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Violent Media Consumption and the Recognition of Dynamic Facial Expressions

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This study assessed the speed of recognition of facial emotional expressions (happy and angry) as a function of violent media consumption. Color photos of calm facial expressions morphed to either an angry or a happy facial expression. Participants were asked to make a speeded identification of the emotion (happiness or anger) during the morph. Results indicated that, independent of trait aggressiveness, participants high in violent media consumption responded slower to depictions of happiness and faster to depictions of anger than participants low in violent media consumption. Implications of these findings are discussed with respect to current models of aggressive behavior.

Keywords: *media; aggression; violence; video games*

For nearly 100 years, the effects of exposure to violent media (e.g., comic books, movies, television, and video games) have come under scientific, public, and political scrutiny (Anderson & Bushman, 2002). As early as 1910, comic strips published in newspapers were thought to be a "menace" to society. In fact, comics were thought to weaken the use of good manners, teach lawlessness, cheapen life, and increase the chance of mental illness (Starker, 1989). The first empirical research addressing the effects of violent media was undertaken between 1929 and 1932, in what has become known as the "Payne Fund Studies" (Jowett, Jarvie, & Fuller, 1996). The Payne Fund Studies assessed, among other things, the influence of movies on children's emotions, morals, sleep habits, attitudes, and behavior. By the

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1950s, concern that violence in comic books might increase aggression in children (Wertham, 1954) led to the development of a Comics Code Authority, a self-censoring agency for comic book content developed and enforced by the producers of comic books (Savage, 1990). In the 1970s, the U.S. surgeon general warned of individual differences in the susceptibility to the potential negative effects of violent television (U.S. Surgeon General's Scientific Advisory Committee, 1972). More recently, research on the deleterious effects of violent video games on children and adolescents were presented to a U.S. Senate Commerce Committee (e.g., *The Impact of Interactive Violence*, 2000; *Violent Video Games*, 2000). Consistently, research has demonstrated that exposure to violent media appears to increase aggressive behavior, thoughts, and feelings in children, adolescents, and young adults (Anderson & Bushman, 2001). This connection has been found using correlational (e.g., Fling et al., 1992; Griffiths & Hunt, 1995) and experimental (e.g., Anderson & Dill, 2000; Ballard & Lineberger, 1999) methodologies. However, in spite of these findings, the impact of media violence continues to be underreported by news services (Bushman & Anderson, 2001).

Recently, Anderson and Bushman's General Aggression Model (GAM; 2002) has been developed, in part, to account for the effects of violent media on aggressive behavior. According to the GAM, input variables, involving a person (e.g., trait hostility, attitudes toward violence) and a situation (e.g., exposure to real-world or media violence) influence that individual's present internal state. Within an individual's internal state, cognitions (e.g., aggressive scripts, hostile thoughts), affects (e.g., hostile feelings), and arousals (e.g., heart rate, blood pressure) reciprocally influence one another. For example, hostile cognitions can increase hostile feelings (an affect). Subsequently, cognitions, affects, and arousal interrelate to influence outcome, such as an individual's decision-making processes and social interactions. For example, an individual might have to interpret the cause of an aggressive act (e.g., harmdoer has hostile or benign intent). When an interpretation has been made (i.e., harmdoer had benign or malevolent intent), decision-making processes (e.g., aggress, ignore) lead to the onset of thoughtful or impulsive action. Within the GAM, behavior and the response to that behavior operate cyclically in a feedback loop, subsequently affecting future situational and person inputs. Thus, violent media consumption can lead to short-term (as a situational variable) and long-term (by affecting person factors) changes in cognitive processing and aggression-related behavior. Although a great deal of research has linked violent media with aggressive behavior and, to a lesser extent, cognitive processes (Anderson & Bushman,

2001), less is known about the effects of violent media on attentional biases for affectively laden stimuli.

