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Journal of Adolescence 27 (2004) 53–69

Journal of
Adolescence

www.elsevier.com/locate/jado

Playing violent electronic games, hostile attributional style, and aggression-related norms in German adolescents

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Received 30 October 2003; accepted 30 October 2003

Abstract

The relationship was examined between exposure to and preference for violent electronic games and aggressive norms as well as hostile attributional style. Following a pilot study to sample widely used electronic games varying in violent content, 231 eighth-grade adolescents in Germany reported their use of and attraction to violent electronic games. They also completed measures of hostile attributional style and endorsement of aggressive norms. There were significant gender differences in usage and attraction to violent electronic games, with boys scoring higher than girls. Significant relationships were found between attraction to violent electronic games and the acceptance of norms condoning physical aggression. Violent electronic games were linked indirectly to hostile attributional style through aggressive norms. The findings are discussed with respect to North American research on the aggression-enhancing effect of violent electronic games.

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In April 2002, Germany was shocked by an unprecedented school shooting in which 17 people, including the assailant, were killed. It was soon established that the 19-year-old killer, a former pupil at the school who had been expelled some weeks prior to the attack, had not only been fascinated by firearms but had also spent much of his time playing violent electronic games. This observation fuelled an intense public debate about the detrimental effects of exposure to violent media, particularly electronic games, in terms of paving the way for serious acts of aggression and violence. The question of what happens in children and teenagers fighting with authentic-looking swords, revolvers, pump guns, or even flame-throwers on a daily basis when playing “Mortal Kombat”, “Resident Evil” or similarly violent games is of concern not only to researchers but to

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society at large. It is clear that despite self-regulatory efforts, the use of violent electronic games remains widespread, not least among children. This is true even for games, such as the two above-named, which have been censored in Germany by the *Federal Examination Department for Publications Harmful to Young Persons*. A recent survey showed that they are still widely played by youngsters under the age of 14 (Glogauer, 1998). The present study seeks to contribute to the debate on the aggression-enhancing effects of violent electronic games by exploring their effect on two cognitive antecedents of aggressive behaviour: the acceptance of norms condoning aggression and the tendency to attribute hostility to another person when there is ambiguity as to the intentionality of his or her actions.

Drawing on research conducted in the US, where both the availability of violent electronic games and the debate about their potentially harmful effects have a longer history, there seems little doubt that exposure to violent electronic games enhances the likelihood of aggressive behaviour, just as violent contents in other media do (Dill & Dill, 1998; Griffiths, 1999; Goldstein, 2000; Anderson & Bushman, 2001). Evidence from both correlational and experimental research was reviewed in a meta-analysis by Anderson and Bushman (2001) which included 35 studies. The authors concluded that exposure to games high in violent content leads to increases in aggressive behaviour, aggressive cognitions, and aggressive affect as well as reducing the willingness to show prosocial behaviour. Moreover, there was no indication of moderators that might influence the relationship between electronic games and aggression: The detrimental effect of playing violent games was found to be the same for men and women, for children and adults, and results are similar in experimental and correlational studies. A qualitative review by Dill and Dill (1998) arrived at similar conclusions. These authors stipulated that compared to the effects of television violence, an area where harmful effects have long been established (e.g. Paik & Comstock, 1994; cf. Krahé, 2001, for a review), electronic games may even more detrimental due to a number of specific features: (a) they provide direct rewards (e.g. points, promotion to the next level of the game) to the players for their aggressive actions in the game, (b) they facilitate the rehearsal of specific behavioural skills (such as hitting a target with a firearm), (c) they facilitate identification with the aggressor by allowing players to choose from a range of characters, and (d) they are characterized by increasing realism in graphics and sounds, combined with even more extreme violent action.

Beyond establishing an empirical connection between exposure to violent electronic games and aggressive behaviour, an important question refers to the psychological processes through which this connection is brought about. Research on television violence has highlighted the effect of violent media contents on altering social information processing (Smith & Donnerstein, 1998). As Anderson and Bushman (2002) point out in their “General Aggression Model”, repeated violent game playing is an important antecedent of aggressive behaviour. It leads to the learning, rehearsal, and reinforcement of aggression-related knowledge structures, conceptualized as “aggressive scripts” (Crick & Dodge, 1994; Huesmann, 1998). Aggressive scripts incorporate normative beliefs about the appropriateness of an aggressive action in a particular situation. According to Huesmann’s (1998) script theory, normative beliefs control whether or not an aggressive script an individual has encoded and stored in memory will be retrieved and translated into action. Huesmann and Guerra (1997) found a positive relationship between aggression-enhancing normative beliefs and aggressive behaviour in 1st and 4th graders in the domain of physical aggression, with a stronger link for boys than for girls. Studies including relational

aggression found a reversal of the gender effect, with greater normative acceptance of relational aggression in girls than in boys (Crick & Grotpeter, 1995; Crick, Bigbee, & Howes, 1996). Typically, violent electronic games reward aggressive actions by the players, thereby promoting the view that aggression is a useful and appropriate way of dealing with interpersonal conflict and of venting hostility or frustration. In the same vein, media violence which fails to show the effects of violence on the victims or presents violent actions as justified by a moral purpose affects the evaluation of aggressive scripts by weakening the normative beliefs that would inhibit aggressive behaviour.

