Published in final edited form as:

J Youth Adolesc. 2015 May ; 44(5): 1092–1108. doi:10.1007/s10964-014-0202-z.

Emotional and Physiological Desensitization to Real-Life and Movie Violence

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Abstract

Youth are exposed to large amounts of violence in real life and media, which may lead to desensitization. Given evidence of curvilinear associations between exposure to violence and emotional distress, we examined linear and curvilinear associations of exposure to real-life and movie violence with PTSD symptoms, empathy, and physiological arousal, as well emotional and physiological reactivity to movie violence. College students ($N=209$; mean age=18.74) reported on their exposure to real-life and televised violence, PTSD symptoms, and empathy. Then, students were randomly assigned to view a series of violent or nonviolent high-action movie scenes, providing ratings of emotional distress after each clip. Blood pressure was measured at rest and during video viewing. Results showed that with increasing exposure to real-life violence, youth reported more PTSD symptoms and greater identification with fictional characters. Cognitive and emotional empathy increased from low to medium levels of exposure to violence, but declined at higher levels. For males, exposure to higher levels of real-life violence was associated with diminishing (vs. increasing) emotional distress when viewing violent videos.

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Author Contributions

SM designed the study, performed statistical analyses, and drafted the manuscript; AM designed the study, coordinated data collection, and contributed to manuscript revisions; EC contributed to study design, data analyses and manuscript revisions; RW provided guidance on study design, use of equipment for data collection, and manuscript revisions. All authors read and approved the final manuscript.

Exposure to televised violence was generally unrelated to emotional functioning. However, those with medium levels of exposure to TV/movie violence experienced lower elevations of blood pressure when viewing violent videos compared to those with low exposure, and those with higher levels of exposure evidenced rapid increase in blood pressure that quickly declined over time. The results point to diminished empathy and reduced emotional reactivity to violence as key aspects of desensitization to real-life violence, and more limited evidence of physiological desensitization to movie violence among those exposed to high levels of televised violence.

Keywords

violence; desensitization; emotion; physiological

Introduction

Adolescents and emerging adults in the U.S. are exposed to large amounts of interpersonal violence, typically defined as the intentional use of threatened or actual physical force against another person that could or does result in injury, death or psychological harm. By age 15, over 50 to 70% of youth report witnessing real-life violence or being assaulted in their lifetime, with rates varying based on the types of violence measured (Cisler et al. 2012; Finkelhor et al. 2013). Most youth also experience violence through media, including television, movies and video games. For instance, the average 18-year old observes approximately 6,000 acts of violence on television and in movies in one year (Browne and Hamilton-Giachritsis 2005; Center for Research Excellence 2009).

Although exposure to violence is a cause for concern across all stages of youth development, this study focuses on late adolescents and emerging adults (ages 18-22) and their exposure to violence in the community and passive media (television and movies). This age group may be at a greater risk for the negative effects of exposure to these types of violence than younger youth, because they are more likely to experience community violence and more severe types of real-life violence (e.g., involving weapons or resulting in injury) (Finkelhor et al. 2013). In addition, older youth spend more time watching movies and television overall and the programs they watch are substantially more violent than those watched by younger adolescents (Center for Research Excellence 2009). Although more mature than younger youth, older adolescents and emerging adults are still vulnerable to negative influences (such as exposure to violence) due to ongoing developmental processes (e.g., brain maturation, identity formation, normative changes in relationships with parents and peers), as well as the instability that accompanies the transition from high school to college or work (Arnett 2000; Bennett and Baird 2006). Indeed, meta-analyses show that psychological functioning of late adolescents is more strongly related to community and media violence compared to younger and/or older age groups (Fischer et al. 2011; Fowler et al. 2009).

The negative influences of exposure to violence on youth have been widely studied. In particular, there is evidence that exposure to both real-life and media violence increases aggressive and antisocial behavior (Bushman and Huesmann 2001; Huesmann et al. 2003;

Fowler et al. 2009). However, it should be noted that the causal role of media violence in aggression remains controversial, as some studies suggest that the effects of media violence are often inflated by methodological problems, such as poor measurement and failure to control for confounding variables, and that the effects on actual aggressive and violent behavior are too small to be of practical significance (Ferguson and Kilburn 2009; Savage and Yancey 2008). Accordingly, when exposures to media and community violence were compared in a single study of older adolescents, violence in the community was more strongly related to aggression than violent media (Boxer et al. 2009). Nevertheless, both types of exposure to violence are thought to stimulate aggressive behavior through the same social-cognitive and behavioral mechanisms, such as observational learning, adoption of pro-violent beliefs and attitudes, and priming of aggressive behavior (Bradshaw et al. 2009; Huesmann 2007).

Another, less studied mechanism through which exposure to violence may increase violent behavior is emotional and physiological desensitization to violence, defined as diminished emotional and physiological reactivity following repeated encounters with violence (Fanti and Avraamides 2011). Although emotional and physiological desensitization is likely adaptive for preserving normal functioning among youth faced with overwhelming levels of violence, over time it may contribute to more violent behavior, greater tolerance of violence, and impaired interpersonal relationships (Bushman and Anderson 2009; Engelhardt et al. 2011). Desensitization has been studied primarily as a consequence of exposure to violent video games (e.g., Anderson et al. 2010; Carnagey et al. 2007), so less is known about desensitization to violence encountered in real life or on television and in movies. Despite the many commonalities between real-life and media violence and their effects on adjustment, these two types of exposure to violence rarely have been studied together. Thus, this study examines emotional and physiological desensitization to both real-life and televised violence among late adolescents and emerging adults.

Exposure to Violence and Internalizing Problems

In general, exposure to real-life violence in youth is associated with elevated internalizing symptoms, but the associations are weaker compared to links with externalizing problems and are less consistent across studies (Fowler et al. 2009). Emotional desensitization has been offered as a possible explanation for these weaker and inconsistent findings (e.g., Farrel and Bruce 1997). In fact, several studies investigated and found curvilinear relationships between exposure to community violence and internalizing symptoms that are consistent with the desensitization hypothesis (Gaylord-Harden et al. 2011; Ng-Mak et al. 2004; Mrug et al. 2008). These studies found the same pattern across three different samples of early adolescents (mean ages 12-13): depressive symptoms increased between low and medium levels of exposure to violence, but declined at high levels of exposure, likely reflecting emotional desensitization. By contrast, mixed findings have been reported for anxiety symptoms. One study found a quadratic pattern similar to depression (Mrug et al. 2008), but another study with a smaller sample found no quadratic effects, only a positive linear relationship between exposure to community violence and anxiety (Gaylord-Harden et al. 2011). Although gender differences were not investigated in these aforementioned studies, another investigation found the quadratic effect of community violence on a specific

type of anxiety (PTSD symptoms) among adolescent females, but not males (McCart et al. 2007). The authors speculated that the lower levels of PTSD symptoms among females exposed to high levels of community violence may not reflect desensitization, but perhaps greater access to certain protective factors by females, such as emotional support from parents. The youth studied by McCart et al. were also somewhat older (mean age 14) compared to the other studies, so the results could also reflect developmental differences. It is possible that emotional desensitization is more likely to occur among younger adolescents who may have fewer coping resources.

