAP</td>
<td>Violent</td>
<td>80.77</td>
<td>81.36</td>
<td>81.30</td>
<td>81.66</td>
<td>81.43</td>
<td>81.29</td>
<td>51.90***</td>
<td>-2.33*</td>
</tr>
<tr>
<td></td>
<td>Nonviolent</td>
<td>(1.41)</td>
<td>(1.41)</td>
<td>(1.48)</td>
<td>(1.42)</td>
<td>(1.47)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: + p<.10; *p<.05; **p<.01; ***p<.001
To further investigate the relationships between specific movie clips and each outcome variable, correlations were computed between subjective emotional ratings and physiological responses at the level of each movie clip viewed by each individual (see Table 7). Correlations with physiological variables were computed after partialling out the baseline values of the same physiological variable. Violent condition was positively related to distress and threat and negatively related to engagement. Violent condition was also associated with lower values of SBP, DBP, and MAP during the movies. All emotional ratings (anxious, fearful, threatened, engaged, alert, distressed) were positively correlated with each other, with a few exceptions. Ratings of engagement were negatively correlated with anxiety, and fear and alertness were not correlated with anxiety. When considering physiological responses during the movie period, SBP, DBP, and MAP were all positively correlated with fear, but not with any other emotional rating. In contrast, HR was positively correlated with distress, engagement, and alertness. HR was also positively correlated with DBP and MAP, but not with SBP. Finally, SBP was positively correlated with DBP and MAP. Thus it appears that when these responses are examined at the individual person and movie level, HR is related to different emotions more extensively than SBP, DBP, and MAP. Additionally, SBP and HR were not correlated with each other.

Main Analyses

To address the main hypotheses, the physiological measures for individual movie clips were averaged across condition to create composite values for the overall condition. Additionally, change scores from baseline to the movie period were calculated by sub-
Table 7

Correlations between Emotional Ratings of Individual Movie Clips and Physiological Variables as a Function of Individual Movies

<table>
<thead>
<tr>
<th></th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
<th>7.</th>
<th>8.</th>
<th>9.</th>
<th>10.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Violent condition</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>2. Anxiety</td>
<td>-.03</td>
<td>1.00</td>
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<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>3. Distress</td>
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<td>.63**</td>
<td>1.00</td>
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<td></td>
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<td>4. Threat</td>
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<td>.51**</td>
<td>.63**</td>
<td>1.00</td>
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<td></td>
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<td>5. Fear</td>
<td>-.06</td>
<td>.66**</td>
<td>.66**</td>
<td>.66**</td>
<td>1.00</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Engaged</td>
<td>-.11**</td>
<td>.59**</td>
<td>.42**</td>
<td>.37**</td>
<td>.46**</td>
<td>1.00</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>7. Alert</td>
<td>.03</td>
<td>.58**</td>
<td>.48**</td>
<td>.39**</td>
<td>.46**</td>
<td>.68**</td>
<td>1.00</td>
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</tr>
<tr>
<td>8. SBP (during movies)</td>
<td>-.09*</td>
<td>.04</td>
<td>.00</td>
<td>-.01</td>
<td>.09*</td>
<td>-.02</td>
<td>-.07+</td>
<td>1.00</td>
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<td></td>
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<tr>
<td>9. DBP (during movies)</td>
<td>-.12**</td>
<td>.07+</td>
<td>.04</td>
<td>.02</td>
<td>.12**</td>
<td>.02</td>
<td>-.04</td>
<td>.90**</td>
<td>1.00</td>
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<tr>
<td>10. HR (during movies)</td>
<td>-.02</td>
<td>.07+</td>
<td>.08*</td>
<td>.04</td>
<td>.07+</td>
<td>.08*</td>
<td>.11**</td>
<td>.07+</td>
<td>.14**</td>
<td>1.00</td>
</tr>
<tr>
<td>11. MAP (during movies)</td>
<td>-.10**</td>
<td>.05</td>
<td>.02</td>
<td>.00</td>
<td>.11**</td>
<td>-.01</td>
<td>-.06+</td>
<td>.96**</td>
<td>.95**</td>
<td>.10**</td>
</tr>
</tbody>
</table>

Note: +p<.10, *p<.05, **p<.01. Baseline levels of each outcome variable partialled out of all correlations.
tracting baseline measurements from the manipulation/control measurements of the same variables. Multiple regressions were then used to examine the effect of condition on all change scores. Covariates for these analyses included baseline levels of the outcome variable, age, gender, ethnicity, highest level of education of either parent, and number of movie clips in the condition that the participant had previously seen. Standardized beta coefficients and R-squared changes are displayed in Table 8. Results indicated a main effect of condition on the change score for state anxiety, but there were no main effects of condition on any other dependent variables. More specifically, participants exposed to the violent condition reported higher increases in state anxiety ($\beta = .18$, $p<.05$). The effect size for the difference between the violent and nonviolent condition on post-test state anxiety was in the medium range (Cohen’s $d = .36$). The absence of main effects of condition on each physiological dependent variable indicates that participants in both conditions showed similar responses in terms of SBP, DBP, HR, and MAP averaged across all clips.

