

# Desensitization to Media Violence: Links With Habitual Media Violence Exposure, Aggressive Cognitions, and Aggressive Behavior

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This study examined the links between desensitization to violent media stimuli and habitual media violence exposure as a predictor and aggressive cognitions and behavior as outcome variables. Two weeks after completing measures of habitual media violence exposure, trait aggression, trait arousability, and normative beliefs about aggression, undergraduates ( $N = 303$ ) saw a violent film clip and a sad or a funny comparison clip. Skin conductance level (SCL) was measured continuously, and ratings of anxious and pleasant arousal were obtained after each clip. Following the clips, participants completed a lexical decision task to measure accessibility of aggressive cognitions and a competitive reaction time task to measure aggressive behavior. Habitual media violence exposure correlated negatively with SCL during violent clips and positively with pleasant arousal, response times for aggressive words, and trait aggression, but it was unrelated to anxious arousal and aggressive responding during the reaction time task. In path analyses controlling for trait aggression, normative beliefs, and trait arousability, habitual media violence exposure predicted faster accessibility of aggressive cognitions, partly mediated by higher pleasant arousal. Unprovoked aggression during the reaction time task was predicted by lower anxious arousal. Neither habitual media violence usage nor anxious or pleasant arousal predicted provoked aggression during the laboratory task, and SCL was unrelated to aggressive cognitions and behavior. No relations were found between habitual media violence viewing and arousal in response to the sad and funny film clips, and arousal in response to the sad and funny clips did not predict aggressive cognitions or aggressive behavior on the laboratory task. This suggests that the observed desensitization effects are specific to violent content.

*Keywords:* media violence, desensitization, physiological arousal, aggressive cognitions, aggressive behavior

The hypothesis that media violence increases aggressive behavior has been widely studied in experimental research looking at the short-term effects of exposure to violent media stimuli, as well as in cross-sectional and longitudinal studies relating habitual media violence exposure to individual differences in the readiness to show aggressive behavior. Although there is disagreement among some researchers as to whether or not the evidence currently available supports the view that media violence exposure is a risk

factor for aggression (Huesmann & Taylor, 2003), most meta-analyses and reviews have reported substantial effect sizes across different media, methodologies, and outcome variables, suggesting that exposure to violent media contents increases the likelihood of aggressive behavior in the short term as well as over time (e.g., Anderson et al., 2003; Bushman & Huesmann, 2006; Huesmann, 1982; Huesmann & Kirwil, 2007; Murray, 2008; Paik & Comstock, 1994). Other authors have questioned both the strength of the evidence and its implications (e.g., Ferguson, 2007; Savage & Yancey, 2008). Ferguson and Kilburn (2009, 2010) concluded from their meta-analysis that there was no support for the claim that media violence increases aggressive behavior. However, they acknowledged that experimental studies using proxy measures of aggression did produce substantive effect sizes and were relatively unaffected by publication bias, and their conclusions have been vigorously disputed by others (Anderson et al., 2010; Bushman, Rothstein, & Anderson, 2010; Huesmann, 2010).

Beyond studying the strength of the link between media violence usage and aggression, researchers have worked toward identifying the underlying processes that mediate between violent media stimuli as input variables and aggressive behavior as an outcome. Whereas priming, mimicry, and excitation transfer are

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thought to be important mechanisms for the short-term effects of media violence on aggression, observational learning and desensitization have been hypothesized as key mechanisms for long-term effects (Bandura, 1973; Berkowitz, 1965; Huesmann, 1982, 1988; Huesmann & Kirwil, 2007; Huesmann, Moise, Podolski, & Eron, 2003). *Observational learning* refers to the acquisition of cognitive structures that promote specific behaviors from observing others perform similar behaviors. Watching media characters behave in a violent fashion can instigate a process of observational learning in which a new cognitive and behavioral repertoire promoting violence is acquired. *Desensitization*, on the other hand, is a process involving changes in emotional responsiveness. In general terms, desensitization refers to the gradual reduction in responsiveness to an arousal-eliciting stimulus as a function of repeated exposure. In the context of media violence, desensitization more specifically describes a process “by which initial arousal responses to violent stimuli are reduced, thereby changing an individual’s ‘present internal state’” (Carnagey, Anderson, & Bushman, 2007, p. 491). In particular, desensitization to violent media stimuli is thought to reduce anxious arousal. Fear is a spontaneous and probably innate response of humans in reaction to violence. As with other emotional responses, repeated exposure to media violence can *decrease* negative affect, because violent stimuli lose their capacity to elicit strong emotions the more often the stimulus is presented (Anderson & Dill, 2000).

Several studies have shown that in the long run, habitual exposure to media violence may reduce anxious arousal in response to depictions of violence. Research has found that the more time individuals spent watching violent media depictions, the less emotionally responsive they became to violent stimuli (e.g., Averill, Malstrom, Koriat, & Lazarus, 1972) and the less sympathy they showed for victims of violence in the real world (e.g., Mullin & Linz, 1995). Bartholow, Bushman, and Sestir (2006) used event-related brain potential data (ERPs) to compare responses by violent and nonviolent video game users to violent stimuli and relate them to subsequent aggressive responses in a laboratory task. Bartholow et al. found that the more violent games participants played habitually, the less brain activity they showed in response to violent pictures and the more aggressively they behaved in the subsequent task. In a series of studies with children age 5 to 12, Funk and colleagues demonstrated that habitual usage of violent video games was associated with reduced empathy with others in need of help (Funk, Baldacci, Pasold, & Baumgardner, 2004; Funk, Buchman, Jenks, & Bechtoldt, 2003).

Evidence is less clear with regard to short-term desensitization effects in experimental settings. In one recent study, Carnagey et al. (2007) showed that participants’ physiological arousal to depictions of real-life violence was reduced after participants had played a violent video game compared to a control group that had played a nonviolent game. In contrast, Funk et al. (2003) found no evidence of short-term desensitization (indicated by reduced empathy with others in need of help) in the children in their study who played a violent video game as compared with those who played a nonviolent game. Ballard, Hamby, Panee, and Nivens (2006) found some evidence of physiological desensitization over a 3-week game playing period but failed to find differential desensitization as a function of playing a violent versus nonviolent game. Finally, Arriaga, Esteves, Carneiro, and Monteiro (2006) failed to find a decrease in physiological arousal from the begin-

ning to the end of a 4-min playing period regardless of whether participants played a violent or a nonviolent game.

Past research has varied with regard to the critical measure of desensitization. Some studies have used self-reported affect (e.g., Fanti, Vanman, Henrich, & Avraamides, 2009), while others have used different indicators of physiological arousal, such as heart rate, blood pressure, skin conductance, or measured brain activity (e.g., Bartholow et al., 2006; Carnagey et al., 2007). Few studies have concurrently examined physiological and subjective indices of arousal (e.g., Ballard et al., 2006), and yet fewer have included subjective reports of both negative (anxiety, anger) and positive (enjoyment) emotional responses (for an exception, see Kirwil, 2008). This diversity in operationalizing arousal may be one of the reasons for the lack of consistency in research on short-term desensitization.

The vast majority of studies have looked at desensitization in terms of reduced negative arousal in response to media violence. Another pertinent effect of habitual or repeated exposure to media violence may be increased positive arousal or enjoyment. The role of positive arousal to violent media is less than clear. In line with Zillmann’s (1996) model of suspense enjoyment based on excitation transfer principles, a positive association was found between experienced negative affect and enjoyment of violent media in a meta-analysis by Hoffner and Levine (2005). However, this pattern held only for self-reported negative affect and enjoyment and failed to emerge for the link between physiological arousal and enjoyment.

An alternative perspective on the relationship between anxious and pleasant arousal may be derived from the general aggression model extended by Carnagey et al. (2007), to include desensitization. They argued that because repeated exposure to media violence reduces the anxiety reaction to violence, new presentations of violence “instigate different cognitive and affective reactions than would have occurred in the absence of desensitization” (p. 491). One such affective reaction may be a positive response to violence that would otherwise have been inhibited by anxious arousal. Huesmann and Kirwil (2007) have called this process *sensitization*. They argued that, for some individuals, watching violence is enjoyable, and, whereas it may provoke anger, it does not produce anxious arousal. On the contrary, the more such individuals watch violence, the more they like watching it. They are experiencing a “sensitization” of positive feelings. Because finding violence pleasant is incompatible with experiencing anxious arousal, increased pleasant arousal to depictions of violence in individuals with a high exposure to media violence would constitute indirect evidence of desensitization of “negative feelings” about violence. On the basis of this line of reasoning, we propose that anxious arousal by violent media stimuli is negatively related to pleasant arousal and that habitual exposure to media violence should both decrease negative emotional reactions and increase positive emotional reactions to violence, though the increase in positive emotions may occur for only a subset of individuals. For example, in a recent study of young adults in Poland, Kirwil (2008) found that proactively aggressive individuals tended to respond to violent media stimuli with a reduction in anxious arousal, whereas reactively aggressive individuals tended to respond with an increase in enjoyment.

A further key question refers to the content specificity of desensitization in response to violent media stimuli. Does desensiti-

zation to other arousing stimuli also predict increased aggression, or is the link dependent on violent content? Anderson and Bushman (2001) pointed out that although exciting nonviolent video games can increase arousal, “only violent games should directly prime aggressive thoughts and stimulate the long-term development of aggressive knowledge structures” (p. 356). Experimental studies comparing the effects of violent and nonviolent video games matched for difficulty, enjoyment, arousal quality, and level of frustration have provided empirical support for this line of reasoning (e.g., Anderson et al., 2004; Bartholow, Sestir, & Davis, 2005). Carnegie et al. (2007) found that although there were no differences in heart rate immediately after playing a violent versus a nonviolent game for 20 min, participants in the violent but not in the nonviolent game condition subsequently showed reduced arousal when witnessing a real-life incident of violence. This finding indicates that desensitization to real-life violence is contingent upon the violent content of the media stimulus. However, this explanation focuses on the cognitive effects of violent media input, and a different mechanism is required to explain how changes in emotional reactivity might affect aggression. Huesmann and colleagues (Huesmann, 1997, p. 81; Huesmann, 2007; Huesmann & Kirwil, 2007; Huesmann et al., 2003) proposed that a person’s emotional reaction to the anticipation of aggression and violence plays a role in inhibiting or promoting aggressive responding. When scripts for behaving aggressively are activated by some situation, they may be inhibited if the anxious arousal stimulated by that activation is greater than the pleasant arousal. Consequently, people whose negative emotional reactions to violence have been desensitized (or who by disposition have lower reactions) may experience more positive emotions when anticipating aggression and should be more likely to engage in aggression. According to this theoretical position, people who react less negatively to violent media scenes and experience more positive reactions to such scenes should be more aggression prone. The key mechanism is the person’s emotional reaction to violent scenes, not the person’s reaction to other kinds of arousing scenes. Relating emotional reactions to scenes of violence to aggression, Moise-Titus (1999) found that people who showed lower anxious reactions to violent scenes scored higher on trait aggression, had watched more media violence, and subsequently behaved more aggressively on a laboratory task. However, she examined only reactions to violent films and did not compare them with reactions to other types of arousing scenes.