According to the GAM, internal-state variables affect the processing of new information by creating an attentional bias for mood-congruent information. Thus, emotional stimuli of a valence similar to that of activated cognitive internal-state variables should garner greater attentional resources. The association between *affect* and *cognition* has been assessed by numerous researchers using a modification of the Stroop color-naming task (Stroop, 1935). This modified procedure, known as an "emotional Stroop," requires that participants identify the color of emotionally laden and nonemotionally laden words as quickly as possible (see Eckhardt & Cohen, 1997). The difference in reaction time (RT) between emotional and neutral words represents the degree to which the content of the words (which is irrelevant to the color identification task) affects attentional resources. Kirsh, Olczak, and Mounts (2005), found that individuals exposed to violent video games showed greater Stroop interference for negative valenced words (in comparison to neutral words) than participants playing nonviolent video games. These findings suggest that violent video game play may induce a processing bias, subsequently rendering emotionally congruent stimuli more attentionally salient and hence receive greater cognitive processing.

The results of Kirsh et al. (2005) are intriguing and provide further evidence of biased cognitive processes associated with exposure to violent media. This processing bias made threatening information (the threat words) more salient and, therefore, more difficult from which to withdraw attentional resources. As noted above, in the Stroop task used by Kirsh et al., the words (threat and neutral) were irrelevant to that task (identifying the color used to display the words). In the current study, we assessed whether such processing biases can be observed when the task itself is to identify emotionally valenced information. Specifically, we examined the perceptual processing of facial expressions. In addition to giving a direct measure of the processing of differently valenced information, the stimuli and task present a more ecologically realistic situation (i.e., identifying the emotion being expressed by a person as it evolves).

The ability to monitor and correctly identify facial expression is a key component of social relationships (Halberstadt, 2003). For instance, the recognition of *sadness* may evoke comforting behavior, and the identification of *fear* may elicit protection. Conversely, the misidentification of *anger* may increase the likelihood of a behavioral interaction becoming aggressive. The interpretation of basic emotional expressions (i.e., happiness, sadness,

anger, fear, disgust, and surprise) has been found to be influenced by factors external to the individual (such as situational information and verbal labels; Carroll & Russell, 1996). Halberstadt (2003) argued that verbal explanations of an emotional expression bias the configural processing of the face toward the affect described in the verbal explanation. These studies demonstrate that experimentally induced cognitive biases can alter the perceptual processing of emotional expressions. Thus, such perceptual processes may also be sensitive to other cognitive biases, such as those postulated by the GAM to arise as a result of exposure to violent media. Previous research has connected violent media consumption and the expression of affect (Anderson & Bushman, 2001). However, little research has assessed the influence of violent media consumption on affect recognition.

In summary, the purpose of the current study is to assess the impact of violent media consumption and the identification of positive and negative emotions. To address this issue, participants watched a series of calm facial expressions morph (i.e., change) to either an expression of happiness or anger. Participants were asked to make a speeded identification of the emotion (happiness or anger) as soon as possible during the morph sequence. Based on the contention that exposure to media violence increases the salience of negatively valenced information (Kirsh et al., 2005), it is hypothesized that participants reporting a high degree of violent media consumption will evidence a negative processing bias, relative to participants reporting low levels of media violence exposure.

Method

Participants were 118 students (66% female, 88% White) from lower-division psychology courses at a public liberal arts college in western New York State. Participants received extra credit for participation in the current study. Participants' ages ranged from 17 to 22 years.

Materials

Trait aggressiveness. The Aggression Questionnaire (AQ; Buss & Perry, 1992) was used to assess trait levels of aggressiveness. The AQ is a 29-item instrument designed to measure four dimensions of aggression: anger, hostility, verbal aggression, and physical aggression. For the current study, responses were summed to create a total trait aggressiveness score. Previous research has shown that individuals high in trait anger and hostility process social information more negatively than individuals low in trait

anger and hostility (e.g., Epps & Kendall, 1995; Kirsh & Olczak, 2000). Thus, the summary score from the AQ will be entered as a covariate in subsequent analyses.