Information processing on the basis of aggressive scripts can lead to the development of a “hostile attributional style”, i.e. to the habitual tendency to interpret ambiguous stimuli in terms of hostility and aggression. As Dill, Anderson, Anderson, and Deuser (1997, p. 275) graphically put it, people characterized by a hostile attributional style “tend to view the world through blood-red tinted glasses”. Every time hostile intent is attributed to another person’s ambiguous action and aggressive behaviour shown as a reaction, the link between the perception of hostile intent and aggression is reinforced, a cycle which may account for the long-term stability of aggressive behaviour (Burks, Laird, Dodge, Pettit, & Bates, 1999). Given the well-established link between hostile attributional style and aggression (e.g. Dodge & Coie, 1987; Burks et al., 1999), it is important to explore whether exposure to violent electronic games promotes the attribution of hostile intent to actions with ambiguous meaning. Kirsh (1998) analysed the link between playing aggressive electronic games and a short-term hostile attributional style in an experimental study with children aged 9–10 years. After playing either a violent or a non-violent electronic game, subjects were asked to answer a series of questions about ambiguous scenarios, referring to the intent of, likely responses to and potential punishments for the provocateur. A short-term hostile attribution bias was observed in children who played the violent game, but only when subjects responded to the scenarios in an open-ended format. When predefined response options were provided, the effect of the video game manipulation disappeared, supporting the view that hostile attributional styles operate in spontaneous rather than systematic information processing (Dodge & Somberg, 1987).

Based on the evidence reviewed so far, the present study was designed to further explore the impact of exposure to violent electronic games on adolescents’ normative beliefs condoning aggression as well as on the manifestation of a hostile attributional style. The violent content of electronic games characteristically refers to physical aggression rather than verbal or relational aggression. Therefore, it was expected that exposure and attraction to violent electronic games would be related to an increased normative acceptance of physical aggression as well as the tendency to show a hostile attributional style when interpreting physical interactions. Accordingly, the central hypothesis of the present study was as follows: *The frequency with which adolescents play violent electronic games and the extent to which they feel attracted to such games are associated with the normative acceptance of aggression as well as to the tendency to show a hostile attributional style in interpreting ambiguous interpersonal interactions.*

In addition, the study examined the potential effect of violent electronic games on normative beliefs and hostile attributional style with respect to relational aggression. This was deemed important in light of findings on gender differences in aggressive norms, suggesting that physical aggression is considered more normatively appropriate by boys than by girls and that girls consider relational aggression to be more acceptable than boys. Finally, it was explored whether

high frequency of playing electronic games regardless of their level of violence would be associated with aggressive norms and hostile attributional tendencies. From a conceptual point of view, only violent games should affect aggression-related cognitions and knowledge structures through enhancing the cognitive accessibility of aggressive thoughts (Anderson & Bushman, 2001). In public debate about the media-aggression link, however, it is often claimed that extensive media consumption, irrespective of violent content, promotes aggression. By including a measure of overall electronic game playing, the present study attempts to address this issue.

Method

Pilot study

The aim of the pilot study was to select a sample of widely used electronic games varying in violent content as well as to examine the reliability of two measures designed for the present study: a measure of endorsement of aggressive norms and a measure of hostile attributional style.

Sample

A total of 124 8th grade students (50 female and 74 male) took part in the pilot study during regular school hours. The mean age of the sample was 13.8 years (s.d. = 0.74). 96% of respondents were German nationals, the remaining 4% were of different nationalities.