Regarding the link between aggression and skin conductance level (SCL) as a quantitative measure of arousal, empirical evidence is mixed, varying for measures of electrodermal activity, age, and the psychological meaning assigned to the stimuli (Fowles, 2000; Fowles, Kochanska, & Murray, 2000; Lorber, 2004; Patrick & Verona, 2007). There is some indication that adults low on resting SCL and in SCL responses to negative stimuli are more prone to showing hostility and aggression. Huesmann and Kirwil (2007) reviewed evidence that individuals displaying low physiological arousal at baseline level were more likely to show aggressive behavior over a subsequent period of observation. Longitudinal studies showed that boys who had lower heart rate and SCLs at age 15 were significantly more likely to commit violent offenses in the following years (Scarpa & Raine, 2007). However, to complicate matters, studies have shown dif-

ferent links between SCL and proactive and reactive aggression, respectively. For example, Hubbard et al. (2002, 2004) found low SCL to be associated with proactive aggression in children, whereas higher levels of SC were related to reactive aggression.

Each of these studies linked individual differences in arousal to relatively stable aggressive dispositions. More pertinent to the present study are studies linking physiological activation to laboratory-induced aggression. In reviewing this research, relying mostly on heart rate as a measure of arousal, Patrick and Verona (2007) concluded that these studies have produced mixed results and called for more research using multiple measures of activation, including SCL. The potential relation of SCL to aggressive cognitions is even less clear. Past research provides at best indirect evidence concerning this issue. Studies have demonstrated a link between low SCL and shorter response latencies in a word association task (Jones, 1960) or a visual discrimination task (Vossel, 1988), but neither study addressed responses to aggression-related stimuli. Against this limited body of research, the present study examined whether differences in baseline SCL and SCL responses during the violent clips would be associated with differences in aggressive cognitions.

Few studies are available that have addressed desensitization to arousing stimuli differing in affective quality. Fanti et al. (2009) showed participants a series of violent and funny film scenes and asked them to indicate how much they enjoyed them. For the violent scenes, there was a curvilinear pattern of liking. An initial decline in enjoyment of the violent scenes was followed by an increase during subsequent scenes, and enjoyment was greater at the end than at the beginning of the series. In contrast, a gradual decline in enjoyment was found for the funny scenes. This finding suggests that sensitization (defined here in terms of an increase in positive affect to depictions of violence that can be assumed to correlate with a decrease in negative affect [desensitization]) was specific to violent content. Unfortunately, Fanti et al. did not include a measure of habitual usage of media violence. Bartholow et al. (2006) compared ERPs to violent pictures with nonviolent but negatively arousing images (e.g., images of facial disfigurements). They found that greater preference and past use of violent games predicted decreased ERPs to the violent pictures but not to the unpleasant comparison pictures and that differences in responses to the nonviolent pictures, unlike differences in response to violent images, were unrelated to subsequent aggressive behavior. In combination, the two studies suggest (a) that repeated media exposure desensitizes emotional reactions to violence only if the exposure is to scenes of violence and (b) that it is only decreased emotional reactions to violence that are linked to increases in aggressive cognitions and behavior.

### The Current Study

The current study was designed to add to the existing body of evidence on the role of desensitization in the media violence–aggression link in four ways: (a) by looking at altered emotional reactions to a violent film clip as an outcome variable of long-term, habitual media violence exposure; (b) by looking at desensitization to violence both in terms of a decrease in anxious arousal and of an increase in pleasant arousal; (c) by looking at altered emotional reactions to violent films as a situational predictor of aggressive cognitions and behavior; and (d) by comparing responses to vio-

lent media stimuli with responses to sad and funny stimuli to address the issue of the content specificity of the aggression-promoting effects of desensitization.

The study was designed to test our hypotheses about how anxious and pleasant emotional responses to arousing scenes of violence (in contrast to other arousing scenes) relate both to habitual media violence exposure and to proactive and reactive immediate aggression. As described above, existing evidence suggests that those who watch or play violent media should become desensitized to the negative emotions violence stimulates and should experience both less anxious arousal and more pleasant arousal when viewing or thinking about violence. In turn, as Huesmann and colleagues have argued (Huesmann & Kirwil, 2007; Huesmann et al., 2003), the reduced anxious and increased pleasant arousal that accompanies thinking about violence should cause more aggressive thoughts to be stimulated by the violent scene and should allow more aggressive scripts—scripts that would normally be inhibited by the anxious arousal—to be used proactively in social problem solving. However, it is unlikely that the more reactive type of angry emotional aggression in response to provocation would be made any more likely by such changes in emotional arousal to scenes of violence. The present study included measures of both proactive and reactive aggression to test this line of reasoning.

This thinking leads us to four specific hypotheses:

1. The more media violence exposure individuals have had in the past, the less increase in physiological arousal they will show in response to a violent film clip, both compared to arousal at baseline and compared to other arousing media stimuli (sad and funny clips).

2. The more media violence exposure individuals have had in the past, the less anxious and, correspondingly, the more pleasant arousal will they report in response to a violent film clip. No significant correlations are expected between habitual media violence exposure and anxious and pleasant arousal in response to sad or funny clips, because the desensitization that prior exposure produced would be specific to violent content.

3. The lower the anxious arousal and the higher the pleasant arousal of individuals in response to a violent film clip, the more rapid will be the accessibility of aggressive cognitions, as evidenced in shorter response latencies in recognizing aggression-related words, and the greater will be the individuals' immediate proactive unprovoked aggression. The effects will occur independently of the effects of habitual media violence exposure, trait aggression, and aggressive beliefs on the aggression measures and independent of the effects of trait arousability on the arousal measures. The arousal response to violent film clips is not assumed to be related to immediate reactive provoked aggression.

4. Finally, the relations between emotional arousal to film clips and subsequent aggressive cognitions and behavior are hypothesized to be dependent on the violent content of the arousing stimulus. That is, lower anxious arousal and greater pleasant arousal to the violent film clip but not to the sad or funny clips should be linked to increased accessibility of aggressive cognitions and higher levels of proactive aggressive behavior.

To examine these predictions, we conducted a study in which participants first completed an online questionnaire about their

habitual media violence exposure. In addition, trait aggression, trait arousability, and normative beliefs about aggression were measured at this stage as alternative predictors of arousal, aggressive cognitions, and aggressive behavior to enable us to identify the unique contribution of media violence exposure. Two weeks later the participants came into the laboratory and were exposed to two different emotionally arousing films: a violent clip and a sad or a funny comparison clip. They answered a brief questionnaire after each clip assessing a variety of variables including their emotional arousal during the film clip. SCL was recorded constantly before and during the films as a measure of physiological arousal. Following the film clips, participants completed a lexical decision task as a measure of the cognitive accessibility of aggressive thoughts and a competitive reaction time task as a measure of aggressive behavior.

## Method

### Participants

Students enrolled in a broad range of courses at the University of Potsdam, Germany, were invited by university intranet and flyers to participate in a two-part study on emotional responses to films, the first part of which was to be completed as an online survey. They were informed that following the first part they would be invited to the lab for an experimental session in which they would be shown different film clips. Students were asked to respond by e-mail to express their willingness to participate, and those who did so were sent the link to the online questionnaire, also via e-mail. Participants were offered 15 Euros or, alternatively, 3 hours of course credit for participation in both parts. A total of 625 undergraduate students, 413 men and 212 women, with a mean age of 23.7 years ( $SD = 3.09$ ) participated in this initial online survey.

At the end of the online questionnaire, participants received detailed information about the second part of the study and were asked to sign up for a lab session in which they would view some film clips, be recorded physiologically, play a game, and answer more questions. In compliance with the requirements of the Ethics Committee of the University of Potsdam, which formally approved the study, participants were then told about the violent nature of some of the film clips and possible viewer reactions to them as well as about the recording of physiological arousal. Once they had made an appointment for the lab session, participants received a confirmation e-mail instructing them to refrain from drinking coffee or other stimulating drinks for at least two hours prior to the scheduled appointment, as this would interfere with the SCL recording. A total of 341 of the 625 undergraduate students who had completed the online survey participated in the second part of the study; of these, 38 had to be excluded due to unusable SCL data. The final sample consisted of 303 participants (215 men and 88 women) for whom complete data were available from both data points. The mean age of this sample was 23.75 years ( $SD = 2.76$ ). On average, lab sessions took place 2 weeks after the return of the online questionnaire.

### Measures: Online Questionnaire

**Habitual media violence exposure.** Participants were provided with genre lists for movies and electronic games. For each

item on the two lists, they were asked to indicate how frequently they used the respective genre on a 5-point scale ranging from 1 (*never*) to 5 (*very often*). Frequency ratings are commonly used in studies operationalizing media violence exposure through providing broad media categories or genre lists (e.g., Potts, Dedmon, & Halford, 1996; Slater, Henry, Swaim, & Anderson, 2003).

For movies, 10 genres were provided: (a) action, (b) drama, (c) horror/slasher, (d) comedies, (e) military and war, (f) crime thrillers, (g) romantic fiction, (h) martial arts, (i) science fiction, and (j) western. For electronic games, 15 genres were presented: (a) beat-em ups, (b) shoot-em ups, (c) first-person shooters, (d) third-person shooters, (e) tactical shooters, (f) survival horror games, (g) genre mix, (h) classic adventure, (i) action adventure, (j) role-playing games, (k) general simulations, (l) military simulations, (m) sports games, (n) construction strategy, and (o) military strategy. Each game category was illustrated by a specific example prominent at the time of the study.

A sample of 21 undergraduate students (5 women and 16 men, mean age = 23.8 years,  $SD = 3.12$ ) who identified themselves as regular media users rated the genres in terms of violent content. They were asked to rate the level of violence typically characteristic of each genre, using a 5-point scale from 1 (*nonviolent*) to 5 (*very violent*). Interrater agreement as indicated by Kendall's  $W$  was high ( $W = .86, p < .001$ ). On that basis, a mean violence score was computed across raters for each genre.