Media Consumption Questionnaire. The present media consumption questionnaire is an adaptation of a measure created by Funk and colleagues (Funk, Buchman, Jenks, & Bechtoldt, 2003). For the current study, estimated hourly consumption per week of each media type was added to the questionnaire. Participants were asked about their general media consumption habits in an average week. Specifically, participants were asked to identify their two favorite content categories for television (e.g., educational, sports with violence, sports without violence, real people not fighting, real people fighting, etc.), video games (e.g., reach goals with killing, reach goals without killing, racing, sports without violence, etc.), and movies (e.g. action adventure without fighting, action adventure with fighting, horror, documentaries, etc.), and how often (reported in hours and minutes) they watch and/or play each content category in an average week. The composite variable violent media consumption was created by combining media categories containing aggressive content (e.g., reach goals killing, real people fighting, etc.). Similarly, the composite variable nonviolent media consumption was created by combining media categories lacking aggressive content (e.g., reach goals without killing, real people not fighting, etc.). The percentage of time-consuming violent media was calculated by dividing the total amount of violent media consumption by the total amount of media consumed (i.e., violent and nonviolent). Individuals consuming greater than or equal to 50% violent media were classified as high violent media consumers whereas individuals consuming less than 50% violent media were classified as low violent media consumers.

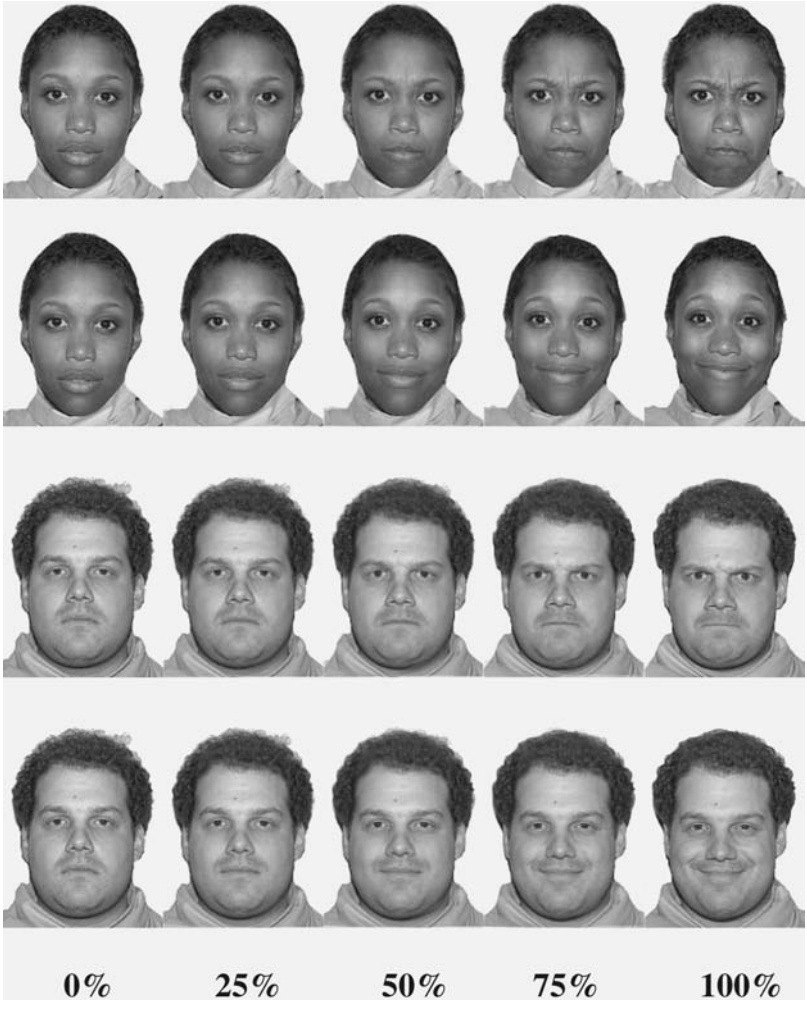
Face stimuli. Depictions of closed-mouth calm facial expressions and corresponding (i.e., same model depicting the emotion) expressions of closed-mouth anger and closed-mouth happiness were taken from the NimStim Face Stimulus Set (MacArthur Research Network on Early Experience and Brain Development, 2002).[1] The NimStim Face Stimulus Set contains color photographs of adult males and females, of varying races, depicting frontal views of emotional expressions. For the current study, we used 12 facial expressions (6 angry, 6 happy) for a block of practice trials, followed by an experimental block of 60 expressions (30 angry, 30 happy). Within the experimental block, 30 different models were used, each expressing happiness and anger. Of the