Then, Steps 2 and 3 of each regression analysis examined the main effects and moderating effects of real-life violence exposure and media violence exposure on each dependent variable. The effect of media violence exposure on HR approached significance ($\beta = -.16$, $p<.10$), indicating that participants reporting high levels of exposure to media violence tended to decrease their HR when viewing the movie clips, regardless of their condition. There were no main effects of media violence exposure on any other outcomes and there were no main effects of real-life violence exposure on any dependent variables. However, real-life violence exposure moderated the relationships between condition and change in SBP ($\beta = -.29$, $p<.01$), DBP ($\beta = -.29$, $p<.01$), and MAP
Table 8

*Multiple Regressions Predicting Each Outcome as a Function of Condition, Covariates, and Previous Violence Exposure*

<table>
<thead>
<tr>
<th>Predictor</th>
<th>State Anxiety Change</th>
<th>SBP Change</th>
<th>DBP Change</th>
<th>HR Change</th>
<th>MAP Change</th>
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<tbody>
<tr>
<td></td>
<td>β</td>
<td>ΔR²</td>
<td>β</td>
<td>ΔR²</td>
<td>β</td>
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<td><strong>Step 1</strong></td>
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<tr>
<td>Age</td>
<td>.04</td>
<td>.14**</td>
<td>-.07</td>
<td>.09+</td>
<td>-.08</td>
</tr>
<tr>
<td>Caucasian ethnicity</td>
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<td>.01</td>
<td>.03</td>
<td>.11</td>
<td>.04</td>
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<td>Female gender</td>
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<td>-.05</td>
<td>-.07</td>
<td>-.00</td>
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<td>Parent education</td>
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<td>.10</td>
<td>.12</td>
<td>.04</td>
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<td>Movies seen</td>
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<td>.10</td>
<td>.08</td>
<td>.02</td>
<td>.10</td>
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<td>-.28**</td>
<td>-.26**</td>
<td>-.39***</td>
<td>-.24**</td>
</tr>
<tr>
<td>Condition</td>
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<td>-.07</td>
<td>-.11</td>
<td>-.04</td>
<td>-.08</td>
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<tr>
<td><strong>Step 2a</strong></td>
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<tr>
<td>Real-life violence exposure</td>
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<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.02</td>
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<td><strong>Step 2b</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Media violence exposure</td>
<td>-.08</td>
<td>.01</td>
<td>-.01</td>
<td>.00</td>
<td>-.08</td>
</tr>
<tr>
<td><strong>Step 3a</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condition x Real-life Violence Exposure</td>
<td>.02</td>
<td>.00</td>
<td>-.29**</td>
<td>.05**</td>
<td>-.29**</td>
</tr>
<tr>
<td><strong>Step 3b</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condition x Media Violence Exposure</td>
<td>-.05</td>
<td>.00</td>
<td>-.19</td>
<td>.02</td>
<td>-.19+</td>
</tr>
</tbody>
</table>

*Note: + p<.10; * p<.05; ** p<.01; *** p<.001*
(β = -.26, p<.05). By contrast, real-life violence exposure did not moderate the relationships between condition and change in state anxiety or heart rate. Additionally, media violence exposure approached significance in moderating the relationship between condition and change in DBP (β = -.19, p<.10).

Simple slopes analyses were utilized to further examine the significant interactions between condition and real-life violence exposure. The simple slopes of the violent and nonviolent condition on each change score were determined at one standard deviation above and below the mean level of real-life violence exposure. Exposure to high levels of real-life violence exposure was associated with a trend of decreased SBP for young adults viewing violent movies, but with a trend of increased SBP for those viewing control movies (β = -.24, p<.10 vs. β = .19, p<.10; see Figure 1).

![Figure 1. Interaction between condition and real-life violence exposure on SBP.](image-url)
The same pattern of relationships was obtained for changes in DBP and MAP. Specifically, exposure to high levels of real-life violence was related to a trend of decreased DBP for participants in the violent condition but a trend of increased DBP for those in the nonviolent condition ($\beta = -.24, p<.10$ vs. $\beta = .19, p<.10$; see Figure 2).

![Figure 2](image.png)

*Figure 2. Interaction between condition and real-life violence exposure on DBP.*

Likewise, exposure to high levels of real-life violence exposure was related to a trend of decreased MAP for those exposed to the violent condition, but was unrelated to MAP for participants in the nonviolent condition ($\beta = -.22, p<.10$ vs. $\beta = .17$, ns; see Figure 3).