To arrive at a measure of media violence exposure, we selected those genres that had received violence ratings of higher than 2 on the 5-point scale from 1 (*nonviolent*) to 5 (*very violent*) from the sample of independent raters for the media violence exposure index. This was true for nine out of the 10 movie genres (all except romantic fiction; violence ratings ranged from 2.43 for drama to 4.81 for military and war films) and 12 of the 15 video game genres (all except general simulations, sports games, and construction strategy games; range from 2.05 for classic adventure to 4.95 for first-person shooters). Participants' frequency ratings for each of the selected genres were multiplied by the average violence rating of that genre obtained from the independent raters. The resulting product scores per genre were then averaged across the 21 genres.<sup>1</sup>

**Trait arousability.** This construct referred to a person's susceptibility to strong emotional responsiveness in terms of the general tendency to experience strong emotions and the ease of getting into strong positive and negative emotional states. It was measured by a 21-item scale composed of 11 items from Mehrabian's (1995) Trait Arousability Scale (example item: "I get happy or sad easily") and 10 items from the Affect Intensity Scale by Geuens and de Pelsmacker (2002; example item: "My happy moods are so strong that I feel like I'm in heaven"). Responses were made on a 7-point scale ranging from 1 (*not at all true*) to 7 (*exactly true*). An overall arousability score was computed for each participant by averaging responses across the 21 items. The scale reliability data for the scales of the online questionnaire are presented in Table 1.

**Trait aggression.** The dispositional tendency toward aggression was measured by a German version of the Aggression Questionnaire by Buss and Perry (1992; Krahe & Möller, 2010). The original Aggression Questionnaire comprises *aggressive behavior* (physical aggression, e.g., "I may hit someone if he or she provokes me"); verbal aggression, e.g., "I can't help getting into

arguments when people disagree with me"), *anger* (e.g., "I have trouble controlling my temper"), and *hostility* (e.g., "I know that 'friends' talk about me behind my back") as facets of dispositional aggressiveness and has a total of 29 items. Four new items were added to measure *relationally aggressive* behavior (e.g., "I have sometimes spread rumors about someone who had treated me badly"), bringing the total number of items on this measure to 33. Responses were made on a 5-point scale ranging from 1 (*not at all true*) to 5 (*exactly true*). A total aggression score was computed for each participant by averaging responses across the 33 items.

**Aggressive normative beliefs.** Normative acceptance of aggression was measured with a vignette describing a provocation scenario based on Krahe and Möller (2004). The scenario described a confrontation where the protagonist was criticized unfairly by a colleague in front of others and then finds himself/herself alone with that colleague later in the day. The protagonist was described as male or female to match the participants' gender. A total of 11 aggressive responses by the protagonist toward the colleague were presented as potential actions in that situation (e.g., "to scream at him", "to insult him"). Participants were asked to indicate, on a 5-point scale, ranging from 1 (*not at all ok*) to 5 (*very much ok*), how acceptable they would find the response in that situation. Ratings were averaged across the 11 items to create an overall index of normative acceptance of aggression. Huesmann and Guerra (1997) have previously found that norms of this type are predictive of aggressive behavior and related to observation of violence.

**Order variation.** To control for order effects, we created different versions of the questionnaire in which each dispositional measure appeared once in every possible position. The media violence exposure measure was always presented first because it was most closely related to the theme of the study (i.e., a study on emotional reactions to films), as advertised to the participants.

<sup>1</sup> Although different participants, if asked, might think of any one specific program as falling into multiple genres (e.g., action-adventure vs. military-war), this is unlikely to produce much difference in violence exposure scores when the participants are being asked about frequency of media genres. The self-reports of how often genres are used are more subjective self-perceptions that allow the same media game or movie to influence frequencies of multiple categories. For example, if asked about their viewing of war-military genres, participants who have watched *The Matrix* are likely to think of it as in that category. When asked about science fiction or action, the participants are likely to think of *The Matrix* as in those genres. Thus, self-reported viewing frequencies for all three categories are likely to be increased. However, because the overall violence viewing score for a participant is the average of the violence viewing scores for genres, the contribution to the participant's overall violence viewing score will actually be lower than that for another participant who perceives *The Matrix* only as military-war, which has a higher violence rating. We consider this property of our rating system desirable, as perceiving a game or movie only in a more violent genre probably indicates more of a focus on the violence.

Table 1

Reliabilities, Descriptive Statistics, and Gender Differences for the Dispositional Measures in the Online Survey (Time 1 Sample, N = 625)

| Measure                 | Items | $\alpha$ | Range                   | <i>M</i> | <i>SD</i> | Men  | Women | <i>F</i>  | Final sample<br>( <i>N</i> = 303) |
|-------------------------|-------|----------|-------------------------|----------|-----------|------|-------|-----------|-----------------------------------|
| Media violence exposure | 21    | .85      | 2.05–24.75 <sup>a</sup> | 7.53     | 1.86      | 8.06 | 6.49  | 119.60*** | 6.75 (1.62)                       |
| Trait aggression        | 33    | .89      | 1–5                     | 2.08     | 0.43      | 2.09 | 2.00  | 6.24*     | 2.06 (0.44)                       |
| Trait arousability      | 21    | .84      | 1–7                     | 4.57     | 0.76      | 4.32 | 5.04  | 152.02*** | 4.57 (0.73)                       |
| Aggressive norms        | 11    | .84      | 1–5                     | 1.78     | 0.60      | 1.83 | 1.69  | 6.42*     | 1.76 (0.57)                       |

Note. Values for final sample are *M* (*SD*).

<sup>a</sup> Multiplicative index of frequency and violence ratings. Frequency ratings ranged from 1 to 5; violence ratings ranged from 2.05 to 4.95.

\*  $p < .05$ . \*\*\*  $p < .001$ .

## Measures: Laboratory Session

**Violent film clips.** Two violent film clips were used in the laboratory part of the study.<sup>2</sup> The first was taken from the film *Casino* (Scorsese, 1995) and lasted a total of 2:19 min. Within the clip, two critical violent scenes were selected, lasting 59 and 32 s, respectively. The second clip was taken from the film *Reservoir Dogs* (Tarantino, 1992) with a total length of 4.41 min and two critical scenes of 60 s each. The clips were selected on the basis of a pilot study with 87 undergraduate students that showed them to elicit strong negative affect, in particular anxiety. They had also been used in a previous study by Moise-Titus (1999) and were found to elicit high levels of anxiety.

**Sad clips.** Based on the results of the pilot study, two clips were selected to elicit sad mood. One was taken from the film *The Champ* (Zeffirelli, 1979) and lasted 4:19 min. The first critical sad scene lasted 106 s, and the second sad scene lasted 104 s. The second clip was selected from the film *Stepmom* (Columbus, 1998) and lasted 4:12 min. The two critical scenes lasted 93 s and 92 s, respectively.

**Funny clips.** The two funny clips were also selected on the basis of the pilot study. Selection criteria were that they contained an action element (excluding purely verbal humor) and that there was no aggression (excluding slapstick scenes, e.g., cream cakes being thrown into a person's face). The first clip was taken from *Monty Python's Life of Brian* (Jones, 1979) and had a total length of 4:07 min. The two critical scenes lasted 136 s and 79 s, respectively. The second funny clip was taken from another Monty Python sketch, *Philosophers' World Cup* (Cleese, 1972; [http://www.metacafe.com/watch/yt-92vV3QGagck/monty\\_python\\_philosophers\\_world\\_cup/](http://www.metacafe.com/watch/yt-92vV3QGagck/monty_python_philosophers_world_cup/)) and had a total length of 3:50 min and two critical scenes of 98 s and 78 s, respectively. Participants in the pilot study were asked if they had seen the clips in question; percentages ranged below 20% across the three types of film. On that basis, it was concluded that familiarity with the selected clips was low in the target sample.

**Physiological arousal.** SCL was recorded as a measure of physiological arousal. This measure has been widely used in research of desensitization and was described by Ravaja (2004) as an excellent operationalization of arousal in the context of media research. The present study used PAR-PORT, a portable device that records SCL data at a rate of 10 measures per second ([www.par-berlin.com](http://www.par-berlin.com)). This sampling rate is common in studies in which SCL is used as an outcome measure in media research (e.g.,

Lang, Zhou, Schwartz, Bolls, & Potter, 2000). Prior to the film presentation, an 80-s baseline measure was taken during a resting period.<sup>3</sup> SCL was then recorded continuously throughout the presentation of the film clips.

**Self-reported affective responses and perceptions of film clips.** Immediately after each film clip ended, participants were asked to rate how they had felt while watching the clip by indicating how pleasant they had found the clip and how much anxiety they had felt while watching it. These two critical items were embedded within three manipulation check items and four further filler items, and responses were made on a 7-point scale ranging from 0 (*not at all*) to 6 (*very much*). For the manipulation check items, participants were asked to rate how violent, sad, and funny they had found the film clip. Ratings were made on a 7-point scale ranging from 0 (*not at all*) to 6 (*very much*).

**Accessibility of aggressive thoughts.** To measure response latencies for aggressive words as an index of cognitive availability, we asked participants to work on a lexical decision task and measured their reaction time to complete it. They were presented with a total of 160 six-letter strings and had to indicate for each string whether or not it represented a meaningful German word. The stimulus material was drawn from a pilot study with linguistics students and consisted of 40 aggressive words (e.g., *cannon*, *weapon*, *knives*), 40 nonaggressive words (e.g., *flower*, *summer*, *meadow*), and 80 nonwords (e.g., *rahmin*, *strese*, *faltar*) presented in random order. The nonaggressive words and the nonwords served as covariates to control for overall differences in response latencies regardless of content. The reaction times in the lexical decision task were converted into log scores and were then aggregated into mean scores for aggressive words, nonaggressive words, and nonwords, respectively.

**Aggressive behavior.** The noise blast paradigm, a standard competitive reaction time task often employed in media violence research, was used as a measure of aggressive behavior (Anderson & Bushman, 1997; Ferguson, Rueda, Cruz, Ferguson, & Fritz, 2008). Participants were instructed that they would compete

<sup>2</sup> All film clips are available in both German and English and can be obtained from the first author.