Surprisingly little research has examined internalizing problems in relationship to television or movie violence. In one study, children and adolescents (age 7-15) who spent more time watching television reported more PTSD symptoms, even after accounting for exposure to real-life violence (Singer et al. 2004). Although this cross-sectional finding could reflect a role of TV violence in trauma symptoms, it could also be explained by traumatized youth spending more time watching TV. Although significant, the effect of TV time also was substantially smaller compared to the effects of real-life violence, suggesting that any possible effects of TV violence on internalizing problems are likely very small. However, this study did not evaluate any possible emotional desensitization effects (e.g., through quadratic relationships).

Nevertheless, several studies suggest that emotional desensitization to televised violence occurs both in the short-term (e.g., over several viewing sessions) as well as long-term. In one experimental study, male college students reported increased depressive and anxiety symptoms after watching a violent movie, but these negative emotional reactions diminished after several days of repeated exposure to violent movies (Linz et al. 1988); females were not included in this study. Similarly, children (8-12 years) who frequently watched television reported feeling less frightened and worried about television violence (van der Molen and Bushman 2008), which could reflect long-term emotional desensitization, but also a self-selection of less anxious children into more frequent TV viewing. Thus, the evidence for emotional desensitization following exposure to televised violence is very limited, and more research on this topic is needed.

Exposure to Violence and Empathy

Empathy refers to individuals' ability to understand the mental states of others and includes both cognitive and emotional processes. The cognitive dimension of empathy centers on understanding of others' behavior and emotions (i.e., perspective taking); the emotional dimension refers to one's ability to experience others' emotional states (i.e., emotional empathy) (Smith 2006). Despite the common assumption that exposure to real-life violence dulls empathy for others (e.g., Farrell and Bruce 1997), direct evidence for such effects of exposure to real-life violence is very limited. Early studies of young children (ages 1-5) exposed to child abuse, neglect, and domestic violence documented the children's lower levels of empathy (Hinchey and Gavelek 1982; Main and George 1985), but a more recent investigation found no association between childhood (age 6-12) exposure to domestic violence and empathy in adolescence (mean age 14) (McCloskey and Lichter 2003). Similarly, exposure to community violence was not related to empathy in several studies of

children and adolescents, with mean ages ranging from 10 to 17 (Funk et al. 2004; Sams and Truscott 2004; Su et al. 2010), although two of these three investigations were limited by small samples and generally low levels of exposure to violence experienced by the participants. Together, these findings suggest that, among school-aged children and adolescents, exposure to community (or family) violence bears no relationship to empathy. Another possibility, which has not yet been empirically investigated, is that there may be a curvilinear (e.g., quadratic) relationship between exposure to violence and empathy. Perhaps exposure to a limited amount of violence increases one's empathy, but repeated exposure to violence decreases empathy as a part of the desensitization process.

Stronger evidence links diminished empathy with exposure to movie violence. Viewing sexually violent movies led to less empathy for victims of violence several days later in experimental studies with male college students (Linz et al. 1988; Mullin and Linz 1995). Longer-term effects have also been suggested, with 12-14-year old adolescents' exposure to media violence predicting lower levels of empathy one year later (Krahe and Moller 2010). Experimental and field studies also documented less helping behavior following exposure to movie violence, which could reflect decreased empathy (although empathy was not measured directly in these studies). For instance, 9-11-year old children randomly assigned to watch a violent video took longer to seek help for a (staged) fight among other children, compared to peers watching a nonviolent video (Drabman and Thomas 1976; Molitor and Hirsch 1994). Similarly, adults who just watched a violent film at the movie theatre took longer to help an injured individual than those who watched a nonviolent film or those arriving to see either type of movie (Bushman and Anderson 2009). A correlational study that measured self-reported empathy among 10-year old children found that it correlated negatively with exposure to movie violence, but was not uniquely predicted by movie violence once other types of violence were included in the model (videogame, TV, and real-life violence; Funk et al. 2004).

No studies have tested possible curvilinear relationship between long-term exposure to movie violence and empathy. However, a quadratic relationship has been demonstrated in the short-term: As college students watched nine 2-minute violent scenes, their sympathy for the victims increased and then decreased to below initial levels (Fanti et al. 2009). This finding was interpreted by the authors as evidence for desensitization to violence. Thus, curvilinear effects of movie violence on empathy warrant further investigation. Additionally, previous studies of both real-life and media violence have focused exclusively on emotional empathy, so possible effects of violence on cognitive empathy remain to be determined. As a highly emotionally distressing experience, it is possible that violence has stronger effects on emotional than cognitive aspects of functioning. Thus, high levels of exposure to violence, both in real-life and media, may be more likely to produce desensitization in emotional identification with others than in more cognitive perspective taking.

Exposure to Violence and Physiological Functioning

As a disturbing and stressful experience, exposure to violence is assumed to stimulate the physiological stress response (Kliewer, 2006), which involves two physiological processes: 1) Activation of the HPA-axis that leads to increased secretion of the hormone cortisol; and

2) activation of the sympathetic and adrenomedullary systems, which results in increased blood pressure (de Kloet et al. 2005). Thus, acute exposure to violence should produce short-term increases in both cortisol and blood pressure. With chronic stress, the repeated activation of the physiological stress response may lead to long-term increases in baseline levels of cortisol and blood pressure, which in turn contribute to various physiological and psychological problems, such as hypertension, depression, and learning deficits (Coughlin 2011; Lupien et al. 2009). Both animal and human studies suggest that the physiological effects of stress are greater and longer-lasting during adolescence than adulthood (Lupien et al. 2009), supporting the importance of studying the physiological effects of exposure to violence during the adolescent period.

As expected, adolescents exposed to violence in their communities had higher resting blood pressure and cortisol levels (Murali and Chen 2005; Wilson et al. 2002), and children (age 5 to 13) exposed to marital violence had increased salivary cortisol (Saltzman et al. 2005) than their peers without chronic exposure to community or domestic violence. However, other studies found *lower* resting blood pressure (Cooley-Quille and Lorion 1999; Krenichyn et al. 2001) and cortisol levels (Kliewer 2006) among youth exposed to higher levels of violence. Interestingly, these latter studies sampled youth from more disadvantaged, higher crime urban areas than the former studies, suggesting that very high levels of exposure to violence and related stressors may be associated with chronically low levels of the physiological stress system activation, perhaps due to physiological desensitization. Thus, a nonlinear relationship between exposure to violence and baseline physiological functioning may exist, but this possibility has not been studied. However, the discrepancies could also be explained by other methodological differences among the studies or the presence of different, unmeasured moderating factors in each sample. Although gender differences have not been investigated in most of these studies, Kliewer (2006) found that witnessing community violence was associated with lower blood pressure in boys but not girls. She speculated that boys may be more affected by exposure to violence because they have lower access to internal and external coping resources than girls.