Although none of the simple slopes were significant at the .05 level, the significant interactions strongly indicate that previous levels of exposure to real-life violence affect cardiovascular reactivity to violent vs. nonviolent high action movies. Individuals exposed
to high levels of real-life violence tend to show lower reactivity to violent movies and higher reactivity to nonviolent movies.

![Graph](attachment:image.png)

**Real-Life Violence Exposure**

*Figure 3.* Interaction between condition and real-life violence exposure on MAP.

Yet, it is important to note that several of these variables (specifically, changes in state anxiety, DBP, and HR) were non-normal based on Shapiro-Wilk statistics. When evaluating assumptions of multiple regression, Shapiro-Wilk statistics for change scores for state anxiety, DBP, and HR were significant (W=.960, df=148, p<.001, W=.982, df=148, p<.05, and W=.974, df=148, p<.01, respectively), indicating non-normal data distributions for these three variables. The results presented above involve the use of these non-normal variables, as transforming the variables would have obscured the meaning of the change scores. To determine the effects of normalizing these variables, analyses were repeated with transformed post-test measurements used as the dependent variables.
instead of the change scores. The non-normal distributions of these post-test measurements were corrected with square-root transformations (with the exceptions of the DBP which was normally distributed; Shapiro-Wilk $W=.984$, df=148, $p>.05$). When these transformed variables were used in subsequent analyses, the pattern of results were essentially the same, except the main effect of violent condition on state anxiety was only marginally significant ($\beta = .16$, $p<.10$). However, this effect had a slightly higher effect size ($d=.43$) compared with the anxiety change score.
DISCUSSION

This study used an experimental paradigm to address whether exposure to media violence increases state anxiety and physiological arousal in young adults attending college. Overall, results indicated that media violence exposure increases state anxiety but not physiological arousal (as indicated by SBP, DBP, HR, and MAP). Additionally, previous media violence exposure was associated with a trend toward lower heart rate among participants when watching both violent and nonviolent high action movie clips. Finally, real-life violence exposure moderated the relationships between media violence exposure and physiological activity, with individuals exposed to high levels of real-life violence having lower arousal when exposed to violent vs. nonviolent clips, whereas the opposite pattern appeared for students with low levels of real-life violence exposure.

The Effects of Media Violence on Anxiety and Physiological Arousal

For state anxiety, we hypothesized that individuals exposed to violent media scenes would report increases in state anxiety after exposure. Indeed, zero-order correlations revealed a positive relationship between the violent condition and post-test state anxiety. Likewise, when change in post-test state anxiety was examined as a function of condition and other covariates, including pre-test anxiety and demographics, the effect of violent condition was significant in eliciting changes in state anxiety, with a medium effect size ($d=.36$). However, when a square-root transformation of post-test state anxiety was used as the dependent variable (instead of non-transformed anxiety change scores),
the main effect of violent condition on state anxiety was only marginally significant ($\beta = .16, p<.10$) with a medium effect size ($d=.43$). Since the significant result using change scores is likely biased due to the violation of the normality assumption, the effect of media violence on state anxiety needs to be interpreted with caution and requires replication in future studies.

In contrast, when participants rated how anxious they felt after each individual clip, these ratings showed that individuals in the nonviolent condition felt more anxious after each clip than those in the violent condition. Thus, the results for anxiety ratings made immediately after each movie clip yielded opposite results compared to those for state anxiety reported after all clips have been viewed. One potential explanation of this discrepancy pertains to measurement of anxiety. The state anxiety measure does not contain an item that specifically asks about respondents’ anxiety, while the ratings of anxiety after individual clips required participants to answer directly how anxious they felt while watching the previous clip. Perhaps individuals denied that they felt anxious when asked directly after each clip due to a negative connotation of the term “anxious,” while the state anxiety measure, which assesses anxiety more indirectly, detected otherwise. Alternatively, it is possible that the violence shown in any individual clip was insufficient to induce anxiety, but the combined effect of all five clips did produce greater feelings of anxiety. Also, it is possible that the clips in the nonviolent condition included more suspense, sadness, or other emotions not accounted for in the present study, which could contribute to greater self-rated anxiety in response to these clips. Finally, it possible that participants in the violent condition were operating under a social desirability bias, such that they may have responded to items for post-test state anxiety in a way they believed
the researcher expected of them (i.e., reporting higher state anxiety after watching the violent movie clips).