<sup>3</sup> The total length of the SCL measurement prior to the presentation of the film clips was 90 s. The first 10 s were discarded from the analyses to clean the data from fluctuations due to movements and orienting responses at the start of the recording, leaving a baseline period of 80 s.

against another person in a series of 25 trials in how fast they could press a button in response to a visual signal and that the faster of the two would win the trial. They were told that the winner could send an aversive noise stimulus to the other person and that prior to each trial both participants would set the intensity of the noise level they were going to send to the other person in case they won. In fact, there was no other player involved, and the winning and losing trials were computer generated. Prior to the first round, participants received a sample noise blast and did a dummy run to familiarize themselves with the procedure. Noise levels ranged from 60 dB (Level 1) to 105 dB (Level 10, about the same volume as a smoke or fire alarm). A nonaggressive no-noise option (Level 0) was also provided. They were told that prior to each trial they would see the alleged opponent's chosen noise level for the preceding trial and that the other person would see theirs.

The noise level set for the first trial (before participants learned about the noise level set by the alleged opponent) yielded a measure of proactive, *unprovoked aggression* (Giancola & Parrott, 2008). The mean noise level set for the remaining 24 trials served as a measure of reactive, *provoked aggression*, because participants were aware of the noise levels their alleged opponent had set before selecting theirs. The noise level set for the first trial is considered the purer measure of individual differences in aggression, because it is not confounded by the pattern of provocations the participant receives on subsequent trials.

## Procedure

Upon arrival at the lab, participants were seated in front of a computer and connected to the PAR-PORT device for measuring SCL. After the 80-s baseline was recorded, they were shown the first film clip. Participants were randomly allocated to one of two orders (violent film first, comparison film second and vice versa), one of two comparison conditions (sad vs. funny), and one of the two film clips per condition, yielding a total of 16 different combinations. Following the film clip, they rated their pleasant and anxious arousal during the clip and also made ratings of how violent, sad, and funny they found the clip. These measures were completed in a paper-and-pencil format, and the SCL recording was halted during this phase. Then the SCL recording was resumed and, after another 80-s baseline recording period, the second film clip was shown. The procedure was exactly the same for the second film clip, with the same measurements of self-reported arousal and evaluation of the film clip taken immediately afterward. After the second clip ratings were completed, the participants received a standardized set of verbal instructions on screen for the word completion task and for the noise blast task (see

Bartholow et al., 2006). These two tasks were presented in counterbalanced order. The experimenter was present during the whole session but separated from the participant by a screen. At the end of the session, participants were shown an entertaining film about frolicking monkeys designed to dissipate any remaining negative arousal and were fully debriefed before receiving their monetary reward or course credit.

## Results

### Dispositional Measures (Time 1)

The means and standard deviations for the dispositional measures from the online survey (i.e., media violence exposure, trait aggression, trait arousability, and normative beliefs) along with information about internal consistency are presented in Table 1. All measures were found to have good reliability. It should be noted that conceptually, the media violence exposure measure is not required to have high internal consistency because the different genres and media can be used independently of one another, and the index therefore presents a cumulative measure of exposure. Nonetheless, the alpha of .85 reported in Table 1 is substantial, suggesting that preference for violent media contents shows a consistent pattern across genres.

One-way analyses of variance revealed significant gender differences on all of the variables in the study. As shown in Table 1, men scored higher on media violence exposure, acceptance of aggressive norms, and aggressive behavior, and women scored higher on trait arousability. A comparison of participants who took part in both parts of the study with those who dropped out after Time 1 showed no significant differences between the two groups on any of the Time 1 measures, multivariate  $F(4, 567) = 1.23, p = .30$ , all univariate effects  $p > .10$  (see Table 1 for means of the final sample). Therefore, there is no indication that the final sample of participants who took part in the full study was different from the initial, larger sample on any of the variables of interest.

### Laboratory Measures of Aggression and Self-Reported Emotional Arousal (Time 2)

The means, reliabilities, and gender differences for the self-report arousal measures and aggression variables are shown in Table 2. Again, the measures had high internal consistencies, and again there were significant gender differences. Men scored significantly higher on pleasant arousal while watching the clips, whereas women scored significantly higher on anxious arousal.

Table 2

*Means and Gender Differences for Self-Reports of Arousal and Situational Aggression Measures During Laboratory Task (N = 303)*

| Measure                             | Items | $\alpha$ | Range     | $M$  | $SD$ | Men  | Women | $F$      |
|-------------------------------------|-------|----------|-----------|------|------|------|-------|----------|
| Pleasant arousal: All films         | 3     |          | 0–6       | 2.76 | 1.04 | 2.93 | 2.41  | 15.71*** |
| Anxious arousal: All films          | 3     |          | 0–6       | 1.13 | 1.19 | 0.98 | 1.58  | 14.75*** |
| Log response times aggressive words | 40    | .92      | 6.21–7.60 | 6.60 | 0.20 | 6.60 | 6.60  | 0.01     |
| Unprovoked aggression               | 1     |          | 0–10      | 2.19 | 1.63 | 2.29 | 1.82  | 4.95*    |
| Provoked aggression                 | 24    | .96      | 0–10      | 3.63 | 2.02 | 3.62 | 3.50  | 0.19     |

\*  $p < .05$ . \*\*\*  $p < .001$ .

Men also scored higher on unprovoked aggression in the competitive reaction time task.

**Manipulation Checks for Film Clips**

The manipulation checks for the three types of film clips are presented in Table 3. As expected, the two violent film clips were perceived as highly violent, and violence ratings were significantly higher than those for the sad and funny comparison films. The two sad films produced significantly higher sadness ratings than the violent and funny films did, and the two funny films produced significantly higher funniness ratings than the violent and the sad films did. Thus, the clips were successful at representing the categories of violent, sad, and funny films. There were no significant differences within each film condition or between different orders of presentation. Therefore, the data were collapsed across these two variables for further analysis.

**Bivariate Correlations Between Violence Exposure, Aggressive Norms, Arousal, and Aggression**

The correlations between the dispositional trait measures from the online survey, the self-reported measures of arousal in response to the violent film clip, and the postfilm aggression measures are presented in Table 4. Because men and women differed on several of the measures, the correlations are presented separately for men and for women. For both genders, habitual media violence exposure correlated positively with trait aggression, with pleasant arousal to the violent clip, and with more rapid recognition of aggressive words in the lexical decisions task. Trait aggression was linked to beliefs accepting aggression, and trait arousability showed a positive correlation with anxious arousal elicited by the violent clip. In addition, some gender-specific correlations were found. For women, media violence exposure correlated with beliefs accepting aggression and trait aggression correlated with pleasant arousal. For men, trait arousability was negatively correlated with pleasant arousal by the violent clip. Habitual media violence exposure was unrelated to both unprovoked and provoked aggression on the competitive reaction time task for both genders.

**Aggregate Scores of Physiological Arousal**

After they had been cleaned for outliers and adjusted for skewness through square root transformations, the continuous SCL measures during each clip were transformed into five aggregated scores: (a) mean across the first 15 s of the first critical scene (i.e.,

averaged across 150 data points; Time 1); (b) mean across the rest of the first critical scene (Time 2); (c) mean between the first and second critical scene (Time 3); (d) mean across the first 15 s of the second critical scene (Time 4); and (e) mean across the rest of the second critical scene (Time 5). The rationale for selecting the first 15 s into each critical scene (Time 1 and Time 4) was to have a time window of the same duration across scenes that otherwise varied in length. In addition, the 80-s baseline measure was created by averaging across the 800 data points prior to the start of the first clip. No gender differences were found on any of these indices: baseline,  $F(1, 302) = 0.07, p = .78$ ; violent clips, multivariate  $F(6, 296) = 1.70, p = .13$ ; sad clips,  $F(6, 151) = 1.32, p = .25$ ; funny clips,  $F(6, 138) = 1.86, p = .09$ .

**Relations of Self-Reports of Emotional Arousal to SCL Indices of Arousal**

Table 5 shows the partial correlations between self-reports of emotional arousal during the film clips and SCL arousal during the film clips, controlling for baseline SCL. The results show positive correlations between ratings of anxious arousal in response to violent films and SCL for all five consecutive points in time. Conversely, negative correlations were found between reported pleasant arousal and SCL levels across the five indices. In contrast, for viewing the sad and funny clips, none of the correlations between SCL arousal and self-reported pleasant or anxious arousal were significant. These results confer particular validity on the self-report measures of anxious and pleasant arousal while watching violent clips as accurate measures of the strength of emotional responses to such clips. While as Table 7 indicates, the participants showed just as much average SCL arousal to funny films as to violent films, SCL arousal from funny films did not translate into subjective experiences of pleasant (or anxious) arousal.

The analyses addressing our hypotheses are reported in three steps: First, to examine the proposed links between habitual media violence usage and situationally induced arousal and affect, we report the bivariate correlations between past media violence exposure and physiological arousal (Hypothesis 1) as well as self-reported affect (Hypothesis 2) in response to the three types of films. Second, situational arousal and affect elicited by the violent clip are linked to aggressive cognitions and aggressive behavior, placing them in the context of other relevant predictors. A series of multivariate path analyses that includes trait aggression, trait arousability, and aggressive norms is reported to assess the independent contribution of desensitization to the prediction of aggres-

Table 3  
*Manipulation Checks for Violent, Sad, and Funny Films in Laboratory Study*

| Affective response | Violent clips |                       | Sad clips    |                | Funny clips          |                                |
|--------------------|---------------|-----------------------|--------------|----------------|----------------------|--------------------------------|
|                    | <i>Casino</i> | <i>Reservoir Dogs</i> | <i>Champ</i> | <i>Stepmom</i> | <i>Life of Brian</i> | <i>Philosophers' World Cup</i> |
| Was violent        | 5.30 (1.07)   | 5.00 (1.00)           | 0.54 (0.94)  | 0.02 (0.15)    | 1.06 (1.12)          | 0.02 (0.16)                    |
| Was sad            | 2.95 (1.84)   | 1.81 (1.72)           | 4.11 (1.46)  | 4.50 (1.30)    | 0.28 (0.97)          | 0.04 (0.20)                    |
| Was funny          | 0.27 (0.82)   | 0.94 (1.30)           | 0.22 (0.61)  | 0.50 (0.24)    | 4.82 (1.22)          | 4.74 (1.22)                    |

Note. Values are *M* (*SD*). Scale range was 0–6. Violence ratings were significantly higher in the two violent clips than in the sad and funny clips, sadness ratings were significantly higher in the two sad clips than in the violent and funny clips, and funniness ratings were significantly higher in the two funny clips than in the sad and violent clips. All *ps* < .000.