Instruments and procedure

Three instruments were included in the pilot study. First, a list of 60 electronic games was compiled on the basis of sales hit lists as evidenced in computer magazines, sales ranks provided by internet shops (e.g. amazon.de) and stocks in pertinent shops. These games were popular and widely available at the time of data collection in the second half of 2001. Respondents were asked to indicate, for each of the games they knew, how much (a) excitement, (b) action and (c) fun they thought the game provided. Responses were made on a four-point scale ranging from “none” to “a lot”. The purpose of these ratings was to find out which games the respondents had played. They were part of the cover story telling respondents that they would be asked as experts on electronic games. The rankings they provided were irrelevant to the study and will not be reported further. To ensure the comprehensiveness of the list to be used in the main study, respondents were given the opportunity to write down, in an open-ended format, up to five further games not in the list that they particularly liked. To gain preliminary insight into user patterns in this age group, respondents were also asked a series of questions about their use of electronic games: (a) how often they played electronic games in the course of the week (six-point scale with scale points labeled “every day”, “every other day”, “2–3 times a week”, “once a week”, “every other week”, “less than every other week); (b) how long they would normally play electronic games on the days they played (four-point scale, with scale points labeled “less than half an hour”, “between 30 min and an hour”, “one to two hours”, “more than two hours”, (c) how much they enjoyed playing electronic games (four-point scale from “not at all” to “very much”). Finally, respondents were

asked whether or not they had access, at home, to (a) a personal computer, (b) a play station, and (c) a game boy. These latter measures were designed to provide a preliminary picture about the extent to which respondents of that age have access to and use equipment enabling them to play electronic games.

The second measure included in the pilot study was designed to measure endorsement of pro-aggression norms. Using previous instruments, such as the “Normative Beliefs about Aggression Scale” (Huesmann & Guerra, 1997) and findings from previous research (Lagerspetz and Björqvist, 1994; Crick, 1997), 17 items were generated, tapping two forms of aggression: relational, and physical. Eight items referred to relational aggression (e.g. “To spread rumors about another person”), and nine items referred to physical aggression (e.g. “To threaten to beat him/her up”). For each item, respondents indicated the extent to which they considered the respective behaviour acceptable, using a four-point scale from “not at all ok” (1) to “totally ok” (4).

The third measure referred to the construct of hostile attributional style. For this measure, eight scenarios were developed that described ambiguous interactions in which an actor caused some form of harm to a target person but it is not obvious whether or not the harm was intended. Four scenarios described situations in which the target person suffered physical harm or damage of his/her property, four scenarios described a relational problem. The scenarios were described in the second person singular to make it easier for respondents to place themselves in the position of the target person. A sample scenario referring to physical harm/property damage read as follows:

Imagine you are out in the school yard during break time, talking to your friends. You hold your drink bottle in your hand. Just as you are about to take a sip, someone pushes you from behind.

Following the scenario, respondents were asked to make three ratings:

Perceived hostile intent: How certain would you be that the other person pushed you on purpose? (four-point scale ranging from (1) “not at all certain” to (4) “very certain”).

Anger: How angry would you feel in this situation? (four-point scale ranging from “not at all angry” to “very angry”).

Wish to retaliate: “How much would you wish you could get your own back on the other person?” (four-point scale ranging from (1) “not at all” to (4) “very much”).

Two versions were created, using a male and female target person, respectively, to match respondents’ gender. The aim of the pilot study was to identify scenarios sufficiently ambiguous to allow for the reflection of the hostile attributional style. To keep completion times for the measures within limits acceptable to the school administration, the sample was split for the aggressive norms and the hostile attributions measures, respectively. 64 respondents (25 girls and 39 boys) completed the aggressive norms measure, 60 respondents (25 girls and 35 boys) completed the hostile attributional measure. All respondents received the questions referring to the list of electronic games.

Results

The descriptive data on playing times and access to electronic games showed that 89.5% of respondents had played a game on at least one occasion. 71% had access to a computer at home,

66.1% had a play station, and 65.3% had a game boy. The majority of respondents said that they enjoyed playing electronic games (79% responses fell into the positive side of the scale), and 68.5% reported enjoying playing games very much. 30.6% of respondents played electronic games every day, 38.8% played between every other day and once a week. At the other end of the response scale, 25.8% played less than every other week. On the days they played, 33.1% of respondents played for more than two hours, a further 30.6% between one and two hours. The remaining respondents played between 30 min and an hour (21.8%) or less than thirty minutes (13.7%).

In terms of the popularity of the 60 games presented, the analysis yielded a list of 19 games that had been played by at least twenty of the respondents. These games were selected for the main study. In addition, the open-ended nominations yielded six games which were named by 8 and 9 respondents, respectively. These frequencies are lower than the cut-off point of 20 nominations adopted for the predefined list, but the fact that consensus emerged in the free-response format showed that these games were popular among the studied age group. The resulting list of 25 electronic games used in the main study is presented in [Table 1](#).

A reliability analysis of the aggression-related norms scale showed that the scale had good reliability. For the total scale, α was 0.89, the two subscales of norms referring to relational and physical aggression had α s of 0.76 and 0.86, respectively. Two items from the physical aggression subscale were eliminated because of ambiguities in meaning, resulting in a final scale of 15 items. The reduced scale with an α of 0.86 was used in the main study.

