Video game playing and its relations with aggressive and prosocial behaviour

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In this study of 278 children from the seventh and eighth grade of five elementary schools in Enschede, The Netherlands, the relationship between the amount of time children spent on playing video games and aggressive as well as prosocial behaviour was investigated. In addition, the relationship between the preference for aggressive video games and aggressive and prosocial behaviour was studied. No significant relationship was found between video game use in general and aggressive behaviour, but a significant negative relationship with prosocial behaviour was supported. However, separate analyses for boys and girls did not reveal this relationship. More consistent results were found for the preference for aggressive video games: children, especially boys, who preferred aggressive video games were more aggressive and showed less prosocial behaviour than those with a low preference for these games. Further analyses showed that children who preferred playing aggressive video games tended to be less intelligent.

The video game industry has become a multi-billion pound per year business and has revolutionized children’s leisure activities (see e.g. Central Bureau of Statistics, 1996; Hettrick, 1995). The 'video game craze' has raised concern among teachers, health professionals and parents about the possible detrimental effects of these games. Bowman & Rotter (1983) established that 85 per cent of the video games required the player to act violently. Braun & Giroux (1989) reported that 71 per cent of the video games they surveyed contained violence. Provenzo (1991) analysed 47 leading Nintendo video games and concluded that 85 per cent of these games involved violence. The question is whether the violent themes in these games have the effect of increasing aggressive behaviour in children and adolescents.

A great deal of research has focused on the influence television has on aggressive behaviour. The balance of this research, mainly based on meta-analyses, indicates that television can contribute to aggressive behaviour in viewers (Hearold, 1986; Paik & Comstock, 1994; Wood, Wong & Chachere, 1991). This influence can be explained by Bandura's social cognitive theory (Bandura, 1986), which also provides the theoretical framework for this study. Bandura demonstrated that various aggressive models affected the aggressive behaviour of children and adults. Exposure to violence may have different effects on the behaviour of viewers: it may teach aggressive styles of conduct and it may weaken people's resistance against behaving

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aggressively (disinhibition). Like television, video games have the potential to intensely engage a child (Selnow, 1984). Because television research so clearly demonstrates a relationship between this intense engagement and subsequent aggression when the programme content is violent, researchers into the effects of video game playing have usually predicted a similar relationship. Schutte, Malouff, Post-Gordon & Rodasta (1988) mentioned two additional links between video game playing and subsequent behaviour, namely participant modelling and reward reinforcement. Video games involve a type of participant modelling in that the person who controls a character in the course of playing a video game in some way becomes that character. Furthermore, the player is rewarded for his aggressive behaviour: the more successful in destroying the monster, the more points the player will receive and the longer the game will last.

In contrast to television research (see e.g. Paik & Comstock, 1994), relatively few studies have been published in which the relationship between playing video games and children's subsequent aggressive behaviour was examined. In a recent review of the literature, Griffiths (1996) concluded that research into the effects of the violent contents of computer games on children's subsequent behaviour is sparse and that research into the long-term exposure to violent computer games is noticeably lacking.

Cooper & Mackie (1986) compared children's free-play behaviour after playing an aggressive or a non-aggressive video game and found that girls were more aggressive after an aggressive game but boys remained unaffected. Schutte et al. (1988) also observed the free play of young children and demonstrated that those who played a violent video game became more aggressive. Silvern & Williamson (1987) established that young children became more aggressive and showed less prosocial behaviour when they were observed during free play after playing an aggressive video game.

Apart from observing free play, aggression can be measured in other ways. Anderson & Ford (1986) measured the hostility of undergraduates after having played a very aggressive and mildly aggressive video game using the Multiple Affect Adjective Checklist. Students who had played the very aggressive game showed more hostility and anxiety. Graybill, Kirsch & Esselman (1985) reported that children who had played a violent video game exhibited fewer defensive fantasies and more assertive fantasies than those who played the non-violent game. On the basis of this study they concluded that playing violent video games may have some short-term beneficial effects on children.