Table 4

*Correlations Between Media Violence Exposure, Trait Aggression, Trait Arousability, Aggressive Norms, Self-Reported Arousal From Violent Clip, and Situational Aggression (N = 303)*

| Variable                                | 1                 | 2      | 3     | 4      | 5                | 6       | 7                | 8      | 9                |
|---|-------------------|--------|-------|--------|------------------|---------|------------------|--------|------------------|
| 1. Media violence exposure              | —                 | .18**  | .04   | .06    | .13 <sup>†</sup> | -.03    | -.21*            | .09    | .11              |
| 2. Trait aggression                     | .18 <sup>†</sup>  | —      | .21** | .49*** | .00              | .05     | -.15*            | .18**  | .12 <sup>†</sup> |
| 3. Trait arousability                   | -.18 <sup>†</sup> | .09    | —     | .11    | -.21**           | .15*    | .02              | -.03   | .11              |
| 4. Aggressive norms                     | .26*              | .38*** | .04   | —      | .01              | .10     | -.08             | .18*   | .26***           |
| 5. Pleasant arousal from violent clip   | .30**             | .27**  | -.06  | .08    | —                | -.43*** | .17*             | .07    | .03              |
| 6. Anxious arousal from violent clip    | -.19 <sup>†</sup> | -.03   | .30** | -.06   | -.39***          | —       | .12 <sup>†</sup> | -.11   | -.01             |
| 7. Log RT aggressive words <sup>a</sup> | -.19 <sup>†</sup> | -.14   | .11   | -.18   | -.11             | -.08    | —                | -.03   | -.08             |
| 8. Unprovoked aggression                | -.03              | .17    | .09   | .01    | -.08             | -.14    | -.09             | —      | .59***           |
| 9. Provoked aggression                  | -.07              | .10    | .05   | -.11   | .12              | .03     | -.09             | .54*** | —                |

*Note.* Men ( $N = 215$ ) are above and women ( $N = 88$ ) are below the diagonal. RT = reaction time.

<sup>a</sup> Controlled for nonaggressive words and nonwords.

<sup>†</sup>  $p < .10$ . \*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

sive cognitions and proactive/unprovoked as well as reactive/provoked aggression (Hypothesis 3). Finally, we contrast responses to the violent clips with those to the sad and funny clips to address the issue of the content specificity of desensitization (Hypothesis 4).

### Relation of Media Violence Exposure With Physiological Arousal to Film Clips (Hypothesis 1)

To control for individual differences in characteristic SCL, we computed partial correlations (controlling for baseline SCL) between habitual media violence exposure and the five SCL indices into which the continuous SCL data were divided. As there were no gender differences in SCL reactions to the films, genders were combined for this analysis. The results are displayed in Table 6. As predicted, habitual media violence exposure showed significant negative correlations with each of the five indices for violent clips, indicating that the more participants were used to media violence, the less physiological response they showed in the course of

watching the violent clip. This finding supports the desensitization hypothesis for violent media. Table 6 further reveals that habitual exposure to media violence was also associated with reduced physiological arousal to sad scenes, indicating that habituation at the physiological levels in those who use a lot of media violence occurs for sad as well as violent content. However, media violence exposure did not correlate with SCL for funny films.

### Relations of Media Violence Exposure With Self-Reports of Arousal to Film Clips (Hypothesis 2)

Our desensitization hypothesis predicted that the more participants habitually used media violence, the more pleasant and the less anxious arousal they would experience when viewing the violent clip. As shown in Table 4, a positive correlation was found for both genders between media violence exposure and pleasant arousal. The correlations with anxious arousal were in the predicted direction but were only marginally significant for women and failed to reach significance for men. When the data from both genders were combined, media violence exposure correlated with

Table 5

*Partial Correlations of SCLs During Violent, Sad, and Funny Film Clips (Controlled for Baseline SCL) With Self-Reported Anxious Arousal and Pleasant Arousal During the Film Clips*

| SCL period | Type of film    |      |       |                  |      |       |
|------------|-----------------|------|-------|------------------|------|-------|
|            | Anxious arousal |      |       | Pleasant arousal |      |       |
|            | Violent         | Sad  | Funny | Violent          | Sad  | Funny |
| T1         | .18**           | .12  | .01   | -.12*            | -.05 | .05   |
| T2         | .19***          | .01  | -.04  | -.19**           | -.06 | .01   |
| T3         | .17*            | -.05 | -.04  | -.15**           | .11  | -.06  |
| T4         | .18**           | -.06 | -.07  | -.19**           | .12  | .03   |
| T5         | .16*            | -.06 | -.06  | -.18**           | .12  | .02   |

*Note.*  $N = 303$  for the violent film;  $N = 158$  for the sad film;  $N = 145$  for the funny film. SCL = skin conductance level; T1 = mean across the first 15 s of the first critical scene; T2 = mean across the rest of the first critical scene; T3 = mean between the first and second critical scenes; T4 = mean across the first 15 s of the second critical scene; T5 = mean across the rest of the second critical scene.

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

Table 6

*Partial Correlations of Habitual Media Violence Exposure With SCLs During Violent, Sad, and Funny Film Clips (Controlling for Baseline SCL)*

| SCL period | Type of film  |               |               |
|------------|---------------|---------------|---------------|
|            | Violent       | Sad           | Funny         |
|            | ( $N = 303$ ) | ( $N = 158$ ) | ( $N = 145$ ) |
| T1         | -.14*         | -.22**        | .11           |
| T2         | -.17**        | -.19*         | .04           |
| T3         | -.19***       | -.16          | -.04          |
| T4         | -.21**        | -.17*         | .00           |
| T5         | -.23***       | -.21**        | .03           |

*Note.*  $N = 303$  for the violent film;  $N = 158$  for the sad film;  $N = 145$  for the funny film. SCL = skin conductance level; T1 = mean across the first 15 s of the first critical scene; T2 = mean across the rest of the first critical scene; T3 = mean between the first and second critical scenes; T4 = mean across the first 15 s of the second critical scene; T5 = mean across the rest of the second critical scene.

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

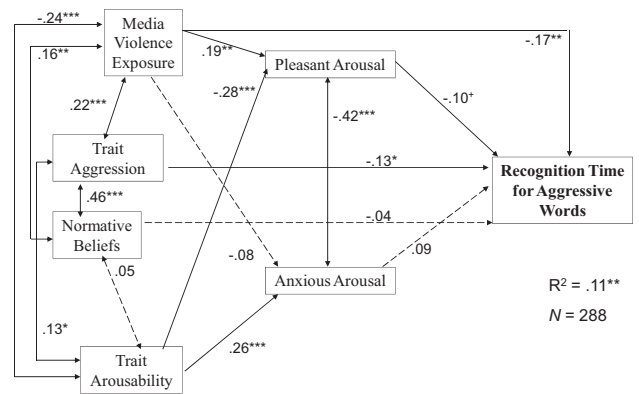
self-reports of pleasant arousal to the violent clips,  $r(302) = .26$ ,  $p < .001$ , and with self-reports of anxious arousal to the violent clips,  $r(303) = -.17$ ,  $p < .01$ . The correlations of habitual media violence exposure with anxious and pleasant arousal following the sad and funny clips were nonsignificant: sad films: anxious arousal,  $r(158) = -.08$ ,  $p = .35$ ; pleasant arousal,  $r(158) = -.04$ ,  $p = .57$ ; funny films: anxious arousal,  $r(145) = -.11$ ,  $p = .19$ ; pleasant arousal,  $r(145) = .09$ ,  $p = .31$ . Although, due to the smaller sample sizes, the power of these significance tests with sad and funny films is less than the tests with violent films, none of the obtained correlations would have been significant even if the sample size had been doubled. Thus, Hypothesis 2 is confirmed by the data.

**Relations of Self-Reports of Arousal to Violent Film Clip With Situational Aggression (Hypothesis 3)**

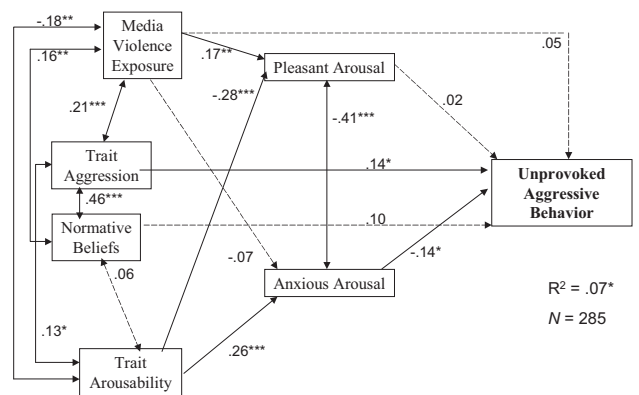
None of the five SCL indices of emotional arousal to violent clips correlated significantly with reaction times for aggressive words in the subsequent lexical decision task or with the intensity of noise blasts in the competitive reaction time task. Consequently, to investigate relations between arousal to the violent films and state aggression outcomes, we examined subjective appraisals by participants of the quality of their arousal in terms of anxiety or enjoyment.

From our theoretical perspective, individual differences in anxious and pleasant arousal while viewing violent clips should be related to individual differences in immediate aggression after viewing violent clips over and above the impact of dispositional variables, such as trait aggression, trait arousability, and normative acceptance of aggression. The pattern of correlations in Table 4 suggests that one needs to examine the relations in a multivariate context to be able to identify the unique role of desensitization. First, pleasant and anxious arousal correlated with each other, for women,  $r(88) = -.39$ ,  $p < .001$ ; for men,  $r(215) = -.43$ ,  $p < .001$ . Second, trait arousability correlated positively with anxious arousal for both genders and negatively with pleasant arousal and positively with trait aggression for men. Third, trait arousability correlated negatively with media violence exposure in women but not at all in men. This suggests that one needs to test the relations with a multivariate model taking account of gender. To review, we had hypothesized that habitual exposure to media violence would be linked to reduced anxious arousal and increased pleasant arousal in response to violent film clips. Furthermore, we predicted that increased pleasant arousal and reduced anxious arousal in response to a violent film clip would be associated with lower reaction times for recognizing aggressive words and a greater readiness to engage in unprovoked aggressive behavior. The relations were hypothesized to be independent of the correlations of aggressive cognitions and behavior with trait aggression, trait arousability, and aggressive normative beliefs.