30 models used in the experimental block, 19 were male and 11 were female. Twenty of the models were White (5 female), seven of the models were African American (3 female), two were Asian (both female), and one was classified as Other (female). Given that racial biases may affect the processing of faces of individuals outside one's race (Anthony, Copper, & Mullen, 1992), race of participant will be entered as a covariate in the main analyses. See Figure 1 for a sample of four dynamic sequences at 0%, 25%, 50%, 75%, and 100% changed.

Creation of the dynamic stimuli. For each corresponding pair of facial expressions (i.e., calm/happy or calm/angry) a dynamic facial expression was created by morphing (i.e., changing) the calm expression to either happiness or anger using the computer program Magic Morph (iTinysoft, 2002). To create each morph, the start emotion (i.e., calm) and the target emotion (e.g., happy) were matched using approximately 75 feature points. For instance, the corner of the left upper lip for the start emotion (i.e., calm) was matched to the corner of the left upper lip for the target emotion (e.g., happy). Magic Morph interpolates the intervening points between the start and target images to create new images. A total of 20 bitmap images were created for each dynamic facial expression. When viewed in sequence, the 20-bitmap images give the appearance of a calm person becoming either angry or happy. For each photographed individual, a dynamic facial expression was created to depict emotional expressions changing from calm to angry and from calm to happy.

Dynamic Emotion Identification Task (DEIT). Stimulus presentation and response collection were accomplished using custom scripts created in E-Prime (Psychology Software Tools, 2002). Each trial began with a warning signal (fixation cross), followed 500 ms later by the presentation of the dynamic facial expression. Each dynamic facial expression was created by displaying 20 individual bitmaps, each for 120 ms. One half of the participants were instructed to press the z key if they identified a dynamic facial expression changing from calm to angry and the / key if they identified the dynamic facial expression changing from calm to happy; the other half of the participants were randomly assigned to the opposite-response mapping condition. Stimulus displays were response terminated, and participants were notified of incorrect responses by a red X appearing in the middle of the screen. Trials were force paced, with an intertrial interval of 2.5. The ordering of the 30 calm-to-angry and 30 calm-to-happy dynamic facial expressions was randomly set for each participant.

Figure 1
Dynamic Sequences at 0%, 25%, 50%, 75%, and 100% Changed



Emotion effect. The variable emotion effect was created for each individual by subtracting the average reaction time (RT) for calm/happy dynamic facial expression from the average RT for calm/angry dynamic facial expression. Positive scores thus represent faster recognition of happy expressions,

a finding that is typically observed (i.e., the happy-face advantage; e.g., Billings, Harrison, & Alden, 1993; Leppänen, Tenhunen, & Hietanen, 2003). Thus, larger emotion effect scores represent a larger happy-face advantage, whereas smaller emotion effect scores represent a smaller happy-face advantage (a score of 0 would indicate no advantage for recognizing happy faces).

Procedure

At the beginning of the semester, participants filled out the AQ. Approximately 6 to 10 weeks later, these participants were recruited to participate in the media consumption survey portion of the study. After filling out the questionnaire assessing media consumption, participants were randomly assigned, within gender, to one of the two response mappings. To familiarize participants with the task, and thus reduce error, a series of 12 practice expressions (6 calm/angry, 6 calm/happy) were presented. Following the brief (fewer than 2 minutes) training period, the DEIT was conducted. The dynamic facial expressions used during the training period were not used during the experimental task.