The analysis of the eight scenarios in terms of perceived hostile intent, anger, and wish to retaliate was guided by the aim to identify scenarios with sufficient ambiguity for a hostile attributional style to become apparent. The four scenarios with mean scores on the three dependent measures closest to the scale midpoint of 2.5 were selected for the main study. Two scenarios referred to physical harm/damage of property and two referred to relational conflict. The mean scores for the four selected scenarios are presented in [Table 2](#). Across the four scenarios and three ratings per scenario, reliability was good with an α of 0.79.

Discussion

The pilot study was designed to select a sample of widely used electronic games familiar to our target population and to develop instruments in German to address hostile attributional style and support of pro-aggression norms to be used in the main study. Twenty-five games were selected on the basis of responses to a predefined list of games as well as additional nominations from the respondents. To measure endorsement of pro-aggression norms, a 15-item measure was developed and shown to be reliable. Finally, four scenarios depicting ambiguous interactions leading to physical harm or property damage or to relational conflict were selected to form a measure of hostile attributional style, reflected in the tendency (a) to interpret ambiguous interactions in terms of the actor's hostile intent, (b) to react with anger to the actor's behaviour, and (c) to wish to retaliate against the actor. These measures were used in the main study to examine the proposed link between exposure to violent electronic games and hostile attributional style as well as endorsement of aggressive norms.

Table 1
List of electronic games included in the main study

Name of game	Violence rating ^a	<i>N</i> played	<i>M</i> frequency ^b (s.d.)	<i>M</i> liking ^c (s.d.)	Age recommendation ^d
Age of Empires	2.33	104	2.11 (1.45)	3.85 (1.15)	12
Anno 1602	2.19	63	1.62 (1.17)	3.51 (1.24)	6
Army Man	3.02	55	1.51 (1.05)	3.43 (1.22)	16
Black and White	2.51	64	1.67 (1.24)	3.94 (1.13)	12
Command and Conquer	2.83	99	2.09 (1.49)	3.83 (1.17)	16
Counterstrike	4.33	61	1.68 (1.32)	3.98 (1.18)	16
Desperados	3.19	43	1.36 (0.94)	3.37 (1.09)	12
Diablo	3.00	79	1.77 (1.30)	3.71 (1.15)	16
Die Siedler (The settlers)	1.69	100	1.96 (1.33)	3.56 (1.27)	12
Die Völker (The peoples)	2.03	51	1.50 (1.05)	3.47 (1.17)	No limit
FiFa (Football)	1.00	105	2.14 (1.46)	3.64 (1.35)	No limit
Final Fantasy	2.84	71	1.81 (1.38)	3.99 (1.22)	12
Grand Theft Auto	4.50	93	2.11 (1.57)	4.18 (1.14)	16
Half Life	4.33	60	1.61 (1.25)	3.88 (1.33)	16
Max Payne	4.83	48	1.56 (1.27)	4.23 (1.13)	18
Medal of Honor	4.75	56	1.63 (1.30)	4.00 (1.29)	18
Mortal Kombat	4.83	52	1.52 (1.17)	3.54 (1.21)	18
Operation Flashpoint	3.69	59	1.67 (1.31)	3.90 (1.21)	16
Quake III	4.50	48	1.60 (1.28)	4.10 (1.32)	18
Resident Evil	4.50	81	1.88 (1.42)	3.93 (1.24)	18
Sim City 3000	1.68	84	1.87 (1.35)	3.74 (1.23)	12
South Park	2.37	75	1.79 (1.32)	3.81 (1.23)	12
The Sims	1.17	120	2.40 (1.58)	4.12 (1.10)	No limit
Tomb Raider	1.33	133	2.13 (1.22)	3.32 (1.15)	12
Wer wird Millionär? (Who wants to be a millionaire)	1.00	107	2.05 (1.36)	3.62 (1.21)	No limit

^a As provided by six independent experts (cf. Main Study for explanation). Range from (1) “free of violent content” to (5) “high level of violent content”.

^b Response scale ranging from 1 (never) to 5 (very often).

^c Response scale ranging from 1 (not at all) to 5 (very much). Based only on respondents with frequency ratings > 1.

^d As provided by the German self-regulating body for electronic games (Unterhaltungssoftware-Selbstkontrolle; USK).

Main study

Participants

A new sample of 231 8th grade students, 115 girls and 116 boys, participated in this study. The mean age of the sample was 13.6 years (s.d. = 0.63). 216 (97.7%) of the respondents were German nationals, 5 (2.3%) had a different nationality. 221 respondents (95.7%) had played electronic games, 10 respondents (4.3%; one boy and nine girls) reported no previous experience with electronic games.