In a further study by Graybill, Strawniak, Hunter & O'Leary (1987) a behavioural measure of aggression was used (in addition to self-report measures): by pushing buttons the children could either hurt or help another child. After playing a violent or non-violent video game no significant differences in aggression were found between the conditions. Graybill et al. (1987) assumed that there may be differences between television viewing and playing video games. Although the context of video games may be violent, the graphics in video games are not as realistic as on television, which might explain why the children in their study were not affected by the aggressive game content. Winkel, Novak & Hopson (1987) found that teenagers who had been playing a violent video game were not displaying significantly more aggressive behaviour in a teacher/learner paradigm. After playing a very aggressive,
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an aggressive or a non-aggressive video game the teenagers were given the role of a teacher. Their job was to punish another person, the learner, by deducting money whenever the learner made a mistake. The amount of money they deducted served as a measure of aggression. The aggressive content of the video games had no significant effect on the amount of money teenagers deducted. In a recent study, Scott (1995) measured the aggressiveness of university students by using the Buss Durkee Hostility Inventory (Buss & Durkee, 1957) and the Eysenck Personality Questionnaire (Eysenck & Eysenck, 1975). No significant differences in aggressiveness were found between students after playing a non-aggressive, a moderately aggressive, or a highly aggressive video game.

In a study by Chambers & Ascione (1987), children donated significantly less money to a charitable cause after playing an aggressive video game, compared to children who had played a prosocial video game. A study by Fling, Smith, Rodriguez, Thornton, Atkins & Nixon (1992) showed not only that playing aggressive video games leads to an increase in aggressive behaviour, but also that there is also a positive relationship between time spent on playing video games and aggression. They found that the more time young people play video games, the more aggressive they are considered to be by their teachers and the more they think of themselves as behaving aggressively.

In addition to experimental studies, some correlational studies have also been conducted into the relationship between video game playing and aggression. Using a questionnaire, Dominick (1984) established a significant relationship between video game playing and aggressive delinquency in adolescents. However, when the effects of other factors were taken into account the significant correlation between video game playing and aggression became non-significant. On the basis of a survey amongst teenagers, Kestenbaum & Weinstein (1985) concluded that aggressive video games had a calming effect. It should be noted, however, that aggression was not directly measured in this study—Eysenck’s (1958) Extraversion and Neuroticism scale and the daydreaming scale of Singer & Antrobus (1970) were used—so a conclusion with regard to aggressive behaviour is not warranted.

On the basis of the studies mentioned above, it can be concluded that research findings concerning effects of aggressive video games are rather inconsistent and that the theoretical basis is somewhat weak (Griffiths, 1991, 1996). Some evidence exists that very young children (rather than adolescents) tend to become more aggressive after playing an aggressive video game. However, research into the effect of long-term exposure to video games on aggressive behaviour is missing and, unlike the case of television research, no meta-analyses have been performed.

The effect of vicarious models is not only restricted to aggressive behaviour but also applies to prosocial behaviour which we consider as its opposite. It has been demonstrated that both aggressive and prosocial films affected children’s behaviour (Wiegman, 1975; Wiegman, Seydel & Baarda, 1983). In his earlier work Bandura was not explicitly concerned with prosocial behaviour since disinhibitory processes are not involved in modelling this type of behaviour because the elicited behaviour is socially acceptable and not encumbered by restraints. In his later work, however, he stressed that ‘By exemplification one can get people to behave altruistically, to volunteer these services to delay or seek gratification, to show affection’ (Bandura,
1986, p. 50). So in agreement with social cognitive theory, both aggressive and prosocial behaviour can be activated by exemplification.

Some video games call for a player to behave prosocially. These games reflect a prosocial example to be repeated or imitated by the player. Subsequently the player's correct behaviour is rewarded. In other prosocial games the player has to cooperate with other players to gain good results. However, there are only a few video games of a prosocial nature, and even less research has been done into the effects of these prosocial games. One study in which prosocial behaviour was measured is the study by Chambers & Ascione (1987) mentioned above. They had children between the ages of eight and 15 play an aggressive or prosocial video game on their own or with their fellow player. Chambers & Ascione concluded that the prosocial video game had no significant effect upon donating money, but that playing the aggressive video game tended to suppress this behaviour.

If people are affected by aggressive models this does not only mean that they become more aggressive but also that they show less prosocial behaviour. The study of Silvern & Williamson (1987) reported earlier also supports this assumption, since they demonstrated that children became more aggressive after playing an aggressive video game but at the same time showed less prosocial behaviour.

The present study investigates the relationship between the amount of time children spend playing (aggressive) video games and aggressive as well as prosocial behaviour as part of a more extensive inventory of the leisure activities of elementary school pupils. The first hypothesis based on social cognitive theory is that the amount of video game exposure will be positively related to aggressive behaviour (as also found by Fling et al., 1992). The second hypotheses is that the amount of video game exposure will be negatively related to prosocial behaviour. The third hypothesis is that preference for aggressive video games will be positively related to aggressive behaviour. The fourth hypothesis is that aggressive video game preference will be negatively related to prosocial behaviour.