For the physiological measures, we hypothesized that individuals in the violent condition would show increases in cardiovascular activity following exposure. However, condition had no effect on changes in cardiovascular activity during each clip or overall, when averaged across the five clips. When these analyses were conducted using variables that were transformed to create normal distributions for DBP and HR, a similar pattern of results emerged. One possible explanation is that media violence does not elicit physiological arousal, at least not when compared to high action movie clips that are not violent. Because violent movies tend to be high in action and high action could produce arousal, we purposefully selected violent and nonviolent clips that were overall equivalent on their action level, thus preventing differences in action confounding the effects of violence. Although the relative importance of violence and high action for arousal cannot be determined with the present design, the results are consistent with the possibility that high action, regardless of violent content, increases arousal. To further investigate this possibility, paired samples t-tests were conducted to compare physiological activity during the clips to baseline levels, as well as post-test state anxiety to pre-test state anxiety. As previously reported, all t-tests were significant (SBP: $t=4.55$, $p<.001$; DBP: $t=2.53$, $p<.05$; HR: $t=–8.85$, $p<.001$; MAP: $t=3.31$, $p<.01$; state anxiety: $t=10.03$, $p<.001$), indicating that all indices of cardiovascular reactivity increased from baseline to the movie period (with the exception of HR, which decreased from baseline to the movie period). Likewise, reported state anxiety increased from before to after the clips. Altogether, these results suggest that the high action (which was common to both conditions) elicited in-
creased SBP, DBP, and MAP, and decreased HR. Additionally, both the high action and violence may have contributed to increased state anxiety. Thus, high action may affect HR differently than measures of blood pressure and self-reported state anxiety, which may be attributable to different mechanisms underlying the control of HR compared to SBP, DBP, and MAP (to be discussed later). A replication of the present results with low action nonviolent and violent movie conditions would be necessary to fully determine the respective effects of movie violence and level of action.

Another explanation for the obtained patterns of findings is that the manipulation was not successful. The pilot testing was conducted to select high-violent and low-violent clips similar in the level of action. During the piloting, participants reported feeling more fearful, threatened, and anxious, but only marginally more distressed, when watching the violent movie clips compared to the nonviolent movie clips. Similarly, participants in the main study reported marginally more distress in response to the violent clips. However, they also reported greater anxiety, fear, and engagement in response to the nonviolent clips rather than the violent clips, which is contrary to findings from the pilot study. Finally, participants in the main study did not report feeling more threatened or alert while watching the violent clips. Taken together, these discrepancies suggest that participants in the main study perceived the violent and nonviolent clips differently than participants in the pilot study, perhaps because the sampled populations differed (more junior vs. more senior students), because the small size of the pilot group resulted in biased results, or because the pilot sample watched both types of clips. Because of these differences on the rated dimensions, it is possible that the participants in the main study did not perceive the violent clips as more violent than the nonviolent clips. Unfortunately, ratings of clip vio-
lence were not collected in the main study as a direct manipulation check. Similarly, the main study analyses demonstrated that overall, the subjective emotional ratings differed more consistently as a function of individual movie clip viewed than as a function of condition, again indicating differences in perception from the pilot study which produced more uniform ratings across clips. This high variability of perceptions among the clips likely diluted any true effects of movie violence.

When correlations between emotional ratings and physiological responses were computed at the level of each movie clip and person, SBP, DBP, and MAP were all positively correlated with fear, but not with any other emotion. This finding suggests that any physiological response to the movies may have been mediated through fear rather than anxiety. Thus, it seems that some of the clips (in both conditions) elicited more fear, as well as greater physiological arousal. Future studies on this topic may benefit from including a larger pilot sample drawn from the same population that will be sampled in the main study, attempting to minimize variability in responses to the individual clips within each condition, and including measures of fear in addition to measures of anxiety. Direct manipulation check may also be helpful, for instance by asking participants to rate how violent the movie clips were after they see each clip or at the conclusion of the study.

In summary, participants in the violent condition reported increased state anxiety, but there were no changes in cardiovascular reactivity compared to the nonviolent condition. While the violent movie content may have contributed to the higher levels of state anxiety detected, future studies should replicate this design using low action violent and nonviolent movie clips in order to disentangle the relative effects of violence vs. high action on anxiety and cardiovascular reactivity. Although differences in emotional ratings
and physiological reactivity (except HR) were observed as a function of condition, some of these differences were in the opposite direction than expected. For instance, participants in the nonviolent condition showed higher levels of anxiety, fear, and engagement than those in the violent condition. This finding may be partially attributed to our lack of accounting for other important elements of these movie clips, such as suspense and sadness. It is possible that the clips in the nonviolent condition were more suspenseful and sad, which may have elicited stronger emotional responses from participants. Additionally, participants demonstrated differences in emotional reactivity and HR as a function of the individual movie clips viewed, indicating that other elements in the presented clips may have confounded the results. In order to more conclusively determine the effects of violence alone, future studies must more effectively isolate the violent content from other confounding elements in these movie clips (e.g., suspense level, disgust, etc.). To do so, the process of selecting these clips should involve a larger pilot sample that is drawn from the same population as the sample of the main study. When the movie clips are more equivalent on a larger number of potentially confounding elements, the effects of violent content on outcomes can be determined more accurately.