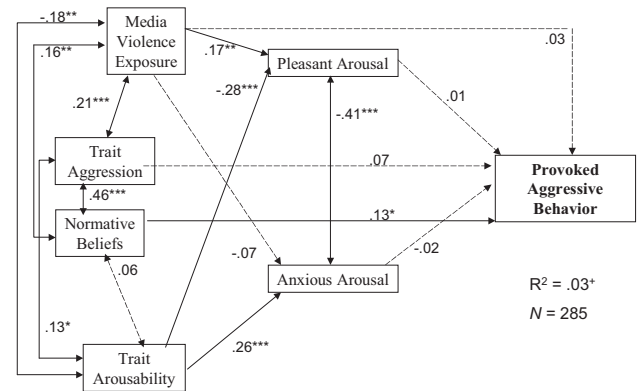
These hypotheses were examined with the three path analyses shown in Figure 1, one for reaction time for recognizing aggressive words as the outcome variable, one for unprovoked aggression in the competitive reaction time task as the outcome, and one for provoked aggression as the outcome. The distinction between unprovoked and provoked aggression is critical for the present analysis, because the unprovoked aggression measure is thought to provide a more conclusive test of the role of habitual media



Chi<sup>2</sup> = 5.37, df = 5, p = .37  
 \*\*\*p < .001, \*\*p < .01, \*p < .05, \*p < .10 CFI = .99, RMSEA = .02 (C.I.: .00-.08), SRMR = .02



Chi<sup>2</sup> = 4.41, df = 5, p = .49  
 \*\*\*p < .001, \*\*p < .01, \*p < .05 CFI = 1.00, RMSEA = .00 (C.I.: .00-.08), SRMR = .02



Chi<sup>2</sup> = 5.87, df = 5, p = .32  
 \*\*\*p < .001, \*\*p < .01, \*p < .05, \*p < .10 CFI = .99, RMSEA = .03 (C.I.: .00-.09), SRMR = .02

Figure 1. Path analyses predicting aggressive cognitions (top), unprovoked aggressive behavior (middle), and provoked aggressive behavior (bottom) as a function of arousal during the violent clips, self-reports of media violence viewing, and other dispositional variables.

violence exposure unaffected by the alleged actions of another person. On the basis of this conceptual argument, separate analyses were conducted for unprovoked and provoked aggression as outcome variables. Because trait aggression, aggressive beliefs, and

trait arousability were shown above to be correlated with the key elements in the models, they were also included. The analyses were carried out with the Mplus software (Muthén & Muthén, 2007).

First, the models were estimated as two-group models, with gender being the grouping variable to allow for gender differences. However, a comparison of the two-group models with the models without gender as a grouping variable on the basis of Bayesian information criterion scores showed no significant advantage in fit for the two-group models. Therefore, single-group models were estimated and are shown in Figure 1. All three single-group models fitted the data well with nonsignificant chi-square values and cumulative fit indices above .99.

The path model for predicting aggressive cognition (reaction times for recognizing aggressive words) showed good fit,  $\chi^2/df = 1.07$ ,  $p = .37$ , comparative fit index (CFI) = 0.99, root-mean-square error of approximation (RMSEA) = .02, standardized root-mean-square residual (SRMR) = .02. The more media violence participants used habitually, the shorter their reaction times in recognizing aggression-related words, independently of the remaining dispositional variables included in the model. Participants who watched more media violence scored significantly higher on pleasant arousal and nonsignificantly lower on anxious arousal. Greater pleasant arousal while viewing the violent clips was linked to shorter reaction times for recognizing aggressive words, but the path fell short of significance ( $p < .10$ ). The total effect of habitual media violence exposure on reaction times was  $-.20$  ( $p < .001$ ), consisting of the direct link of  $-.17$  ( $p < .01$ ) and a marginally significant indirect link via pleasant arousal of  $-.02$  ( $p = .07$ ).

Anxious arousal predicted slightly longer reaction times, but the path was not significant. Anxious arousal was highly negatively correlated with pleasant arousal. These links were independent of the paths from trait arousability to higher anxious arousal and lower pleasant arousal. Overall, these results are consistent with the assumption that media violence exposure desensitized viewers so they responded with more pleasant arousal (highly correlated with less anxious arousal), which in turn increased the availability of aggressive cognitions. These processes operated in parallel with other independent pathways from trait aggression and media violence usage (e.g., observational learning) to increased accessibility of aggression cognitions.

The path model for unprovoked aggression in the laboratory task after exposure to the violent film clips also showed a good fit,

$\chi^2/df = .88$ ,  $p = .49$ , CFI = 1.00, RMSEA = .00, SRMR = .02. Participants who viewed more media violence experienced significantly more pleasant arousal (.17,  $p < .001$ ) while watching violent clips, which was highly negatively correlated ( $-.41$ ,  $p < .001$ ) with anxious arousal. Lower anxious arousal was significantly ( $-.14$ ,  $p < .05$ ) related to more unprovoked aggressive responding in the competitive reaction time tasks. Again, these links were independent of the significant paths from trait arousability on pleasant and anxious arousal in the film task and of trait aggression on unprovoked aggressive responding in the laboratory task. No significant indirect links via pleasant or anxious arousal were found for unprovoked aggression.

Finally, the path model for provoked aggression in the competitive reaction time revealed that lower anxious arousal and greater pleasant arousal to scenes of violence did not play a major role in reactive provoked aggression,  $\chi^2/df = 1.17$ ,  $p = .32$ , CFI = 0.99, RMSEA = .03, SRMR = .02. Neither of the paths from the self-report arousal measures to the aggression measure were significant. The model also showed that normative beliefs approving of aggression were directly linked with provoked aggression. The direct link from trait aggression was not significant, but trait aggression was highly correlated with normative beliefs approving of aggression.

#### Examining the Content Specificity of Desensitization (Hypothesis 4)

##### Physiological arousal to the different kinds of film clips.

The means for the five SCL indices during the film clips are presented in Table 7. The baseline SCL had a mean of 2.70 ( $SD = 0.56$ ). The five SCL scores for violent films were significantly higher than those for sad films, multivariate  $F(5, 152) = 2.66$ ,  $p < .05$ , partial  $\eta^2 = .08$  (all univariate effects significant at  $p < .05$ ). The five SCL scores for the funny films were not significantly different from those for the violent films, multivariate  $F(5, 139) = 1.99$ ,  $p = .09$  (all univariate effects not significant). Thus, we conclude that the sad films stimulated less physiological arousal than the violent clips but the funny films stimulated about the same amount of physiological arousal as the violent clips.

##### Self-reports of arousal to the different kinds of film clips.

According to our script theory of desensitization, media violence exposure should be associated with desensitization of anxious arousal to violent films and corresponding increases in pleasant

Table 7

Comparison of Mean SCL Arousal for Violent Films With Mean Arousal for Sad and Funny Films

| SCL period                          | Violent film ( $N = 303$ ) | Sad film ( $N = 158$ )      | Funny film ( $N = 145$ ) |
|-------------------------------------|----------------------------|-----------------------------|--------------------------|
| T1                                  | 2.86 (0.58)                | 2.77 (0.61)                 | 2.76 (0.53)              |
| T2                                  | 2.85 (0.57)                | 2.69 (0.69)                 | 2.73 (0.53)              |
| T3                                  | 2.79 (0.55)                | 2.65 (0.64)                 | 2.72 (0.54)              |
| T4                                  | 2.79 (0.56)                | 2.65 (0.64)                 | 2.72 (0.55)              |
| T5                                  | 2.74 (0.56)                | 2.65 (0.64)                 | 2.72 (0.55)              |
| MANOVA comparison with violent clip |                            | $F(5, 152) = 2.66, p < .05$ | $F(5, 139) = 1.99, n.s.$ |

*Note.* Means (shown with standard deviations) for violent and sad films are different at  $p < .05$  for every SCL period; means for violent and funny films are not significantly different for any SCL period. SCL = skin conductance level; T1 = mean across the first 15 s of the first critical scene; T2 = mean across the rest of the first critical scene; T3 = mean between the first and second critical scenes; T4 = mean across the first 15 s of the second critical scene; T5 = mean across the rest of the second critical scene; MANOVA = multivariate analysis of variance; n.s. = nonsignificant.

arousal, but the desensitization should be specific to arousal during violent clips. To examine this prediction, we computed the mean arousal scores during the violent clips for high and low media violence viewers and compared those means with the mean arousal scores for high and low violence viewers during the sad and funny clips. To compare the means we conducted a mixed factorial multivariate analysis of variance with habitual media violence exposure (high vs. low; defined via median split) as between-subjects factor and film type as within-subjects factor, using the two arousal measures (anxious, pleasant) as dependent variables. Because only half of the sample watched the sad and funny comparison clips, respectively, separate analyses had to be conducted for comparing violent with sad and violent with funny films.

For the comparison of violent vs. sad films, the analysis yielded a significant multivariate effect of film type,  $F(2, 155) = 53.85, p < .001$ , partial  $\eta^2 = .41$ . Both univariate effects were significant, with violent films producing greater anxious arousal ( $M = 1.75, SE = 0.14$ ) than sad films ( $M = 0.86, SE = 0.11$ ),  $F(1, 156) = 38.69, p < .001$ , partial  $\eta^2 = .20$ . Violent films also produced less pleasant arousal ( $M = 1.49, SE = 0.10$ ) than did sad films ( $M = 2.93, SE = 0.10$ ),  $F(1, 156) = 95.46, p < .001$ , partial  $\eta^2 = .38$ . The multivariate main effect of habitual media violence exposure was also significant,  $F(2, 155) = 4.46, p < .05$ , partial  $\eta^2 = .05$ . Here, the univariate effect for anxious arousal was significant. Participants with high media violence exposure reported lower anxious arousal ( $M = 1.00, SE = 0.15$ ) than did those low on habitual media violence exposure ( $M = 1.61, SE = 0.14$ ),  $F(1, 156) = 8.55, p < .001$ , partial  $\eta^2 = .05$ . The univariate effect for pleasant arousal was marginally significant ( $M = 2.10, SE = 0.09$ , in the low media violence exposure group and  $M = 2.32, SE = 0.09$ , in the high media violence exposure group),  $F(1, 156) = 2.76, p < .10$ , partial  $\eta^2 = .02$ . However, the two main effects were qualified by a significant multivariate interaction effect,  $F(2, 155) = 4.68, p < .05$ , partial  $\eta^2 = .06$ . The means are shown in the top panel of Figure 2. Follow-up  $t$ -tests indicated that the high and low media violence exposure groups differed significantly for the violent films but not for the sad films on anxious arousal,  $t(156) = 2.78, p < .01$ , and on pleasant arousal,  $t(156) = -3.23, p < .01$ . These findings indicate that, as we predicted, participants high in habitual exposure to media violence showed a more positive response to violent scenes than those low in media violence exposure, but the high and low media violence viewers showed no difference in their responses to sad films.