Besides altering baseline physiological functioning, exposure to chronic stress may also affect short-term reactivity to acute stress (Coughlin 2011). Studies examining physiological responses to acute stress generally have found lower physiological reactivity among youth exposed to real-life violence. For instance, higher exposure to real-life violence was associated with lower blood pressure increase among diverse samples of children and adolescents (mean ages 11 and 16; Clark et al. 2006; Murali and Chen 2005). Similarly, youth (mean age 11) exposed to high levels of community violence had lower cortisol elevations after watching a violent video (Kliewer 2006). However, others have found no differences in heart rate reactivity between youth with high vs. low exposure to community violence when watching violent video clips, although neither blood pressure or cortisol were measured in this study (Cooley-Quille et al. 2001). Thus, more research may be needed to examine the links between exposure to violence and physiological reactivity.

Studies of movie violence have focused primarily on physiological reactivity rather than resting levels of physiological variables, perhaps reflecting the assumption that media violence would have only short-term but not long-term effects on physiological functioning.

The findings generally show associations between exposure to movie violence and diminished physiological reactivity to violent videos, as reviewed in detail below. Experimental studies demonstrated that viewing a violent movie led to lower skin conductance among children (Thomas et al. 1977) and lower heart rate among college students (Linz et al. 1989) in response to additional videotaped violence. Interestingly, these effects have not replicated among female college students in the latter study, perhaps because females may be less likely to experience physiological desensitization.

Although less studied, long-term physiological desensitization effects have also been suggested. In several older studies, children who spent more time watching television showed less physiological arousal (skin conductance and blood volume) in response to violent scenes (Cline et al. 1973; Thomas et al. 1977). These results have been interpreted as indicating physiological desensitization to violent programming, but they could also reflect self-selection of children with lower levels of physiological reactivity to heavier television viewing. In a more recent investigation, college students reporting high exposure to media violence had lower skin conductance in response to watching a violent video clip, but blood pressure or cortisol were not assessed (Krahe et al. 2011). In sum, the evidence suggests that exposure to violent media leads to short-term reductions in physiological response to televised violence, but longer-term effects on baseline physiological functioning and reactivity are understudied. Additionally, only linear effects of movie violence on physiological arousal have been tested, and gender differences have been suggested but not systematically evaluated.

Present Study

The evidence suggests that high levels of exposure to real-life and movie violence are associated with diminished emotional distress, emotional empathy, and physiological reactivity, suggesting the presence of emotional and physiological desensitization. However, some of these findings are inconsistent across studies, which could be due to methodological differences across studies, presence of different unmeasured moderators, or nonlinear effects of exposure to violence on functioning that have not been typically tested. Possible gender differences in desensitization also have gone largely unaddressed, despite some evidence for their existence. As reviewed above, one study indicated emotional desensitization (for PTSD symptoms) among females but not males (McCart et al. 2007), and two studies found physiological desensitization among males but not females (Kliewer 2006; Linz et al. 1989). Although it is difficult to draw any conclusions from these few studies, it is important to further evaluate the possibility of gender differences in different types of desensitization. Additionally, little research has focused on the relationship between exposure to violence and cognitive empathy or on the effect of movie violence on general emotional and physiological functioning.

Thus, this study examines linear and quadratic effects of exposure to real-life and movie violence on PTSD symptoms, cognitive and emotional empathy, and physiological functioning, as well as emotional and physiological reactivity to movie violence. We focus on systolic and diastolic blood pressure as measures of physiological functioning, because they represent a major system involved in the physiological response to stress and their

elevated levels are linked with substantial morbidity and mortality later in life (Coughlin 2011). Based on the literature reviewed, we hypothesize that exposure to real-life and movie violence will show quadratic relationships with PTSD symptoms, empathy, baseline blood pressure and emotional and physiological reactivity, so that PTSD symptoms, empathy, and baseline blood pressure, as well as emotional and physiological reactivity, will peak at moderate levels of exposure but show reductions at high levels. Gender differences in all effects will be explored, but due to the paucity of research on this topic no directional hypotheses are offered.

Methods

Participants

Participants were college students recruited from introductory psychology classes at a mid-sized public university located in a metropolitan area in the Southeastern U.S. The study was approved by the university institutional review board. The sample consisted of 209 students (mean age 18.74, SD .91, range 18-22 years old) and included 75% female and 25% males. The sample was racially/ethnically diverse with 50% Caucasian, 34% African American, 9% Asian, 3% Hispanic, and 3% other race/ethnicity students.

Measures

Exposure to real-life violence—The Community Experiences Questionnaire (Schwartz and Proctor 2000) assessed lifetime exposure to violence. The measure includes 14 items assessing witnessing violence (e.g., “How many times have you seen somebody else get hit, punched, or slapped?”) and 11 items assessing victimization (e.g., “How many times has somebody broken in or tried to force their way into your home?”). Items were rated from 0 (never) to 3 (lots of times). Factor analysis of the measure indicated the presence of a single factor, so all 25 items were summed for an overall measure of exposure to real-life violence ($\alpha=.87$).

Exposure to media violence—Exposure to media violence was measured with four items. Two items inquired about the amount of time spent watching television and movies (“How many hours per week do you spend watching TV/movies?”) and two items assessed the frequency of violent content in each medium (“How often do the TV shows/movies you watch show physical fighting, shooting, or killing?”). The first two items were rated on a six-point scale from ‘no time’ (0) to ‘15 or more hours per week’ (5). The two media violence items were rated on a scale from 1 (almost never) to 4 (almost always), or 0 (I don't engage in this activity). Consistent with other studies of media violence (Funk et al. 2004; Huesmann et al. 1984), the amount of time spent watching TV or movies was multiplied by the degree of violence reported for that medium and the two products were summed to yield an overall score of exposure to violent TV and movie content.

PTSD symptoms—The PTSD Checklist – Civilian version (Weathers et al. 1994) is a self-report measure of traumatic symptoms. The 17 items assess DSM IV diagnostic criteria for PTSD across three symptom clusters: intrusions (e.g., “Repeated, disturbing dreams of a stressful experience”), avoidance (e.g., “Avoiding activities or situations because they

reminded you of a stressful experience”), and arousal (e.g., “Feeling jumpy or easily startled”). Participants rated how much each symptom bothered them the last month on a five-point scale from 1 (not at all) to 5 (extremely). All items were averaged to yield a global measure of PTSD symptomatology ($\alpha=.87$).

Empathy—Empathy was measured with three subscales of the Interpersonal Reactivity Index, a multidimensional measure of empathy (Davis 1980). The Empathic Concern scale includes seven items that assess feelings of concern and sympathy for others in distress, or emotional empathy (e.g., “I often have tender, concerned feelings for people less fortunate than me”). The seven-item Perspective Taking scale measures the ability to understand others’ points of view, or cognitive empathy (e.g., “I believe that there are two sides to every question and try to look at them both”). Finally, the seven items on the Fantasy scale assess daydreaming and emotional identification with fictional characters in movies, books and plays (e.g., “I really get involved with the feelings of the characters in a novel”). All items were rated on a five-point scale from 1 (does not describe me well) to 5 (describes me well), reverse coded as needed, and averaged ($\alpha=.75$ for Empathic Concern, $.77$ for Perspective Taking, and $.81$ for Fantasy).