Previous Exposure to Violence and the Effects of Movie Violence on Anxiety and Physiological Arousal

Correlations indicated that individuals with previous exposure to high levels of media violence reported lower state anxiety. Additionally, participants previously exposed to high levels of real-life violence had higher SBP during the movie clips. However, these effects did not replicate in regression analyses that adjusted for other predictors. Yet, the effect of previous media violence exposure on changes in HR approached signif-
icance (p<.10), indicating that greater exposure to media violence was related to lower HR reactivity to both violent and nonviolent movies. These findings were replicated when analyses were conducted using a transformed HR variable to correct for its non-normal distribution. As noted earlier, existing studies have found conflicting results regarding the direction of HR change in response to stressful stimuli (Hayashi et al., 2009; Jönsson & Hansson-Sandsten, 2008; Kreibig et al., 2007). We argued that the discrepancies could be explained by the levels of action of the film clips used, with higher action being associated with increased arousal compared to low action, thus potentially confounding the effects of violence on arousal. In other words, physiological arousal in response to movie clips may arise from the high level of action in each clip, rather than to the violence itself.

To prevent such confounding, efforts were made in this study to balance the levels of action in each condition. Although the net deceleration of HR as a result of previous media violence exposure is contrary to hypotheses, it is possible that in response to repeated exposure to media violence, individuals habituate and their HR decelerates upon additional exposure. More specifically, it is possible that individuals who have seen more media violence are likely to have seen more action movies, and thus have developed a habituation response to high action movies in general. Over time, this habituation may manifest itself in lower heart rate, since the stimulus of media violence would no longer induce the stress response that leads to elevated heart rate (Taylor, 2010). Thus, habituation from previous exposure to high levels of action in violent films may explain the relationship between previous media violence exposure and smaller change in HR during both the violent and nonviolent high action clips. However, this association was
specific only to HR and was not replicated across other indicators of cardiovascular reactivity, so it should be interpreted with caution until replicated in other studies.

Additionally, real-life violence exposure (but not media violence exposure) moderated the relationship between movie condition and changes in SBP, DBP, and MAP. In each case, participants with high levels of real-life violence exposure showed lower reactivity (SBP, DBP, and MAP) in the violent condition, but higher reactivity in the nonviolent condition, compared to participants who experienced less real-life violence. This pattern of results in the violent condition is consistent with the hypothesis of desensitization to violence, such that only individuals who are not accustomed to high levels of violence in everyday life will experience changes in physiological arousal in response to visual displays of violence. Conversely, high exposure to real-life violence has led individuals to become desensitized to visual displays of violence in film, leading to lower reactivity. At this point, it is unclear why these individuals should exhibit higher reactivity in response to high action movie clips that do not contain violence. A replication of these results is warranted before they can be considered valid.

Several other studies reported results indicating the presence of desensitization at high levels of violence. In one study, a sample of sixth graders exposed to high levels of community violence reported lower levels of psychological distress than youth with moderate levels of exposure (Ng-Mak et al., 2004). In another study, early adolescents who have experienced high levels of violence exposure at home, school, and in their communities reported less anxiety than those exposed to moderate levels of violence (Mrug, Loosier, & Windle, 2008). However, Cooley-Quille et al. (2001) examined HR reactivity among a sample of high school students (mean age 15.4) in response to view-
ing a montage of violent movie clips and found no differences in HR reactivity between students exposed to high vs. low levels of community violence. While this finding reflects a lack of desensitization as indicated by HR, we did not find desensitization effects reflected through HR in the present study either. Future studies should further investigate manifestations of desensitization at high levels of violence through different indices of reactivity (self-report, SBP, DBP, MAP, and HR).

Also, real-life violence exposure in the present study did not moderate the relationships between condition and changes in self-reported state anxiety. Perhaps media violence exposure, as used in this study, is not as powerful as real-life violence exposure to induce desensitization responses in the form of self-reported psychological distress. Future research should further investigate this phenomenon of desensitization by measuring both physiological reactivity and self-reported reactions to media and/or real-life violence. Additionally, real-life violence did not moderate the relationship between condition and changes in HR, which indicates that HR reactivity is controlled by different mechanisms than those that control blood pressure. This finding is supported by the positive correlations among SBP, DBP, and MAP during the movie period, but lack of associations of these variables with HR. It is also supported by the findings that physiological reactivity, when analyzed by the mixed procedure at the level of individual person and movie, showed significant condition differences on SBP, DBP, and MAP, but not HR, as well as significant movie differences on HR but not SBP, DBP, or MAP. Finally, when correlations were computed between emotional ratings and physiological responses for each movie viewed by each individual (see Table 7), HR was positively correlated with distress, engagement, and alertness, but not fear or anxiety, which were correlated with
SBP, DBP, and MAP. Thus, HR also appears to be related to different self-reported emotions than SBP, DBP, and MAP.