The comparison of violent and funny films also yielded a significant multivariate effect of film type,  $F(2, 141) = 369.47, p < .001$ , partial  $\eta^2 = .84$ . Both univariate effects were significant, with violent films producing greater anxious arousal ( $M = 1.80, SE = 0.14$ ) than funny films ( $M = 0.07, SE = 0.04$ ),  $F(1, 142) = 151.93, p < .001$ , partial  $\eta^2 = .52$ , and violent films also producing less pleasant arousal ( $M = 1.48, SE = 0.12$ ) than funny films ( $M = 5.22, SE = 0.08$ ),  $F(1, 142) = 712.07, p < .001$ , partial  $\eta^2 = .83$ . A second significant multivariate main effect was found for habitual media violence exposure,  $F(2, 141) = 6.57, p < .01$ , partial  $\eta^2 = .09$ . Both univariate effects were significant. Participants with high media violence exposure reported lower anxious arousal ( $M = 0.68, SE = 0.11$ ) than did those low on habitual media violence exposure ( $M = 1.19, SE = 0.11$ ),  $F(1, 142) = 10.81, p < .01$ , partial  $\eta^2 = .07$ . They also showed higher pleasant

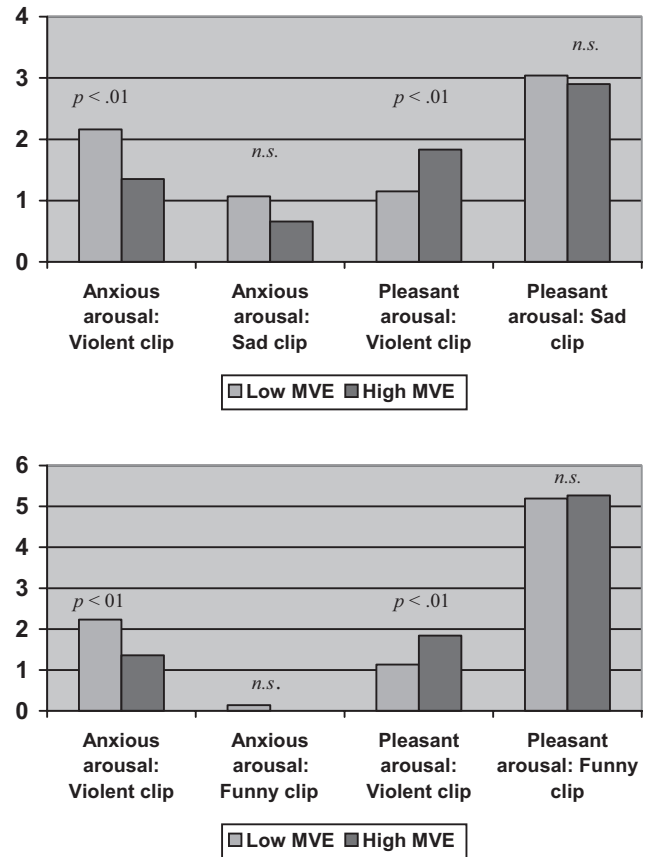


Figure 2. Bar graphs comparing mean anxious and pleasant arousal during violent versus sad clips (top panel) and violent versus funny clips (bottom panel). MVE = habitual media violence exposure.

arousal ( $M = 3.55, SE = 0.09$ , in the high exposure group,  $M = 3.16, SE = 0.11$ , in the low exposure group),  $F(1, 142) = 7.55, p < .01$ , partial  $\eta^2 = .05$ . However, the two main effects were qualified by a significant multivariate interaction,  $F(2, 142) = 4.66, p < .01$ , partial  $\eta^2 = .06$ , and both univariate effects were significant,  $F(1, 142) = 6.71, p < .05$ , partial  $\eta^2 = .05$ , for anxious arousal;  $F(1, 142) = 5.05, p < .05$ , partial  $\eta^2 = .03$ , for pleasant arousal. The means are shown in the bottom panel of Figure 2. Follow-up  $t$ -tests indicated that the high and low media violence exposure groups differed significantly for the violent films but not for the funny films on anxious arousal,  $t(142) = 2.99, p < .01$ , and on pleasant arousal,  $t(142) = -3.08, p < .01$ . Again, these findings indicate that, as predicted, participants high in habitual exposure to media violence showed a more positive response to violent scenes than those low in media violence exposure, but media violence exposure did not affect responses to funny films.

**Self-reported arousal and situational aggression.** The final set of analyses compared the pathways from anxious and pleasant arousal to aggressive cognitions and behavior for the three film types in a set of multiple regression analyses. We predicted that the paths from emotional arousal during viewing the clips to subsequent aggressive cognitions and behavior should be specific to violent clips. The first analysis regressed reaction times for ag-

gressive words (controlled for nonaggressive and nonwords) on anxious arousal in response to violent and funny films. The analysis showed that anxious arousal to violent films significantly predicted reaction times for aggressive words ( $\beta = .21, p < .05$ ; the higher the anxious arousal, the longer it took to recognize an aggressive word), but anxious arousal to funny films did not predict reaction times ( $\beta = .03$ ). The second analysis examined pleasant arousal to violent and funny films. Pleasant arousal to violent films significantly predicted reaction times for aggressive words ( $\beta = -.23, p < .01$ ; the higher the pleasant arousal, the less time it took to recognize aggressive words), but pleasant arousal to funny films did not predict reaction times ( $\beta = .11$ ). Finally, for the sad films neither anxious arousal ( $\beta = .01$ ) nor pleasant arousal ( $\beta = -.03$ ) predicted reaction times for aggressive words. In combination, the findings indicate that individual differences in responsiveness to emotionally arousing material had a content-specific effect on the accessibility of aggressive cognitions and could not be demonstrated for other arousing stimuli.

A parallel set of regression analyses was conducted for unprovoked aggressive behavior as an outcome variable. Higher anxious arousal to violent clips predicted significantly lower levels of unprovoked immediate aggression ( $\beta = -.23, p < .01$ ), but higher anxious arousal to funny clips ( $\beta = -.06$ ) and sad clips ( $\beta = -.03$ ) did not. Similarly, higher pleasant arousal to violent films predicted significantly higher levels of unprovoked immediate aggression ( $\beta = .17, p < .05$ ), but again pleasant arousal to sad films did not ( $\beta = .06$ ), though pleasant arousal to funny films did predict significantly lower aggressive behavior ( $\beta = -.19, p < .05$ ). These findings support the hypothesis that the likelihood of aggressive behavior is increased by desensitization to violent scenes and generally not predicted by desensitization to other kinds of scenes.

A last set of regression analyses compared the three types of film as predictors of provoked aggression. Anxious arousal to violent, sad, or funny films failed to predict provoked aggression, and pleasant arousal to violent and sad clips was also unrelated to provoked aggression. The only significant finding was that pleasant arousal to funny films was negatively related to provoked aggression ( $\beta = -.19, p < .05$ ), paralleling the finding for unprovoked aggression.

In summary, the majority of our predictions were confirmed by the data. Fully supporting Hypothesis 1, habitual media violence exposure showed consistent negative associations with SCL measured at five points in time during exposure to a violent film clip. Partial support was found for Hypothesis 2 predicting lower anxious arousal and higher pleasant arousal to the violent film in participants high on habitual media violence usage. The predicted direct links were found for pleasant arousal but not for anxious arousal. Hypothesis 3 predicted that participants showing higher pleasant arousal and lower anxious arousal to the violent film would respond faster to aggressive words in a lexical decision task and show more unprovoked aggression in the competitive reaction time task. This prediction was confirmed for the link between pleasant arousal and response latencies to aggressive words and for the link between anxious arousal and unprovoked aggression, lending partial support to the hypothesis. Finally, Hypothesis 4, predicting that the links between habitual media violence usage, responses to the film clips, and aggressive thoughts as well as behavior would be dependent on the violent content and not found

for other emotionally charged media stimuli, was also mostly supported by the data.

## Discussion

The debate about the potential of media violence to increase aggression is far from being over, as reflected in a recent issue of *Psychological Bulletin* (Anderson et al., 2010; Bushman et al., 2010; Ferguson & Kilburn, 2010; Huesmann, 2010) and in a 2008 special issue of the *American Behavioral Scientist*, in which Grimes, Anderson, and Bergen (2008) accused "causationists" of "the attempt of making ideology a science" (p. 213). The present research was not designed to settle this question, although we believe that the prior research strongly favors the conclusion of causation. Rather, the present research was designed to investigate the role that emotional desensitization to depictions of violence might play as a potential process variable in the link between media violence and aggression. The study explored desensitization both as an outcome of habitual media violence usage and as a situational antecedent of aggressive cognitions and behavior. Furthermore, it included both SCL and subjectively experienced affect as indicators of desensitization and considered both negatively and positively valenced affective responses. Finally, it compared violent clips with two other types of arousing media stimuli, namely, sad and funny films, to examine the content specificity of the effects.

In support of our hypotheses and in line with previous research, reviewed in the introduction, the findings provide some support for the desensitization hypotheses. Our findings suggest that the more individuals habitually used violent media contents, the less physiological reactivity they showed to a violent film clip presented to them in a laboratory setting. For women there was also a significant link between greater habitual media violence exposure and greater pleasant arousal in response to the violent film. For men, the correlation was in the same direction but was only marginally significant. For men there was a significant correlation between greater habitual media violence exposure and more rapid accessibility of aggressive cognitions after viewing the violent film clip. For women, the correlation was in the same direction but was only marginally significant.

Although significant correlations were found between SCL and the subjectively experienced ratings of anxious and pleasant arousal, when examined on their own, physiological responses reflecting the intensity of arousal turned out to be unrelated to subsequent aggressive cognitions and behavior. The failure to find any links of SCL with aggressive cognitions and behavior ties in with prior research that found little evidence of a link between physiological arousal and laboratory-induced aggression (Patrick & Verona, 2007). Research on psychopathy points to a link between habitual electrodermal hyporeactivity and higher aggression (Scarpa & Raine, 2007) as well as low anxiety combined with higher information processing deficits (for a review see Fowles, 2000). However, the short-term variations in SCL observed in the present study did not covary with differences in aggressive cognitions and behavior. Our data suggest that it is the qualitative aspect of arousal that is needed to understand the role of desensitization by negative affect and sensitization by positive affect in aggressive cognitions and behavior following exposure to violent media stimuli. When we examined self-reports of emotional reac-

tions to the films, we found that anxious arousal to the violent clip was lower and pleasant arousal was higher among heavy users of media violence than among low media violence users, also indicating that habitual media violence usage is linked to desensitization of negative and sensitization of positive affect in response to violent media stimuli.