Covariates—Students reported their age, race/ethnicity (recoded to white versus non-white), and highest parental education level coded on a 6-point scale from 0 (‘Less than high school’) to 6 (‘Graduate degree’).

Materials—Five violent movie clips were selected from a pool of 14 clips based on the results of a small pilot study ($n=10$ graduate and undergraduate students). All selected clips showed the use of physical force to inflict harm to another person and were rated by the pilot participants as highly violent ($M = 4.56$, $SD = .50$, on a 1-5 scale where 1 indicated “not at all” and 5 indicated “extremely” violent). The clips came from the following movies and showed the following scenes: *Man on Fire* (2004) – shooting resulting in death and injury to multiple characters, witnessed by a young girl who grieves over one character who was shot; *Platoon* (1986) – soldiers yelling at, shoving, hitting, shooting at and ultimately killing a disabled civilian; *Precious* (2009) – two women pushing, fighting and throwing heavy objects at each other, with an infant present and in danger of being injured or killed; *Leon: The Professional* (1994) – shooting resulting in death and injury of multiple characters, witnessed by a boy; and *Saving Private Ryan* (1998) – soldiers shooting and killing each other, fist fighting, stabbing and strangling that leads to multiple deaths. The total duration of the clips was 11 minutes 34 seconds, with each clip lasting 2-3 minutes.

In addition, five nonviolent clips were selected from a pool of 11 clips using the same pilot procedures. These clips were matched with the violent clips on duration and high level of action, but they were rated by the pilot participants as not violent ($M = 1.40$, $SD = .29$). These clips came from the following movies and showed the following scenes: *Twister* (1996) – family rushing to an underground shelter during a tornado; *Crash* (2004) – man rescuing a woman from a crashed car that starts burning; *Speed* (1994) – rescue team saving people from a fast riding bus with a bomb on board; and *Castaway* (2000) – one scene showing a man trying to save himself when an airplane crashes in the ocean; another scene where a man tries to get away from an island on a handmade boat through rough waves.

Procedures—Participants were tested individually at a university laboratory. After providing written informed consent, students were left alone in a private room to answer demographic questions and complete computer questionnaires assessing exposure to real-life and media violence, PTSD symptoms, and empathy. Sensors for cardiovascular monitoring were then attached and participants were instructed to sit quietly for 10 minutes while baseline measures were taken. After this baseline period, randomly selected half of the participants ($n=104$) watched the series of five violent video clips, which were presented in random order. The other half of the sample ($n=105$) watched the five nonviolent clips, also presented in random order. Immediately after viewing each clip, participants rated how anxious, distressed, and fearful they felt while watching the last movie clip, with the questions presented in random order. Responses could range from 0 (not at all) to 4 (extremely) and were highly intercorrelated across the three questions ($r = .76 - .80, p < .001$). Thus, the three questions were averaged for a single measure of emotional distress ($\alpha = .91$). At the end of the session, participants watched a neutral video clip to dispel any negative effects of the violent videos and were debriefed and dismissed.

Cardiovascular Measurement—Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were measured with a Medwave Fusion monitor. A wrist cuff was situated on participants' left wrist, with a sensor located over the radial artery measuring radial pulse amplitude. SBP and DBP were estimated based on pulse wave-form properties. Measurements were taken every 30 sec throughout baseline and video clip presentation. Baseline measures were computed by averaging readings during the last 2 minutes of the 10-minute baseline period. Measures from the first 8 minutes of the resting period are typically not used because blood pressure is still declining to a true resting level (Wright et al. 2012). Blood pressure during each of the five video clips was computed as the average of all readings taken during viewing of that clip. Baseline values were subtracted from these averages to yield reactivity scores for each measure.

Data Analysis—Univariate distributions of all variables were examined; four univariate outliers were truncated to 3.5 SD above the mean. Exposures to real-life and media violence were positively skewed; they were normalized by square root transformations prior to subsequent analyses. Bivariate associations among variables were examined with correlations and t-tests. SBP and DBP were very highly correlated ($r = .94, p < .001$), thus only SBP was analyzed further. The effects of real-life and media violence on PTSD symptoms, empathy and baseline SBP were tested with hierarchical multiple regressions. The full sample ($N=209$) was used to maximize power. Of the covariates, parental education was unrelated to any other variables, and thus only gender and race/ethnicity were entered at Step 1. At Step 2, we added exposure to real-life violence and exposure to media violence (both centered at zero) and their squares (to assess quadratic effects); linear and quadratic effects were entered together because they were considered equally important. Analyzing both types of violence in the same model controlled for their overlap ($r = .25, p < .001$) and reduced the number of analyses. At Step 3, we entered interactions of gender with both main and squared effects of real-life and media violence; these interactions tested whether the linear and quadratic relationships between exposure to violence and outcomes varied by gender.

Emotional and physiological responses to the violent videos were evaluated for the 104 participants randomly assigned to the violent movie condition. There were two outcome variables: self-reported emotional distress and changes in SBP from baseline. Because emotional distress and SBP change were assessed separately for each of the five clips, each participant had five separate observations for each outcome. To model the observations as nested within participants and dependent on time (clip number), multilevel modeling using SAS 9.3 PROC MIXED was conducted. The multilevel models estimated the intercept (level of emotional distress or SBP change from baseline during the middle clip) and slope (average change in emotional distress or SBP from one clip to the next) for each participant. The individual estimates of intercept and slope were then modeled as a function of covariates to explain interindividual variability in individuals' responses to the violent videos. In Step 1, we entered gender and race/ethnicity as predictors of intercepts. Baseline (resting) SBP was also included for the analyses of SBP change, because the amount of change partly depends on baseline level. At Step 2, exposure to real-life violence and exposure to media violence and their squares (to assess quadratic effects) were entered as predictors of the intercept and slope. These terms are entered in the model as main effects (predicting intercept) and interactions with clip (predicting slopes). In parallel with the multiple regressions, linear and quadratic effects were included in the same step because they were of equal theoretical importance. At Step 3, gender differences in the effects of exposure to violence on the outcomes were tested by adding interactions of gender with clip and each term from Step 2. All predictor variables were centered at zero to facilitate the interpretation of coefficients. To evaluate whether reactivity effects related to exposure to violence were specific to violent video content, the same multilevel analyses were conducted for the 105 participants randomized to watch the nonviolent clips.

Results

Preliminary Analyses

Descriptive statistics and correlations of all variables are presented in Table 1. On average, participants reported the equivalent of experiencing 16 different acts of violence once or 8 different types several times; and 10 hours a week of TV and movies with some violent content. The average level of PTSD symptoms was low (below 'little bit' for each symptom). Average levels of empathic concern, perspective taking and fantasy were above the midpoint of the scale, indicating that participants felt that the items described them well. Females reported lower levels of exposure to real-life violence than males ($M = 14.35$ vs. 19.62 , $t = -3.87$, $p < .001$) and higher levels of emotional empathy ($M = 4.10$ vs. 3.84 , $t = 2.78$, $p < .01$), but did not differ on any other variables ($p > .05$). Compared to non-Hispanic Caucasian participants, racial/ethnic minority individuals had higher baseline diastolic blood pressure ($M = 64.77$ vs. 61.92 , $t = 2.06$, $p < .05$), but no other racial/ethnic differences emerged ($p > .05$). Exposure to real-life violence was associated with greater exposure to TV/movie violence, PTSD symptoms, perspective taking, and fantasy. Exposure to media violence was associated with greater perspective taking. PTSD symptoms were related to higher fantasy. Empathic concern, perspective taking, and fantasy were weakly positively related.