These differences may be attributed to the fact that the myocardium (heart muscle tissue) and vasculature (blood vessels located throughout the body) have different types of adrenergic receptors, as well as different mechanisms of action of neurotransmitters based on receptor type (Obrist, 1981). Alpha-receptors are found only in the vasculature and initiate vasoconstriction (narrowing of the blood vessels) when stimulated. Beta-receptors, on the other hand, are located in both the vasculature and the myocardium, and increase the frequency and force of HR in the myocardium and induce vasodilation (widening of the blood vessels) in both the myocardium and the vasculature. In addition to different receptor types on each structure, two different neurotransmitters affect each structure differently based on their receptor types (Obrist, 1981). These neurotransmitters are norepinephrine and epinephrine, which are released from the adrenal medulla upon activation of the sympathetic nervous system (Piazza, Almeida, Dmitrieva, & Klein, 2010). Norepinephrine serves as a beta agonist in the myocardium, yet it serves as an alpha agonist in the vasculature. Epinephrine, like norepinephrine, acts as a beta agonist in the myocardium, but it serves as both an alpha and beta agonist in the vasculature (depending on the location in the vasculature; Obrist, 1981). Thus, it is possible that the different receptors found in the myocardium vs. the vasculature, as well as the different effects of each neurotransmitter on each structure, may explain the differential relationships of HR vs. BP indices with different emotions.

Real-life violence exposure, which is a form of stress, likely activates the sympathetic nervous system, which then induces the release of norepinephrine and epinephrine.
This sympathetic activation typically increases HR and BP in response to a stressor (Pi-azza et al., 2010). Yet, while epinephrine and norepinephrine can affect HR, the para-sympathetic nervous system exerts partial control over HR as well (Tank et al., 2007), which may counteract any effects of epinephrine and norepinephrine, since the parasympathetic nervous system tends to decrease HR (Wright & Kirby, 2003) and BP (Bear, Connors, & Paradiso, 2007).

To apply these relationships to the present study, we revisit the findings that participants with high levels of real-life violence exposure showed lower reactivity (on SBP, DBP, and MAP) in the violent condition, yet higher reactivity in the nonviolent condition, in comparison to participants who experienced less real-life violence. The opposite pattern of findings emerged for changes in SBP, DBP, and MAP in participants exposed to low levels of real-life violence. As such, it appears that the participants exposed to low levels of violence exposure displayed reactivity that one would typically expect: Sympathetic activity upon exposure to the violent condition (the hypothesized stressor), and parasympathetic activity upon exposure to the nonviolent condition. However, participants with high levels of real-life violence showed the opposite pattern of reactivity: Parasympathetic activation upon exposure to the violent condition and sympathetic activation upon exposure to the nonviolent condition. Desensitization, therefore, may involve either inhibition of the release of epinephrine or norepinephrine in response to presented violence, or blunted reactivity to epinephrine and norepinephrine in target receptors in the vasculature, among individuals with high previous exposure to real-life violence.

Yet, it is unclear why these patterns of activation did not replicate for HR. It is possible that HR was under greater parasympathetic control than sympathetic control, and
was therefore less sensitive to the effects of epinephrine and norepinephrine to increase HR. It is also possible that the neurobiological processes underlying desensitization induced by high levels of violence exposure may affect the vasculature but not the myocardium, and in turn dampen blood pressure, but not HR. Future studies should investigate the role of desensitization in the differential reactivity of HR and BP indices to stressful stimuli.

Several studies provide additional insights into the role of norepinephrine and epinephrine (and the sympathetic nervous system) in cardiovascular and emotional responses to negative stimuli. In a sample of 26 male undergraduates who watched emotion-inducing film clips, administration of epinephrine led to more intense fear reactions after watching fear-inducing clips, but not to more positive emotions in response to positively-valenced clips, compared to control participants (Mezzacappa, Katkin, & Palmer, 1999). These findings suggest that the release of epinephrine is associated with more enhanced negative emotional reactions to film stimuli. In another study of young adults, those who were administered norepinephrine showed greater amygdala activity in response to negative facial emotion and lower amygdala activity in response to positive facial emotion, in comparison to control participants (Kurkolja et al., 2008). Although this finding suggests that norepinephrine plays a role in mediating negative emotion, this effect was strongest when cortisol was administered along with norepinephrine (Kurkolja et al., 2008). Thus, other neurochemicals may be involved in emotional modulation. Finally, in a sample of college undergraduates, those who performed a negatively-valenced verbal recall task showed higher SBP increases compared to those performing a positively-valenced verbal
recall task (Neumann & Waldstein, 2001), suggesting that negative emotion is related to increases in SBP.