In moving beyond bivariate relationships to examine the role of media violence usage in the context of other dispositional predictors of aggressive cognitions and behavior, path analysis was used. This is a common approach in research designed to identify the specific contribution of media violence exposure to aggression-related outcome variables controlling for other relevant predictors (e.g., Ferguson et al., 2008). For response latencies in the lexical decision task, a significant direct path was found from habitual media violence exposure to recognition times for aggressive words. In addition, there was evidence of an indirect pathway through higher pleasant arousal which in turn showed a marginally significant negative link with recognition times. For unprovoked aggression as outcome variable, no direct or indirect links were found with habitual media violence exposure, but a significant negative link was found with anxious arousal. Of the dispositional measures, trait aggression was positively related to unprovoked aggression. Finally, in the path model for provoked aggression, the trait of acceptance of aggression as normative was the only significant predictor. Neither habitual media violence exposure nor the affective responses to the violent clips were significantly related to provoked aggression.

Although not all predicted links between habitual media violence exposure, situational arousal, and aggressive cognitions and behavior were confirmed, the present data provide significant support for the claim that habitual users of media violence become desensitized to violence as evidenced in higher self-reported pleasant arousal to scenes of violence in the media. There is also some indication that differences in pleasant arousal, associated with differences in habitual media violence exposure, affect the speed with which individuals access aggressive cognitions and the likelihood of engaging in unprovoked aggression in the noise blast task. Results were less conclusive with respect to the role of reduced anxious arousal. Lower anxious arousal in response to the violent clip predicted higher scores of unprovoked aggression, but the level of anxious arousal in our study was unrelated to habitual media violence exposure. There was no evidence in the present data that emotional responses to the violent film were related to provoked aggression or that SCL measures of physiological arousal were linked to the aggression-related outcome variables.

The associations observed between media violence exposure, emotional responses to the film clips, and aggression-related outcome variables were specific to violent media stimuli and were not apparent for other emotionally charged stimuli, such as sad or funny film clips. Lower anxious arousal and higher pleasant arousal to violent clips but not to sad or funny clips predicted faster recognition of aggressive words. Lower anxious arousal to violent but not to sad or funny clips predicted higher unprovoked aggression, as did higher pleasant arousal to violent but not to sad films. One exception was the finding that habitual media violence exposure was not only correlated with reduced physiological arousal to the violent film clips but also correlated with reduced arousal to the sad clips. The latter finding can be attributed to the conceptual overlap between the themes of violence and death in the violent

and sad clips. Violent media stimuli are closely related to the theme of death, and the two sad film clips used in our study centered on the death of a beloved person, so the finding that reduced responsiveness at the physiological level was also found for the sad clips is compatible with the desensitization hypothesis. Another unexpected result was that higher pleasant arousal to funny films predicted reduced aggression. However, this result is consistent with the theory that when emotions incompatible with aggression are stimulated, aggression becomes less likely (Tyson, 1998).

The links of pleasant and anxious arousal to the aggression outcomes occurred independently of the dispositional variables that were measured. Trait aggression showed independent direct paths on reaction times and unprovoked aggression; media violence exposure directly predicted the reaction time for recognizing aggressive words; trait arousability was a positive predictor of anxious arousal and a negative predictor of pleasant arousal; and normative beliefs approving of aggression directly predicted provoked (reactive) aggressive behavior. Also as expected, trait aggression was significantly correlated with media violence exposure and normative beliefs approving of aggression. The hypothesized paths from media violence exposure through arousal reactions to violent clips to the aggression outcomes occurred independently of these relations.

Physiological arousal to violent clips, as measured by SCL, was lower the more participants habitually used media violence. Within the experimental situation, SCL during the violent scenes was positively correlated with anxious arousal and negatively correlated with pleasant arousal. This finding fits with a study by Ravaja, Saari, Salminen, Laarni, and Kallinen (2006), who analyzed patterns of SCL during video game play in relation to predefined positive and negative game events and found higher SCL responses to negative than to positive events. In understanding this pattern, dimensional models of emotion that differentiate between activation (physiological arousal) and valence (perceived pleasant or unpleasant quality; Ravaja, 2004) may be useful. In the dimensional model proposed by Larsen and Diener (1992), for example, fear is regarded as an emotion that is high in activation and negative in valence, whereas happiness/satisfaction is considered to be of medium activation at the positive end of the valence dimension. Thus, fear/anxiety is seen as being associated with high activation, whereas happiness/satisfaction is seen as being associated with a lower level of activation. The negative correlation between subjective ratings of anxious arousal and pleasant arousal corroborates the theoretical conceptualization of the two emotional responses as opposite ends of the valence continuum. The dimensional model can also be used to explain the finding that the five SCL indices were higher during the violent clips than during the sad clips. Sadness and fear are both negatively valenced emotions but they differ in activation, with fear being at the high end and sadness being close to the midpoint of this dimension.

In our data, differences in physiological arousal during the violent film clips were unrelated to differences in the subsequent lexical decision and noise blast tasks, but differences in the qualitative indices of anxious and pleasant arousal mostly showed the expected relations with aggressive cognitions and behavior. The lack of relationships between SCL in response to violent films and subsequent aggressive cognitions and behavior is at odds with meta-analytic evidence by Anderson and Bushman (2001). How-

ever, their analysis was restricted to interactive video games, whereas the present study involved passive reception of filmed violence. Studies comparing active playing of video games and merely observing the violent contents by watching the players showed that active playing produced higher levels of arousal than passive observation of identical content did (Calvert & Tan, 1994). Furthermore, none of the seven studies included in Anderson and Bushman's (2001) meta-analysis used SCL as a measure of arousal. Past research has been inconsistent with regard to the relationship between SCL and self-reported affect. Over a 3-week period, Ballard et al. (2006) found evidence of decreased reactivity to video game exposure (regardless of violent content) at the physiological level but not at the level of affective responses. Arriaga et al. (2006) compared both physiological arousal and affect over a much shorter game-playing period of 4 min, finding differences between violent and nonviolent game players in affective responses but not at the physiological level. Our study was more similar in design to the Arriaga study in that our film clips were of similar length to their game-playing periods, and we also found little evidence of desensitization at the physiological level but more evidence at the affective level. In any case, clarifying the relative contribution of physiological arousal and experienced affect is an important task for future research.

Several limitations must be noted about this study. The first is that whereas SCL was recorded continuously during exposure to the film clips, the qualitative measures of anxious and pleasant arousal were obtained immediately after the film clips had ended. Reliance on self-reports to yield these measures made continuous assessment impossible as it would have distracted from watching the films. Other methodological approaches, such as recording physical responses indicative of the quality of arousal, would be required to overcome this problem. The study by Ravaja et al. (2006), who combined SCL with the electromyographic recording of facial muscle movements as a continuous measure of quality of arousal during video game playing, illustrates this possibility.

A second limitation was that transfer effects of reduced arousal during the violent clip to reduced arousal to depictions of real-life violence were not considered. Our focus was on the disinhibiting effect of reduced anxious reactivity on aggressive cognitions and behavior, but it would also be critically important to demonstrate that reduced negative affect as a result of exposure to media violence leads to reduced arousal by real-life violence and reduced empathy with victims. Carnagey et al. (2007) demonstrated that participants who had previously played a violent game showed less arousal in response to real-life violence than those who had played a nonviolent game. However, they presented the depictions of real-life violence immediately after the game-playing session, so nothing can be said on the basis of that study about the duration of desensitization, nor about any cumulative effects. Further research combining measures of habitual media violence exposure and situational desensitization are needed to clarify these issues.

Third, although the noise blast test is a tried and tested method of measuring aggression in the laboratory and there is evidence of a high convergence between laboratory and field studies of aggression (Anderson, Lindsay, & Bushman, 1999), no inferences can be derived from the present laboratory data to aggression in natural contexts. In addition, unprovoked aggression was represented by a single-item measure due to the interactive design of the noise blast task, which makes all

responses from the second trial onward contingent upon the initial response by the alleged opponent. Therefore, the findings should be substantiated by other measures of unprovoked aggressive behavior with known reliability. At the same time, this weakness should not obscure the fact that for the male participants at least, the measure of trait aggression, representing their "real-world aggression", was correlated both with their habitual media violence exposure and with their aggressive behavior on the laboratory task.

Fourth, and perhaps most important theoretically, no short-term field or laboratory study can determine with certainty that the relation between an individual's history of media violence exposure and current emotional reactions to violent clips is due to desensitization. A plausible alternative hypothesis will always be that dispositional factors promote both the different emotional reactions and the exposure to media violence. However, in the current study we controlled for the most plausible dispositional "third variables" that might be alternatives (trait aggression, trait arousability, and beliefs accepting aggression as normative) and found that habitual media violence exposure predicted desensitization independently of these dispositions.

Finally, the present study was limited in that only responses to passive media exposure were studied. A number of recent studies have looked at desensitization in response to violent video game usage that entails a much more active involvement of players. There is evidence from this research that immersion in the violent events of the game, for example by playing with a virtual reality device, is a critical variable with respect to arousal (Arriaga et al., 2006), but it is as yet unclear how such increased arousal potential affects desensitization. Moreover, studies are needed that compare passive reception of and active involvement in violent events in the virtual reality of the media in terms of their desensitizing potential (see Ballard et al., 2006).

Despite these limitations, the present findings can provide some new insights into the dynamics of affective reactivity to media violence. Several, yet not all, of the findings support our theorizing that weakening fear and anxiety in response to media violence (and the concomitant increase in pleasant emotions) through repeated exposure promotes aggression-enhancing cognitions and, ultimately, the likelihood of initiating proactive aggressive behavior. Our results further suggest that the relations are contingent upon the violent content of the media stimuli, as evidenced by the comparison with sad and funny clips that are also emotionally arousing. The findings join a growing body of research directed at elucidating the processes by which exposure to violent media stimuli may impact aggression, moving on from the issue of whether or not media violence exposure is linked to aggression to a better understanding of the psychological mechanisms that may explain such a link.

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