Exposure to Violence and PTSD Symptoms, Empathy and Baseline Blood Pressure

The results of multiple regressions evaluating linear and quadratic effects of exposure to real-life and media violence on PTSD symptoms, empathy and baseline SBP are listed in Table 2. At Step 1, female gender was associated with greater empathic concern and fantasy. After adjusting for demographic variables, exposure to real-life violence showed positive linear associations with PTSD symptoms and fantasy and negative quadratic associations with empathic concern and perspective taking (Step 2). As shown in Figure 1, both empathy variables reached highest estimated levels among participants with medium levels of real-life violence exposure compared to those with lower or higher levels of exposure. Exposure to media violence only showed a positive linear relationship with perspective taking, but was unrelated to PTSD symptoms, emotional empathy, and fantasy. At Step 3, no interactions with gender reached significance, indicating that the associations between exposure to real-life or media violence and outcomes did not differ between males and females.

Exposure to Violence and Reactivity to Violent Scenes

Results of the multilevel models estimating the effects of exposure to violence on emotional and physiological reactivity to violent movies are presented in Table 3. At Step 1, the positive and significant intercepts indicate that during the middle clip, participants experienced moderate emotional distress (1.64 on a scale from 0 - no distress, to 3 - extreme distress) and their SBP increased by 2.32 points on average from baseline. The significant positive effects of clip for emotional distress indicates that participants experienced increasing levels of emotional distress as they watched the series of five violent movie clips, but the effect of clip was not significant for SBP, indicating no significant changes from one clip to the next (just an overall increase from baseline, as shown by the intercept). The overall increase in SBP was smaller for those with higher resting levels of SBP, as indicated by the negative effect of baseline SBP at Step 1.

At Step 2, exposure to real-life and media violence showed no linear or quadratic associations with the intercept or slope of emotional distress. For SBP, there was a positive quadratic effect of media violence on the intercept, suggesting greater overall increase in SBP for those exposed to high levels of media violence, as well as negative linear and quadratic effects of media violence on the slope, suggesting faster decrease in SBP for those exposed to high levels of movie violence throughout the viewing period. Estimated trajectories of SBP change for individuals with low, average and high levels of exposure to movie violence show the combination of these effects in Figure 2. As can be seen in the figure, individuals with average exposure to movie/TV violence experienced a small increase in blood pressure that remained stable as they watched the five violent clips. Those with low levels of exposure experienced somewhat higher initial elevation in blood pressure followed by slight increase over time. The pattern for individuals exposed to high levels of movie/TV violence was most distinct, and it was characterized by a rapid initial increase in blood pressure that was followed by a steep decline during the viewing period.

At Step 3, there were no gender differences in the effects of violence exposure on SBP. However, gender moderated the effect of real-life violence on the slope of emotional distress

during the viewing period. Figure 3 shows the estimated trajectories of distress for males and females with low vs. high levels of exposure to real-life violence. It shows that emotional distress increased with each clip for females regardless of their exposure to real-life violence, as well as for males with low levels of exposure. By contrast, emotional distress decreased with each clip for males exposed to high levels of real-life violence.

Exposure to Violence and Reactivity to Nonviolent Scenes

When the multilevel models were repeated for the participants randomized to view nonviolent videos, the only significant effects emerged in Step 1. Both intercepts were significant, indicating moderate level of emotional distress ($b=1.57$, $SE=.08$, $p<.001$) and an increase in SBP over baseline ($b=2.77$, $SE=.54$, $p<.001$) during the middle clip. Females reported higher levels of distress than males ($b=.68$, $SE=.18$, $p<.001$) and distress increased from one clip to the next ($b=.06$, $SE=.03$, $p<.05$), but there were no gender differences or time-dependent effects for SBP. No racial/ethnic differences emerged. At Steps 2 and 3, there were no significant effects ($p<.05$) for either type of exposure, their squares, and interactions with gender.

Discussion

Theoretical accounts and limited empirical evidence suggest that repeated exposure to violence, both in real-life and through media, produces emotional and physiological desensitization characterized by diminished emotional distress and empathy, as well as reduced emotional and physiological reactivity to further violence (Krahe and Moller 2010; Krahe et al. 2011; Linz et al. 1988; Mrug et al., 2008). Over time, repeated exposure to violence is also thought to alter baseline physiological functioning, including blood pressure (Kliewer 2006). The negative effects of exposure to violence are particularly salient during adolescence (Fischer et al. 2011; Fowler et al. 2009), likely reflecting adolescents' greater exposure to more severe violence in both real-life and media (Center for Research Excellence 2009; Finkelhor et al. 2013), coupled with ongoing cognitive, emotional, and neural development that makes youth vulnerable to negative environmental influences (Arnett 2000; Bennett and Baird 2006). This study was the first to systematically evaluate multiple aspects of desensitization in relationship to both real-life and media violence experienced by late adolescents, as well as gender differences in these relationships. Because desensitization may follow a more complex curvilinear pattern (Ng-Mak et al. 2004), this study evaluated both linear and quadratic relationships between exposure to violence and functioning.

The results revealed that exposure to real-life violence had a positive linear relationship with PTSD symptoms and fantasy, but a quadratic relationship with emotional and cognitive empathy, so that empathy was the highest at medium levels of exposure but decreased at high levels of real-life violence. After adjusting for exposure to real-life violence, greater exposure to TV/movie violence was associated only with greater perspective taking. Neither type of exposure to violence was related to baseline blood pressure, and there were no gender differences in these relationships.

Viewing 11 minutes of high-action violent or nonviolent videos was associated with increased blood pressure over resting baseline, and moderate levels of emotional distress that generally increased with each successive clip. Although these general reactions did not differ between violent vs. nonviolent high action videos, previous history of exposure to real-life and movie violence was related to differential reactivity for the violent videos only. Specifically, males exposed to high levels of real-life violence exhibited decreasing emotional distress with each clip, compared to increasing distress reported by males with lower levels of exposure and females. Additionally, those with average or low exposure to movie violence had stable or increasing blood pressure while viewing the violent videos, whereas those with higher exposure to movie violence experienced rapid increase in blood pressure followed by decrease. Taken together, these results support the hypothesis that high levels of exposure to real-life violence are related to diminished empathy and, for males only, decreasing emotional distress in response to viewing violence. Those exposed to high levels of TV/movie violence showed no evidence of emotional desensitization, but their blood pressure reaction to violent video clips included high initial arousal followed by quick habituation, which could reflect physiological desensitization to televised violence.