Table 2
Mean scores of scenarios to measure the hostile attribution bias

Scenario	Pilot study		Main study	
	<i>M</i>	s.d.	<i>M</i>	s.d.
Physical harm/damage to property				
Scenario P1				
Perceived hostile intent	2.66	0.84	2.33	0.69
Anger	2.54	0.84	2.58	0.77
Desire for revenge	2.07	0.87	2.05	0.91
Scenario P2				
Perceived hostile intent	2.47	0.77	2.88	0.93
Anger	2.51	0.84	2.91	0.96
Desire for revenge	2.14	0.82	2.58	1.07
Relational conflict				
Scenario R1				
Perceived hostile intent	2.48	0.93	2.61	0.84
Anger	2.58	0.85	2.57	0.88
Desire for revenge	2.28	0.98	2.18	0.93
Scenario R2				
Perceived hostile intent	2.75	0.89	2.55	0.89
Anger	2.88	0.96	2.42	0.99
Desire for revenge	2.70	1.05	2.01	0.93

Note. Response scale ranged from 1 to 4. For the text of the scenarios see Main Study.

Instruments and procedure

Electronic games

Respondents were presented with a list of 25 electronic games selected on the basis of the pilot study (see Table 1). For each game, they were asked to indicate the frequency with which they had played that game, using a five-point scale from “never” (1) to “very often” (5), and to indicate how much they enjoyed playing that game, using a five-point scale from “not at all” (1) to “very much” (5). Following these ratings, respondents were asked to choose up to five games from the list that they particularly liked and would recommend to a friend. Finally, they were asked to estimate the number of occasions per week they played electronic games and the length of time spent per day playing electronic games. The same response format as in the pilot study was used.

To establish the extent to which the electronic games included violent contents, experts from two groups were asked to rate each game in terms of violent content. The first group comprised three male journalists of widely circulated computer magazines. The second group consisted of three male students of communication studies who were involved in research on computer games. These different groups were chosen to arrive at a balanced appraisal of the games. They were given the following instructions: “For each of the following games, please rate the level of violent content. In making your judgment, please consider the following aspects: (a) How realistic are the scenes in which characters are injured and killed (e.g. groaning noises, blood splashing, body parts flying around); (b) How realistic is the presentation of opponents (monsters, aliens

vs. human-shape characters); (c) How realistic is the presentation of scenes in which one's own character gets injured or killed? Raters classified each game on a five-point scale that ranged from "free of violent content" (1) to "high level of violent content" (5).

Endorsement of pro-aggression norms

The 15-item scale developed in the pilot study was used to measure respondents' normative acceptance of aggressive behaviour. The items are listed in Appendix A. Eight items referred to relational aggression and seven items referred to physical aggression. Examples for each type of item are provided in the description of the pilot study. Responses were made on a four-point scale ranging from "not at all ok" (0) to "totally ok" (3).

Hostile attributional style

To measure respondents' tendency to interpret ambiguous interactions in a hostile fashion, four scenarios selected on the basis of the pilot study were presented. Two scenarios described a situation that led to physical harm or property damage. They read as follows:

(P1) Imagine it is break time at school. You sit at your table and are in an intensive conversation with your neighbour. You have already placed your books and folders for the next lesson on the table. Suddenly, one of your classmates runs past very close to your table so that all your things are scattered on the ground.

(P2) Imagine you have spent all afternoon in the swimming pool with your friends. Now you've packed your things and are ready to go home. On the way to the exit you walk past the pool. One of your classmates jumps into the pool just as you pass by, and you get wet all over.

Two scenarios described a social interaction potentially leading to relational harm. These scenarios read as follows:

(R1) Imagine you arrive in school in the morning as usual, enter the building and then walk to the room in which you have your first lesson. From the corridor, you can hear your fellow classmates chat and laugh inside the classroom. When you open the door, you encounter a sudden silence.

(R2) Imagine you are in a German lesson, sitting at one of the front tables. When the lesson starts, the teacher asks you to summarize the topics of the previous lesson. As you are trying to give an answer, your classmates behind you start whispering and giggling.

Following each scenario, respondents rated the actors' hostile intent, the extent to which they would feel angry in the situation, and their wish to retaliate against the actor(s). These ratings were made on four-point scales ranging from "not at all" (1) to "very much" (4).

The measures were administered during normal school lessons. The control for possible order effects, the order of presentation of the three instruments was counterbalanced across respondents. Following the completion of the measures, respondents were informed about the purpose of the study. The debriefing was followed by a class discussion about electronic games and their potential effects on thoughts, feelings, and behaviour.