Results

Preliminary Analyses

DEIT. Participants were excluded from the study if their performance on the DEIT resulted in an error rate greater than 15%. Based on criterion, two participants were excluded from subsequent analyses.

Gender. A series of ANOVAs was conducted to assess differences in media consumption as a function of gender. The ANOVA for violent media consumption was significant, $F(1,138) = 25.3$, $p < .0001$, $\text{eta}^2 = .16$, observed power = .99. Results indicated that, in an average week, males ($M = 7.3$, $SE = .7$) consumed more violent media than females ($M = 3.0$, $SE = 0.5$). In contrast, the ANOVA for nonviolent media consumption was nonsignificant, $F(1,138) = 2.2$, $p > .10$, $\text{eta}^2 = .01$, observed power = .32. However, the trend was similar to that for violent media consumption, with males ($M = 9.0$, $SE = 1.0$) consuming slightly more nonviolent media than females ($M = 7.3$, $SE = 0.7$). Given that males and females differed in terms of total violent media consumption, and trended toward a difference

for nonviolent media consumption, gender was entered as a factor in subsequent analyses.

Main Analyses

To test the effects of violent media consumption on the identification of dynamic facial expression, a 2 (Violent Media Consumption) × 2 (Gender) ANCOVA was conducted, with emotion effect as the dependent variable and race of participant and trait aggressiveness as the covariates. Average RTs for calm/happy and calm/angry dynamic facial expression were based on correct responses only. The main effect for violent media consumption was significant, $F(1,112) = 3.97$, $p < .05$, $\text{eta}^2 = .035$, observed power = .5. Results (in milliseconds) indicated that individuals high in violent media consumption showed a significantly reduced happy-face advantage ($M = 32$ ms, $SE = 22$) in comparison to individuals low in violent media consumption ($M = 83$ ms, $SE = 11$). All other main effects, interaction effects, and covariates were nonsignificant. The error rate was less than 2% for each type of dynamic facial expression. Comparable analyses were run on the error rates. None of the main effects or interactions reached significance, and the pattern was not consistent with the presence of a speed-accuracy trade-off.

Discussion

The finding that males watched more violent media than females is consistent with previous research. For instance, Collins-Standley, Gan, Yu, and Zillman (1996) demonstrated that 2- to 4-year-old boys preferred fairy tales replete with violence whereas same-age girls preferred romantic fairy tales. Valkenburg and Janssen (1999) found that 1st- through 4th-grade Dutch boys and American boys, more so than same-aged girls, preferred television shows with violence. Similarly, boys play video games more than girls; and when engaged in video game play, boys express a greater preference for violent games than girls (Funk & Buchman, 1996). Finally, Goldstein (1998) reported that violent media appeals more to adult males than females. Thus, cutting across age, culture, and presentation medium (e.g., television, movies, and video games) males, more so than females, generally are exposed to and prefer media laden with violence.

As noted above, participants are generally faster to identify happy compared to angry expressions (e.g., Billings et al., 1993; Leppänen et al., 2003). Leppänen et al. (2003) offered several possible explanations for this

happy-face advantage, including the distinctiveness of the visual features of happy faces, the ambiguity of negative facial expressions, and emotion congruence effects. Indeed, Leppänen and Hietanen (2003) found that the presence of pleasant and unpleasant odors could modulate the happy-face advantage, implicating a link between emotional and cognitive processing in the happy-face advantage. The current study suggests that the same happy-face advantage observed with static stimuli is obtained with dynamic emotional expressions as well.