Exposure to Real-Life Violence

A novel contribution to the literature on youth exposed to real-life violence is the demonstration of curvilinear relationships between exposure to violence and empathy. Although the magnitude of this effect was small to medium sized, it replicated across both cognitive and emotional facets of empathy. Prior studies have only evaluated linear relationships between exposure to violence and empathy, and did not find any evidence of such linear relationships among older children and adolescents (Funk et al. 2004; McCloskey and Lichter 2003; Sams and Truscott 2004; Su et al. 2010). Our results replicated the absence of a linear relationship, but revealed a quadratic pattern of higher empathy among youth exposed to medium levels of real-life violence compared to those with lower or higher levels. These results imply that future studies on exposure to violence and empathy should evaluate possible curvilinear relationships to replicate these findings and determine when in development such relationships appear.

The obtained quadratic pattern for empathy suggests that individuals exposed to some real-life violence may have better ability to understand others and share their emotions than those not exposed to any violence, but that this ability to understand and empathize with others may deteriorate at high levels of exposure to violence. It is possible that some exposure to violence may sharpen perspective taking and empathy, because people can relate to traumatic experiences, pain and distress of others. Because limited levels of exposure to violence may be psychologically manageable, successful coping with this experience may promote empathy for others. These processes are consistent with the concept of “stress inoculation”, where limited exposure to stress bolsters coping and promotes resilience (Garnezy 1991; Meichenbaum 2007; Rutter 1993). This hypothesis should be further explored in the literature, particularly with respect to specific characteristics of exposure to violence that may be more or less likely to foster empathy. For instance, proximity to the violence (e.g., witness or victim), frequency of exposure, the context in which the violence

occurs, and identification with the perpetrator or the victim may have different implications for the development vs. dampening of empathy.

By contrast, at high levels of exposure to real-life violence individuals report lower levels of empathy, perhaps because of interference from more severe trauma symptoms (Nietlisbach et al. 2010). Diminished empathy at high levels of exposure to violence may also serve as a protective mechanism to shield individuals from assuming more emotional and cognitive burdens than they can handle. Similarly, high levels of personal trauma may make individuals more callous and dismissive of others' experiences that may be viewed as insignificant compared to one's own. These interpretations need to take into account the levels of violence and trauma experienced by the participants. Although we sampled a nonclinical population of college students, many of them reported relatively high levels of both exposure to violence and trauma symptoms. For instance, 14% endorsed the equivalent of experiencing each of the 25 types of violence at least once (or 8 or more types lots of times), and 10% met the DSM-IV diagnostic criteria for PTSD (using algorithms described by Zatzick et al. 2010). These rates of exposure to violence and trauma symptoms are very similar to other studies with college students conducted across the U.S. (e.g., Brady 2006; Ruggiero et al. 2003), and suggest that a number of college students have been exposed to high levels of real-life violence and are experiencing significant trauma symptoms that would qualify them for a clinical diagnosis.

Interestingly, there was no indication of desensitization for anxiety, as measured with PTSD symptoms. Instead, higher levels of exposure to real-life violence were associated with more PTSD symptoms. This medium-to-large-sized relationship was the strongest effect obtained in the regression analyses. These results are consistent with other studies finding mostly linear relationships between exposure to real-life violence and anxiety among adolescents (Gaylord-Harden et al. 2011; McCart et al. 2007), as well as stronger linear effects of exposure to violence on trauma symptoms compared to more general internalizing distress (Fowler et al. 2009). It is likely that the traumatic nature of real-life violence contributes to increased intrusive thoughts, avoidance, dysphoria and anxious arousal characteristic of PTSD at high levels of exposure to violence. However, higher PTSD symptoms could also partly reflect emotional desensitization, as some PTSD items evaluate emotional detachment and restricted affect.

Detachment from one's own emotions and avoidance experienced by individuals exposed to higher levels of real-life violence may contribute to their increased tendency to daydream and identify with fictional characters, as indicated by elevated fantasy scores in this study (small to medium effect). Similar to our findings, Singer and colleagues (2004) reported moderate associations between exposure to violence and dissociation in children and young adolescents, with their dissociation scale tapping fantasy as well as overt dissociation (Briere 1996). Some of the fantasies employed by individuals exposed to high levels of violence may involve violent content, as suggested by studies linking exposure to violence with engagement in aggressive fantasies among children and adolescents (Guerra et al. 2003; Mrug et al. 2008). This escape to the fantasy world may not be entirely adaptive for young people exposed to violence, as higher fantasy scores are related to interpersonal difficulties and loneliness (Davis 1983). Thus, fantasy may serve as an avoidant coping strategy that

does not promote successful coping with experiences of real-life violence. Future research on exposure to violence should distinguish between aggressive and nonaggressive fantasies and examine their long-term consequences on adjustment.

Contrary to expectations, exposure to real-life violence was unrelated to resting levels of blood pressure. Other studies also found generally weak and nonsignificant relationships between lifetime total exposure to violence and SBP among adolescents, although the results were somewhat stronger for the dimension of frequency of exposure to violence (Murali and Chen 2005). Meta-analyses of studies with adults showed small to medium-sized association between PTSD diagnosis (vs. no trauma or no PTSD) and higher baseline SBP (Buckley and Kaloupek 2001; Pole 2007), suggesting that the effects of trauma on increased blood pressure may accumulate over time and not be reliably observed before later adulthood. Alternatively, the effects of exposure to violence on baseline blood pressure may only be apparent when comparing more extreme groups (e.g., those with PTSD diagnosis vs. those with no exposure).

The effect of exposure to real-life violence on reactivity to violent videos varied by gender and only involved emotional reactions, not changes in blood pressure. Specifically, males who had been exposed to higher levels of real-life violence reported decreasing emotional distress through the viewing period, compared to increasing distress among males exposed to lower levels of real-life violence and females regardless of their exposure history (a medium sized effect). These results are consistent with the hypothesized desensitization pattern of less emotional reactivity to violence among those with higher levels of exposure to real-life violence. One explanation for the gender difference may be a greater tendency of males to develop desensitization, perhaps because they are generally exposed to more violence than females (Finkelhor et al. 2013). This hypothesis is supported by reports of physiological desensitization among males but not females (Kliewer 2006; Linz et al. 1989), although it does not seem to extend to empathy as indicated by the lack of gender differences in our results for empathy. Another explanation may be related to the violent scenes shown in this study depicting primarily males as victims and perpetrators of violence (reflecting general gender patterns in violent movies; Smith et al. 1998). Perhaps males were more likely to identify with the same-sex victims than females (Calvert et al. 2004; Hoffner and Buchanan 2005), which may have produced desensitization effects in males only. Examining males and females' reactions to clips that vary in the gender of the victims may help shed light on this possibility. Finally, it is possible that males exposed to higher levels of real-life violence were more aware of the fictitious nature of the movie violence and therefore experienced declining distress. Clearly, more research is needed to replicate and elucidate these findings.