Results

Scale reliabilities

The scale measuring acceptance of pro-aggression norms had an internal consistency of $\alpha = 0.83$ across the 15 items. The two subscales addressing relational and physical aggression had α s of 0.71 and 0.74, respectively. The mean scores for the physical and relational subscales are shown in Table 4. A multivariate analysis of variance examining gender differences on the two subscales yielded a significant multivariate effect, $F(1, 230) = 9.98, p < 0.001$. This effect was mainly due to the significant univariate effect of gender on norms relating to physical aggression, $F(1, 230) = 18.69, p < 0.001$, where boys scored significantly higher than girls.

The scenarios developed to measure hostile attributional style were found to have good reliability. Across all 12 dependent measures (ratings of perceived hostile intent, anger, and wish to retaliate across four scenarios), Cronbach's α was 0.79. The reliabilities for the physical and relational scenarios considered separately were 0.72 and 0.79, respectively. The mean ratings for each scenario can be found in Table 2. Separate scores were computed for relational and physical scenarios, averaging across the three ratings per scenario, and potential gender differences as a function of scenario type were explored. The resulting mean scores are shown in Table 4. Significant gender differences were found with respect to the physical scenarios, with boys scoring higher than girls, $F(1, 230) = 4.85, p < 0.05$. The corresponding gender differences for the relational scenarios was marginally significant at $p < 0.06$.

Descriptive results

To provide descriptive information about the extent to which electronic games were used in the present sample, the frequency of game playing and the duration per day were analysed and broken down by respondent sex. The results, presented in Table 3, reveal substantial sex differences, with

Table 3
Exposure to video games by gender (in %)

	Boys	Girls	Total
Frequency			
Every day	35.7	7.4	21.8
Every other day	27.7	7.4	17.7
2–3 times a week	26.8	25.6	26.4
Once a week	5.4	14.8	10.0
Every other week	2.7	12.0	7.3
Less than every other week	1.8	32.4	16.8
Time per session			
More than 2 h	51.8	17.9	35.3
Between 1 and 2 h	35.7	37.7	36.7
Between 30 min and 1 h	12.5	34.9	23.4
Less than 30 min	0.0	9.4	4.6

boys playing electronic games more regularly than girls, χ^2 (df=5)=75.1, $p<0.001$. Boys also spend more time per session than girls, χ^2 (df=3)=39.9, $p<0.001$.

The frequency counts showed that the games selected for this study were, indeed, widely used by the present sample. The lowest number of respondents who had played a particular game was 43 (Desperado), the highest number for any one game was 133 (Tomb Raider). The mean frequency of playing across all games was 1.80 (s.d.=0.68), and the mean liking of the games was 3.74 (s.d.=0.74). Boys had significantly higher frequency scores than girls ($M_{\text{Boys}} = 2.13$ vs. $M_{\text{Girls}} = 1.45$, $t(229) = -8.68$, $p < 0.001$) and also showed greater liking for electronic games than girls ($M_{\text{Boys}} = 3.87$ vs. $M_{\text{Girls}} = 3.60$, $t(229) = -2.55$, $p < 0.01$).

The ratings of violent content provided by two independent groups of raters showed a high inter-rater agreement, both within and across their respective groups. For the three computer magazine journalists, the intra-class correlation across the 25 games was 0.94. For the three researchers, the intra-class correlation was 0.93. The correlation between the journalists and the researchers was 0.93, and the mean ratings were 3.00 vs. 3.04 (n.s.). Across all six raters, the intra-class correlation was 0.96. On the basis of this high level of agreement, violence ratings were averaged across all six raters to provide an index of violent content for each game. The second column of Table 1 displays the mean scores across the six experts that indicate the games' violent content. Four measures of exposure to electronic games were computed: (a) an *overall frequency* index consisting of the mean frequency ratings across all 25 games; (b) a *violence frequency* index in which the frequency for each game was multiplied by the violence rating for that game; (c) a *violence liking* index for which the liking for each game was multiplied by the violence rating for that game; and (d) a *violence recommendation* index that consisted of the mean violence ratings of the games recommended to a friend. Measure (a) was included to test whether exposure to electronic games as such, regardless of violent content, would affect aggressive norms and hostile attributional tendencies. Measure (b) provided a weighted frequency index taking into account the violence rating for each game so that high scores reflect high frequency for games high in violent content. Measures (c) and (d) captured attraction to violent games. The descriptive statistics for the four measures are shown in Table 4. In terms of liking for the games, it is worth noting that the game with the highest liking score ("Max Payne") also had the highest violent rating.