Thus, these studies indicate that the release of epinephrine and norepinephrine are associated with more intense negative emotional experiences. Yet, the first two studies only examined externally-administered levels of these neurotransmitters; thus their results may not generalize to the present study. Nonetheless, with respect to our findings on desensitization, it is possible that those with lower levels of real-life violence exposure may release more epinephrine and norepinephrine (or be more susceptible to their effects) while watching violent media clips. As suggested by Neumann and Waldstein’s (2001) findings of increased SBP in response to negatively-valenced stimuli, the negative valence of the violent clips may explain the increased SBP, DBP, and MAP in students with low levels of real-life violence exposure. By contrast, it is perhaps more likely that those with higher levels of real-life violence exposure may release less epinephrine and norepinephrine in response to the violent movie stimuli, or be less responsive to those neurotransmitters, due to desensitization. Future research is needed to more thoroughly elucidate the relationship between emotions and cardiovascular reactivity, and whether or not they are mediated through the release of these neurotransmitters.

While media violence exposure did not moderate the relationships between condition and changes in any dependent variable below the p<.05 level, the moderating effect for changes in DBP approached significance (p<.10). This suggests that the present study did not have sufficient power to detect these smaller effects as statistically significant, and replication with a larger sample size would be helpful in future research. At this time, this finding suggests the possibility that exposure to media violence may also desensitize
frequent viewers to the physiological arousal that is typical in less frequent viewers of media violence. However, media violence exposure appears to be less powerful in desensitizing individuals to violence compared to violence experienced in real life. Nonetheless, the indication that media violence could desensitize viewers to subsequent portrayals of violence in the media is alarming, given the high levels of exposure to media violence among adolescents and young adults. Clearly, these effects warrant further examination for both short- and long-term outcomes.

Implications

The results of this study have implications for how young adults are affected by media violence. Perhaps the most important implication stems from the finding that the media violence manipulation led to greater changes in state anxiety. It is unknown how regular exposures to media violence may affect anxiety in adolescents over time. In younger populations, greater exposure to real-life violence has been linked to lower concentration levels due to unwanted thoughts about violent events, which impede academic performance (Cooley-Strickland et al., 2009). Thus, it is possible that with regular exposure to media violence, college students may repeatedly experience increased state anxiety, which may lead to disruptions in their concentration over time and negatively affect their academic performance. Although no conclusions can be drawn regarding the long-term consequences of this increased state anxiety, regular exposure to violent media may lead to increasingly higher levels of anxiety and other problems. However, individuals may also habituate to visual displays of violence and experience emotional numbing. Future research should investigate the long-term anxiety-related consequences associated
with regular exposure to media violence among college students, in order to better understand its long-term effects. However, as previously noted, the findings for anxiety may be biased by the non-normal distribution of state anxiety change scores. When analyses were conducted using a transformed post-test anxiety variable that corrected for this non-normality, violent condition only marginally predicted state anxiety (p<.10), thus revealing only a trend toward increased state anxiety upon exposure. Thus, more research and replication of these findings is needed to provide more definite recommendations.

Other important implications are based on the finding that exposure to violence appears to affect cardiovascular functioning, both at rest and in response to media violence. Specifically, those exposed to high levels of real-life violence had higher levels of resting SBP and MAP compared to individuals who had experienced lower levels of exposure. The differences were not of a large magnitude, but the participants were still in early stages of their life. It is likely that over time, chronic exposure to violence may lead to chronically elevated blood pressure and clinical hypertension, which is linked to more negative health outcomes long-term (Bear, Connors, & Paradiso, 2007). The lowered BP in response to violent movies in these individuals, a likely indicator of physiological desensitization to violence, may also pose problems for these individuals. Although desensitization may function as an adaptive coping mechanism for these individuals, it may also prevent them from intervening when violence takes place. Thus, it may lead to greater tolerance of violence as a mode of conflict resolution, which may promote the use of aggressive behavior in the future (Ng-Mak et al., 2004) and pose a threat to public safety in the long-term. As such, practitioners working with these young adults should emphasize the negative impact of involvement in violence, such that young adults can
relate to those impacts and re-assess the consequences of violence (e.g., it can negatively affect the well-being of families, it can make life difficult for one’s family if he/she were incarcerated for committing a violent act, etc.). Regardless, the long-term effects of such desensitization clearly deserve further investigation.