Exposure to Movie Violence

Exposure to movie violence was modestly positively correlated with exposure to real-life violence, consistent with other studies of older children and adolescents (Boxer et al. 2009; Funk et al. 2004). When controlling for exposure to real-life violence, higher levels of exposure to TV/movie violence were only associated with greater perspective taking (small to medium effect). To better understand this relationship, we have examined correlations

between perspective taking and the four variables that were combined to measure exposure to televised violence. Perspective taking was only related to the amount of time spent watching movies ($r = .19, p < .01$), but not to the amount of time spent watching TV or the frequency of violence in either TV or movies the participants watched (r 's = .09 to .13, $p > .05$). A similar but weaker pattern of correlations was observed for emotional empathy – the amounts of time spent viewing TV and movies were weakly correlated with higher empathy (r 's = .14, $p < .05$), whereas movie and TV violence were not (r 's = .01-.04, $p > .58$). These results suggest that watching movies (and/or television) may help individuals understand others' perspectives and sympathize with their feelings, or that people who are more empathic choose to spend more time watching movies and television.

However, exposure to movie violence was not related to PTSD symptoms, fantasy, diminished empathy or baseline blood pressure, providing no evidence of longer-term trauma or desensitization. These findings are consistent with others reporting smaller or nonsignificant effects of TV/movie violence when compared with real-life violence on older children's empathy (Funk et al. 2004) or adolescents' aggression (Boxer et al. 2009). These findings also support others' arguments that the long-term effects of TV and movie violence are of limited practical significance and public health importance (Ferguson and Kilburn 2009; Savage and Yancey 2008), at least for late adolescents and emerging adults consuming violent media within the range observed in this study. Our findings may not generalize to younger youth who may be more vulnerable and less able to distinguish between reality and fiction (Wright et al. 1994), to more extreme levels of media violence, or to violent videogames which seem to have stronger effects on aggression and empathy than the passive viewing of movie and TV violence (Anderson et al. 2010; Funk et al. 2004).

Participants reported gradually increasing emotional distress as they watched the violent movie clips, confirming the distressing nature of the movie scenes selected for use in this study. Interestingly, the same effect was observed for the nonviolent clips that showed people's lives endangered by natural phenomena (tornado, waves), or vehicle crashes (car and airplane crash, impending bus crash) but no interpersonal violence. Thus, participants' distress seemed to reflect threats to characters' lives regardless of the nature of the threats (violence or other). Similarly, moderate elevations in blood pressure were experienced by participants viewing both types of videos, which are consistent with response to stressful stimuli in a passive viewing context (Sherwood et al. 1990). Since emotional distress increased throughout the viewing period, there was no evidence of immediate desensitization. Others who found emotional desensitization to violent movies included much longer exposure, presenting full movies over 5 days (Linz et al. 1984), suggesting that our viewing period of 11 minutes was too short to produce emotional desensitization.

Previous exposure to TV/movie violence moderated blood pressure reactivity to the violent (but not to the nonviolent) videos. Specifically, high levels of previous exposure to televised violence were associated with initially high (4.5 points), but decreasing (to less than 1) blood pressure during the viewing period. In contrast, those with low previous exposure to movie violence exhibited moderate initial blood pressure increase (about 2.5) that slowly increased, and those with moderate exposure showed slight initial increase (about 1.5) that remained stable throughout the viewing time. The pattern for individuals with medium

levels of exposure was consistent with our hypothesis of desensitization, involving less physiological reactivity compared to those with low levels of exposure. However, the pattern for the highly exposed group was unexpected. The initial rapid increase in SBP might reflect excitement about watching familiar movie violence, followed by quick physiological habituation, which could reflect physiological desensitization. This pattern may represent a parallel to addiction; for instance, high frequency gamblers experience greater initial arousal than low frequency gamblers, and their arousal decreases faster during the playing period (Leary and Dickerson 1985; Sharpe 2004). As in addiction, this initial arousal may be perceived as a “high” that may motivate individuals to seek more violent media. More research is needed to characterize the physiological and psychological experiences of youth who routinely consume violent media.

Implications

Altogether, the results suggest that, for late adolescents and emerging adults, exposure to real-life violence has stronger implications for adjustment than exposure to TV/movie violence. However, exposure to real-life violence was related to emotional functioning in more complex ways than traditionally assumed. Specifically, some exposure to real-life violence was associated with higher levels of cognitive and emotional empathy than no experience with violence, suggesting that there may be some developmental benefits of experiencing limited amounts of real-life violence. Nevertheless, at higher levels exposure to real-life violence is clearly maladaptive, as it is linked with more symptoms of trauma, including avoidance and escape to fantasy, less empathy and understanding for others, and for males also lower emotional reactivity to violence. The combination of traumatic symptoms, escape to fantasy and low empathy are likely to contribute to difficulties in social relationships and decreased social support (Beck et al. 2009; Davis 1983), which may further compound the negative sequelae of exposure to violence. Additionally, lower empathy and emotional reactivity to violence may contribute to more violent behavior or failure to intervene as a bystander to violence (Florsheim et al. 1996; McCloskey and Lichter 2003; Sams and Truscott 2004). Thus, adolescents and emerging adults who have been exposed to higher levels of real-life violence would benefit from psychological interventions to help them cope with these challenging experiences and emotional sequelae. Prospective research also is needed to elucidate the long-term effects of these markers of desensitization to violence.

The present findings also have implications for future research on exposure to violence. Most importantly, the results demonstrate that the relationships between exposure to violence and some aspects of emotional and physiological functioning are not simply linear, as typically studied, but follow more complex curvilinear patterns. The presence of such curvilinear patterns may help explain previous null or inconsistent findings, as we showed for empathy. Thus, to more accurately represent the role of exposure to violence in adaptive and maladaptive outcomes, future research should incorporate more complex, nonlinear models. In addition, research should continue to systematically evaluate gender differences in the effects of exposure to violence.

Limitations and Future Directions

The findings of this study need to be interpreted in the context of its limitations. The cross-sectional design of the study does not permit causal inferences about the relationships between exposure to violence and PTSD symptoms, empathy, fantasy and baseline physiological functioning. Stronger inferences could be drawn from experimental studies that manipulate exposure to real-life or movie violence, longitudinal studies that track exposure to violence, emotional functioning and physiological arousal over time, and quasi-experimental studies that compare individuals differentially exposed to random violence (e.g., terrorist attacks). Another limitation of this study is the exclusion of video game violence, which has been linked more extensively with emotional and physiological desensitization (Carnagey et al. 2007; Bushman and Anderson 2009). This exclusion was done on purpose to allow a focus on more passive forms of violent media exposure and to parallel the exposure to violent movie clips in the lab. As suggested by some research (Funk et al. 2003), the more active process of playing violent videogames may have stronger effects on desensitization than the more passive watching of violent movies. More research is needed to directly compare these different forms of violent media, particularly in experimental studies. The differences between real-life and movie violence could partly reflect the different timeframe for each type of exposure (lifetime for real-life violence, recent for TV/movie violence); future studies would benefit from using more comparable timeframes (e.g., past year for each).