Table 4

Means and standard deviations of the variables included in the analysis ($N = 231$)

	Total		Boys		Girls		Sex diff.
	<i>M</i>	s.d.	<i>M</i>	s.d.	<i>M</i>	s.d.	<i>p</i>
Mean frequency of playing games ^a	1.80	0.68	2.13	0.78	1.45	0.44	0.001
Frequency \times violence ratings ^b	5.23	2.23	6.39	2.38	4.07	1.24	0.001
Liking \times violence ratings ^b	9.53	3.52	11.28	3.25	7.59	2.69	0.001
Violence level of recommended games ($N = 188$) ^a	2.56	0.89	2.90	0.89	2.09	0.65	0.001
Hostile attributional style (physical)	2.55	0.57	2.64	0.57	2.47	0.59	0.05
Hostile attributional style (relational)	2.39	0.63	2.40	0.66	2.37	0.59	n.s.
Endorsement of aggressive norms (physical)	1.71	0.51	1.85	0.56	1.57	0.41	0.00
Endorsement of aggressive norms (relational)	1.77	0.47	1.83	0.52	1.71	0.40	0.06

^a Possible range: 1–5.

^b Possible range 1–25.

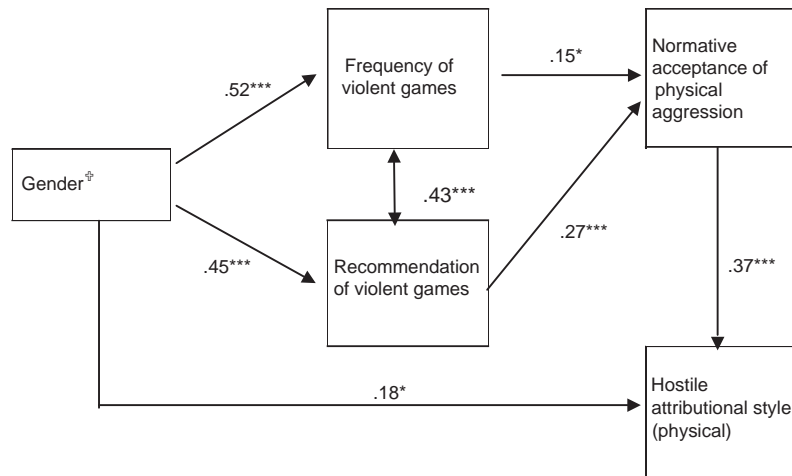


Fig. 1. Electronic games playing, aggressive norms and hostile attributional style with respect to physical aggression.

frequency and the violence recommendation index, indicating that boys scored higher in these two measures than girls.

Positive scores indicate that boys show higher frequencies of violent games, recommend more violent games, and have a stronger hostile attributional style.

A parallel series of regression analyses was conducted with respect to norms for relational aggression and hostile attributional style in the relational scenarios. These analyses yielded only one significant effect: the violence liking measure predicted acceptance of relational aggression ($\beta = 0.19, p < 0.01$). None of the remaining three measures of games usage nor respondent gender were significantly related to hostile attributional style for the relational scenarios.

Discussion

Evidence is mounting that the exposure to media violence in the new medium of electronic games leads to an increase in aggressive behaviour, both in the short-term following a brief exposure and in the long run as a result of continuous playing. However, demonstrating a significant relationship between violent electronic games and aggressive behaviour is necessary, but not sufficient. From a conceptual as well as applied point of view, it is essential to explore the mechanisms by which media violence enhances aggressive behaviour. The present study addressed this task by exploring the impact of violent electronic games on players' aggression-related cognitions. In particular, it looked at adolescents' endorsement of normative beliefs condoning aggression and their tendency toward hostile attributions of ambiguous cues as a function of exposure to violent electronic games.

In line with predictions, the normative acceptance of physical aggression increased as a function of exposure to violent games. In boys as well as girls, both the frequency with which violent games were played and the liking for such games (as evidenced in respondents' recommendations of games to their peers) contributed to the prediction of acceptance of physical aggression as normative. The adverse effects of exposure to media violence on both boys and girls were also demonstrated with respect to aggressive behaviour in a longitudinal analysis by Huesmann,

Moise-Titus, Podolski, and Eron (2003). Given that normative beliefs were found to become more stable from childhood to adolescence (Crick et al., 1996; Huesmann & Guerra, 1997), the fact that an influence of violent games was found in the present sample of 13- to 14-year olds points to the likelihood that they affect behavioural decisions in situations where aggressive scripts are retrieved. There was no evidence in the present study of a direct link between attraction to violent games and a hostile interpretative style, even though such a relationship was found in previous studies (e.g. Kirsh, 1998; Bushman & Anderson, 2002). One potential explanation could be that the scenarios used in this study lacked internal validity. However, the fact that gender differences were found that were consistent with previous research (boys scoring higher than girls in hostile attributional style on the physical scenarios) may be taken as support for the validity of the new measure. It is also important to note that an indirect effect of exposure to violent electronic games was found through aggressive norms, which significantly predicted hostile attributions. This finding suggests that normative beliefs shape a person's view not only of the adequacy of an aggressive response but also in determining whether or not a situation is relevant to the retrieval of an aggressive script.