With regard to media consumption, the results of the current study found that, compared to individuals low in violent media consumption, individuals high in violent media consumption exhibited a reduced happy-face advantage. Specifically, participants high in media violence consumption were faster at identifying anger and slower at identifying happiness relative to the participants low in violent media consumption. This reduction of the happy-face advantage in the high violent media consumption group suggests an increased negative processing bias in the recognition of emotional expressions (Leppänen & Hietanen, 2003). Thus, the results of the current study are consistent with earlier work finding relationships between exposure to violent media and aggressive biases in social information processing (Anderson & Dill, 2000; Bushman & Geen, 1990; Kirsh, 1998; Kirsh & Olczak, 2002; Kirsh et al., 2005; Lynch, Gentile, Olson, & van Brederode, 2001). For instance, Bushman (1998) found that playing violent video games resulted in faster RT when identifying strings of letters as aggressive words or nonwords in a lexical decision task. Similarly, Kirsh et al. (2005) found that individuals playing a violent video game showed greater Stroop interference for anger- and/or threat-related words than participants playing a nonviolent video game. The current research suggests, therefore, that violent media exposure may predispose an individual to perceive anger more rapidly when anger is present. Thus, in experiments involving ecologically realistic and nonrealistic stimuli, violent media consumption appears to bias attention toward threatening affect.

Additional research on social information processing has found that playing violent video games (Kirsh, 1998) and reading violent comic books (Kirsh & Olczak, 2002) increases the likelihood of inferring hostile intent to the actions of another, even though the intent of that individual is unclear. Taken together, these findings suggest violent media produces attentional biases that affect ambiguous and unambiguous processing of information. In turn, this attentional bias may then increase the likelihood of acting aggressively by priming aggressive scripts. Huesmann (1988) contended that in

response to experiences with aggressive stimuli and behavior (including the observation of aggressive acts performed by others) individuals develop aggressive scripts. These scripts contain information regarding the participants and events surrounding the aggressive act, such as the nature of the provocation and subsequent response. The results of the current study suggest that high exposure to violent media biases attention toward negatively valenced information, potentially triggering already developed aggressive scripts. Thus, in combination with aggressive scripts, violent media exposure may increase the likelihood of acting aggressively by increasing the propensity to perceive aggression in situations involving clear and ambiguous acts of aggression.

However, it should be stated that exposure to violent media is just one of many factors that influence aggressive behavior (Kirsh, 2003). Multiple factors have been shown to contribute to aggressive behavior across the lifespan. Family (e.g., low parental involvement, verbal and physical aggression), peer (e.g., aggressive or nonaggressive, popularity), school (e.g., achievement, dropout status), and personality (e.g., self-esteem) factors have all been linked to aggression (Leschied, Cummings, Van Brunschot, Cunningham, & Saunders, 2000). Furthermore, Garbarino (1999) contended that the number of risk factors present is an important determinant of aggression. It may be that violent media consumption primarily affects the aggressive behavior of individuals who already have a certain number of risk factors associated with aggression (e.g., impulsivity, violent home, aggressive peer group). Future research should investigate the roles of multiple risk factors on affect recognition.

Of note, individuals high in trait aggressiveness did not show a reduced happy-face advantage. However, whereas some studies have shown that components of trait aggressiveness, such as trait hostility, increase the effect of violent media exposure, others have not (Anderson et al., 2003). Thus, although we cannot rule out the influence of personality in affecting the RT for emotion identification, the findings in the literature are not strong enough to preclude the conclusion from the current study that violent media exposure, independent of trait aggressiveness, affected RTs for emotion recognition.

In conclusion, the processing of dynamic facial expressions appears to be affected by violent media consumption. However, additional research is necessary to determine the role that multiple risk factors play in the identification of dynamically changing positive and negative emotions. Finally, these findings underscore current theories of aggression (e.g., Anderson & Bushman, 2002) that emphasize the complex role that situational and individual difference variables play in ultimately determining aggressive behavior.

Note

1. Development of the MacBrain Face Stimulus Set was overseen by Nim Tottenham and supported by the John D. and Catherine T. MacArthur Foundation Research Network on Early Experience and Brain Development. Contact Nim Tottenham at e-mail: tott0006@tc.umn.edu for more information concerning the stimulus set.

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