Because the media violence manipulation in the present study significantly affected state anxiety, but not physiological responses, it is possible that frequent exposure to media violence, in conjunction with high levels of real-life violence exposure, could exacerbate the desensitization effects previously discussed. In fact, the positive correlation between real-life violence exposure and media violence exposure suggests that the two exposures do co-occur. Therefore, future studies should examine more comprehensively how violence experienced in one context (real-life or media) affects responses to violence in the other context. Results from this study and other investigations examining different contexts of real-life violence (e.g., Mrug & Windle, 2010) suggest that exposure in one context may produce desensitization to the effects of violence in other contexts. Although the long-term effects of desensitization are not entirely clear, it is advisable for practitioners to encourage adolescents and their parents to moderate exposure to media violence in order to minimize increases in state anxiety and desensitization.

Limitations and Future Directions

In spite of its interesting findings, the limitations of this study must be acknowledged. Because the study involved several questionnaires, participant fatigue may have been an issue in some cases and may have decreased the validity of some of the responses. Additionally, because the post-test state anxiety questionnaire directly followed the
series of violent and nonviolent movie clips, participants may have inferred that the study was testing whether their reactions differed from the pre-test questionnaire. Thus, the findings for state anxiety may have suffered from a social desirability bias, in that the participants may have answered the post-test state anxiety questionnaire in a way they thought was expected by the research team. This explanation may be likely given the discrepancy between the results for self-reported anxiety and physiological reactivity, and the fact that participants are more capable of introducing bias into self-report measures than into physiological measures (Ray, McRae, Ochsner, & Gross, 2010; van de Mortel, 2008), such as heart rate or blood pressure.

Additionally, this study only examined the short-term consequences of media violence exposure, which cannot reveal any conclusion about long-term consequences. The manipulation used was also fairly mild in nature, exposing participants to only 11.5 minutes of violence. Had the exposure lasted longer, its effects on anxiety and physiological functioning may have been stronger. It is also important to note that this manipulation was comprised of isolated clips from unrelated movies, an exposure that differs from individuals’ typical movie-watching experiences, during which they watch a movie continuously from start to finish. Thus, the disjointed way in which the diverse clips were presented may have misrepresented the true effects of media violence on anxiety and physiological reactivity. Future studies should replicate this study using movie clips that are more typical of young adults’ movie-watching experiences, such as using a longer clip from a single movie.

Finally, because the sample consisted of mostly Caucasian and African American young adults in college, these results may not generalize to young adults of different rac-
es or ethnicities, or to young adults who are not enrolled in college. Additionally, some students may be more prone to anxiety than others, which we did not measure in this study. Future research should seek to replicate these results in other young adult subgroups, as well as account for overall proneness to anxiety.

Despite these limitations, this study yielded some valuable findings. Overall, exposure to violent movie clips produced medium increases in state anxiety among young adults. Additionally, young adults who reported high levels of real-life violence exposure appear to become desensitized to the effects of violent movies, as shown by their lower SBP, DBP, and MAP in response to violent movie clips, compared to those with low levels of real-life violence exposure. These findings suggest that young adults with a history of low violence exposure may be more vulnerable to the negative effects of media violence exposure, while young adults with a history of high violence exposure may be more accepting of violence in the future, which may contribute to more violent behavior and further exposure to violence and its negative effects.
LIST OF REFERENCES


APPENDIX

IRB APPROVAL FORM

UAB's Institutional Review Boards for Human Use (IRBs) have an approved Federalwide Assurance with the Office for Human Research Protections (OHRP). The Assurance number is FWA00005960 and it expires on August 29, 2016. The UAB IRBs are also in compliance with 21 CFR Parts 50 and 56.

Principal Investigator: MADAN, ANJANA
Co-Investigator(s):
Protocol Number: X101025004
Protocol Title: Effects of Media Exposure on Behavior and Physiology

The IRB reviewed and approved the above named project on 9-27-11. The review was conducted in accordance with UAB's Assurance of Compliance approved by the Department of Health and Human Services. This Project will be subject to Annual continuing review as provided in that Assurance.

This project received EXPEDITED review.
IRB Approval Date: 9-27-11
Date IRB Approval Issued: 9-27-11

Marilyn Doss, M.A.
Vice Chair of the Institutional Review Board for Human Use (IRB)

Investigators please note:

The IRB approved consent form used in the study must contain the IRB approval date and expiration date.

IRB approval is given for one year unless otherwise noted. For projects subject to annual review research activities may not continue past the one year anniversary of the IRB approval date.

Any modifications in the study methodology, protocol and/or consent form must be submitted for review and approval to the IRB prior to implementation.

Adverse Events and/or unanticipated risks to subjects or others at UAB or other participating institutions must be reported promptly to the IRB.