Concerning the impact of gender, the present findings corroborate previous evidence by showing that males both have a higher frequency of playing violent games and feel more attracted to them (e.g. Glogauer, 1998; Anderson & Dill, 2000). The finding that boys were more accepting of physical aggression than girls is also in line with previous research (e.g. Crick et al., 1996). However, the present evidence suggests that attraction to violent electronic games serves as a mediator between gender and the normative acceptance of physical aggression. The regression analyses revealed no direct effect of gender on normative acceptance of physical aggression when considered simultaneously with usage and liking of violent electronic games.

This finding suggests that part of the reason why boys endorse physical aggression more than girls lies in the fact that they are exposed to a form of media socialization that present physical aggression as appropriate and enjoyable. In addition, a positive link was found between male gender and hostile attributional style with regard to physical interaction, indicating that boys are more inclined than girls to interpret an ambiguous physical interaction in aggression-related terms. This finding is in line with Anderson and Dill (2000) who concluded that men had a more hostile view of the world compared to women.

An exploratory question of the present research was whether the effects of video game violence would generalize to norms and attributional styles referring to relational aggression. With the exception of a link between a single games usage measure on acceptance of relational aggression, there was no evidence to suggest that exposure to violent games was associated with normative beliefs concerning relational aggression or hostile attributions in ambiguous relational contexts. This suggests that the aggression-enhancing effect of video game violence, which is almost exclusively physical in nature, is specific to the domain of physical aggression and does not generalize to other forms of aggressive behaviour.

One limitation of the present study lies in its cross-sectional design that hampers a stringent test of a causal relationship from playing violent games to aggressive cognitions. This is a problem noted in previous non-experimental research and needs to be overcome by future studies adopting a longitudinal approach. Few such studies are available with regard to television violence (cf. Huesmann & Miller, 1994, for a review). There is a need to examine the cumulative impact of long-term exposure to violent electronic games through longitudinal research, particularly given

the specific features of this medium, such as active involvement, realism, and extremity, that render their impact more immediate and potentially more powerful. Furthermore, the present study did not look at individual differences variables other than gender. There is some evidence to suggest that the detrimental effects of media violence are more pronounced in individuals high in dispositional aggressiveness (e.g. Bushman, 1995). Other variables, such as volatile self-esteem, may also indicate increased susceptibility to the negative effects of violent games (Baumeister & Boden, 1998).

By demonstrating an effect of attraction to violent electronic games on aggressive cognitions, the present data joins earlier evidence in dispelling the claim that playing violent games may have a cathartic effect, discharging negative arousal that would otherwise be vented through aggressive action. Despite its longevity and popularity in everyday discourse, there is little empirical support for the catharsis hypothesis (Anderson & Dill, 2000). On the contrary, indulging in imaginary aggression has been found to be a potent priming exercise increasing the accessibility of aggressive thoughts and the probability of subsequent aggressive behaviour (Bushman, Baumeister & Stack, 1999; Bushman, 2002). That is why providing a sound empirical data base demonstrating the aggression-enhancing potential of violent electronic games is a task of vital importance and a first step toward implementing measures at the societal level to contain the risk of media-induced aggression.

Appendix A. Items of the endorsement of aggressive norms scale

1. (R) To threaten to stop being friends with someone after a quarrel is totally ok—somewhat ok—not really ok—not at all ok
 2. (P) To threaten to beat another person up who has made one angry is ...
 3. (R) To spread rumors about others is ...
 4. (P) To destroy something belonging to another person as an act to revenge is ...
 5. (R) To treat another person as though he/she didn't exist when one is in a bad mood is ...
 6. (R) To say nasty things about a person behind his/her back is ...
 7. (P) To take something away from another person when one is in a bad mood is ...
 8. (P) To kick and push a person who has made one really angry is ...
 9. (R) To play people out against one another is ...
 10. (P) To push others around when one is really angry is ...
 11. (P) To threaten to gang up with others to beat someone up is ...
 12. (R) To tell lies about other people is ...
 13. (R) To stir others up against a particular person is ...
 14. (R) To show someone up in front of others is ...
 15. (P) To hit another person the same age as oneself is ...
- (P) = Norms concerning physical aggression; (R) = norms concerning relational aggression.

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