Our assessment of emotional and physiological functioning also was somewhat limited. Future studies would benefit from including measures of more generalized emotional distress (e.g., depressive symptoms, general anxiety), both general and aggressive fantasies, PTSD symptom clusters and dissociation. Similarly, the inclusion of additional physiological measures with well-elaborated links to affective processing mechanisms and (e.g., skin conductance, cortisol, startle) would allow a more refined analysis of how physiological processes are affected by exposure to violence. Finally, neuroimaging is an additional promising avenue for better understanding of the impact of exposure to violence on cognitions, emotions and behavior (Bartholow et al. 2006; Matthews et al. 2005). Although our sample of college students was racially diverse, the results may not generalize to young adults not attending college, males (who were somewhat underrepresented in the sample), and high-risk or clinical populations. The reactivity analyses were limited by smaller sample size (half of the original sample) which decreased power to detect complex interactive effects of smaller magnitude and those involving gender (due to the gender imbalance). The studied relationships may also vary as a function of development and should be examined in studies with younger youth.

Conclusion

Given the high prevalence of exposure to violence that youth experience in both real-life and media and frequently voiced concerns about youth becoming desensitized to violence (Fanti and Avraamides 2011; Finkelhor et al. 2013), this study examined possible emotional and physiological desensitization to both types of violence among late adolescents and emerging adults. The results pointed to more prominent effects of real-life violence on emotional

functioning compared to TV/movie violence. While limited exposure to real-life violence appeared to have some developmental benefits in the form of higher empathy, experiencing higher levels of real-life violence was linked with maladaptive outcomes including higher trauma symptoms, escape to fantasy, and reduced empathy. In males, higher levels of exposure to real-life violence were also associated with diminished emotional reactivity to violent videos. Thus, youth exposed to higher levels of real-life violence do show some signs of emotional desensitization involving lower empathy, and for males also decreasing distress to repeated scenes of violence. Individuals exposed to higher levels of movie violence did not demonstrate any evidence of emotional desensitization, but their blood pressure reactivity to violent videos showed more pronounced habituation effects that may indicate physiological desensitization to televised violence. Future research should address the long-term consequences of emotional desensitization among youth exposed to high levels of real-life violence, as well as strategies to treat or prevent the development of these symptoms in these youth.

Acknowledgments

This research was partly supported by grant R01MH098348 from the National Institutes of Health to the first author.

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Figure 1.
Model-based estimates showing the curvilinear relationship between exposure to real-life violence and empathy.

Figure 2.

Model-based estimates demonstrating changes in blood pressure while watching of violent movie clips as a function of previous exposure to media violence.

Note: Low and high levels of exposure to media violence correspond to 1 SD below and above the mean, respectively.

Figure 3.

Model-based estimates illustrating gender differences in the effect of exposure to real-life violence on emotional distress during watching violent movie clips.

Note: Ratings of distress could range from 0 (not at all) to 4 (extremely). Low and high levels of exposure to violence correspond to 1 SD below and above the mean, respectively.

Table 1

Descriptives and Correlations

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Age	18.74 (.92)	--									
2. Female	.22*	--									
3. Racial/ethnic minority	.06	.16*	--								
4. Parental education	4.24 (1.49)	-.11	-.02	--							
5. Real-life violence ^a	15.68 (8.92)	.05	-.23***	.03	-.02	--					
6. Media violence ^a	13.13 (6.13)	.08	-.06	.09	-.08	.25***	--				
7. PTSD symptoms	1.78 (0.57)	-.10	.08	.02	-.02	.33***	.04	--			
8. Empathic concern	4.04 (0.60)	-.09	.19**	.05	-.10	.00	.12	.12	--		
9. Perspective taking	3.63 (0.71)	.08	-.10	-.08	.02	.19**	.19**	-.01	.36***	--	
10. Fantasy	3.47 (0.86)	-.05	.12	-.09	.02	.16*	.11**	.20**	.33***	.18**	--
11. Baseline SBP	117.47 (13.74)	-.03	-.02	.13	.04	.12	.04	.08	.07	.00	.02
12. Baseline DBP	63.34 (10.08)	-.03	.01	.14*	.02	.10	.04	.07	.09	.03	.03

Note

^a Mean and SD are for the original variable, but square root transformation was applied prior to all analyses. N=214.* $p < .05$ ** $p < .01$ *** $p < .001$.

Multiple Regressions Predicting PTSD Symptoms, Empathy, and Resting SBP from Violence Exposure and Gender

Table 2

	PTSD Symptoms			Empathic Concern			Perspective Taking			Fantasy			SBP		
	β	R ²	β	β	R ²	β	β	R ²	β	β	R ²	β	β	R ²	β
Step 1		.01			.04 [*]			.02			.03			.02	
Female	.08		.18 ^{**}	-.09		.14 [*]									-.04
Racial/ethnic minority	.01		.02	-.07		-.11									.14
Step 2	.14 ^{***}				.05 [*]			.08 ^{***}			.05 [*]			.02	
Real-life violence	.39 ^{***}		-.01	.12		.18 [*]								.12	
Real-life violence squared	.09		-.16 [*]	-.15 [*]		-.05								.08	
Media violence	-.05		.12	.17 [*]		.09								.00	
Media violence squared	-.02		.11	.09		.01								-.04	
Step 3		.01			.03			.02			.02			.01	
Real-life violence × Female	-.02		.13	.10		.06								.03	
Real-life violence squared × Female	-.03		-.04	-.09		-.03								-.03	
Media violence × Female	-.09		-.04	-.01		.06								.05	
Media violence squared × Female	.07		.16	.13		.11								-.05	

Note: N=209.

* p<.05

** p<.01

*** p<.001.

Table 3

Multilevel Models Predicting Subjective Distress and SBP Change from Baseline during Watching of Violent Videos

		Distress b (SE)	SBP b (SE)
Step 1	Intercept	1.64 (.09) ***	2.32 (.61) ***
	Baseline SBP	--	-.16 (.04) ***
	Female	.12 (.21)	.16 (1.42)
	Racial/ethnic minority	-.19 (.18)	1.53 (1.23)
	Clip	.07 (.02) **	.09 (.20)
Step 2	Real-life violence	-.08 (.08)	-.45 (.55)
	Real-life violence squared	.00 (.04)	-.21 (.28)
	Clip × Real-life violence	.01 (.02)	.18 (.17)
	Clip × Real-life violence squared	.00 (.01)	.11 (.08)
	Media violence	-.15 (.11)	.91 (.76)
	Media violence squared	-.01 (.10)	1.66 (.65) *
	Clip × Media violence	-.03 (.03)	-.61 (.24) *
	Clip × Media violence squared	.02 (.03)	-.56 (.20) **
Step 3	Female × Clip	-.12 (.08)	-.21 (.69)
	Female × Real-life violence	.24 (.20)	-1.54 (1.28)
	Female × Real-life violence squared	.00 (.09)	-.49 (.59)
	Female × Clip × Real-life violence	.12 (.05) *	-.05 (.41)
	Female × Clip × Real-life violence squared	.01 (.02)	.24 (.19)
	Female × Media violence	-.26 (.33)	3.22 (2.19)
	Female × Media violence squared	.26 (.28)	.36 (1.86)
	Female × Clip × Media violence	.05 (.08)	-.32 (.69)
	Female × Clip × Media violence squared	-.02 (.07)	-.20 (.59)

Note: N=104.

*
p<.05

**
p<.01

p<.001.