**Method**

**Participants**

Three hundred and forty-six children participated in the original study. In the present study four groups of children were omitted from analyses. These groups contained less than 20 children and such low numbers would have negative consequences for the reliability of our peer-rating measures of aggressive and prosocial behaviour (see also Wiegman, Kuttschreuter & Baarda, 1986). Thus, the final sample consisted of 144 girls and 134 boys from the seventh and eighth grade from five elementary schools in the municipality of Enschede, The Netherlands. The average age of the participating children was 11.5 years; the youngest child was 10 years of age and the oldest was 14.

**Procedure**

In June 1994 measures were administered to the five participating schools at three points in time. During one week (from Tuesday until the Monday of the next week), children completed a diary in which they had to record how much time they spent on playing video games. This took them about 15 minutes each day. During lessons the children also completed a questionnaire in which aggressive and prosocial behaviour as well as their preference for aggressive video games were measured. This questionnaire took them between half an hour and an hour. One week after completing the questionnaire the children took an intelligence test presented in a written form. Intelligence was
measured because a former study had established that this variable played a moderating role between viewing television violence and aggressive behaviour (Wiegman, Kuttschreuter & Baarda, 1992).

**Measures**

*Video game playing.* During one week the children registered in a diary how much time they spent on playing video games. All children were extensively instructed on how to fill in their diary and clearly understood what to do. The five possible responses were ‘not’ (1), ‘from one minute up to and including half an hour’ (2), ‘from half an hour up to and including one hour’ (3), ‘from one hour up to and including two hours’ (4), ‘more than two hours’ (5).

*Preference for aggressive video games.* In the questionnaire the children were asked to give the title of the five video games they liked most. In total 404 different games were mentioned by the children. The aggressive content of these games was rated by three ‘experts’ (one was the chief editor of a video game magazine and the other two were managers of a toyshop concern). These raters were given written instructions on how to score the aggressive video game content (aggressive or non-aggressive), based on Wiegman et al.’s (1983) definition of aggression as an act in which a person harms or injures another person (or persons) such that the actor knows beforehand that this behaviour will result in negative consequences for the other person(s) (the term aggression is often used to refer to physical behaviour, however, in this definition verbal aggression is also included).

Between the three experts the percentage of agreement was 75 per cent and the inter-coder reliability based on Cohen’s kappa was .53. According to Landis & Koch (1977) this value for Cohen’s kappa is moderate, but we should keep in mind that all 404 video games were judged by the experts from memory. The child’s preference score was the sum of the games labelled as aggressive divided by the total number of video games the child mentioned.

*Aggressive behaviour.* To measure aggressive behaviour the peer-nomination technique was used. This measurement instrument has been used by Wiegman et al. (1992) and is a slightly modified version of Walder, Abelson, Eron, Banta & Laulicht’s (1961) Peer-Rating Index of Aggression. The children had to indicate which children in their class exhibited certain aggressive behaviours, like sticking out their tongue, telling lies and fighting (10 items). The aggression score for a child was the total number of times he or she was mentioned by his or her classmates, divided by the total number of his or her classmates. The internal consistency for this aggression measure was high (Cronbach’s α = .95).

*Prosocial behaviour.* Analogous to the definition of aggression (Wiegman et al., 1992), prosocial behaviour was defined as an act in which a person supports or helps another person (or persons) such that the actor knows beforehand that his/her behaviour will result in positive consequences for the other person(s). Altruism and helping behaviour are implied in this definition, but also included are being friendly towards and praising other people.

For the measure of prosocial behaviour the children were asked to indicate the names of the children in their class who showed prosocial behaviour (six items). This measure was derived from Wiegman et al. (1992). Items concerning prosocial behaviour included helping another child when he or she does not understand the homework and sitting next to a new and shy classmate. The prosocial behaviour score for a child was the total number of times he or she was mentioned by his or her classmates, divided by the total number of his or her classmates. The internal consistency for this measure was Cronbach’s α = .86.

*Intelligence.* To measure intelligence the most valid test available, the ISI, was used (Van Boxtel, Snijders & Welten, 1982). This intelligence test consists of six subtests: three verbal tests (synonyms, contrasts and semantic similarity) and three perceptual/motor tests (cut figures, rotated figures and figure similarity). The split-half reliability for the total intelligence index is .93. The correlations between the

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1 Other leisure activities were also measured like watching television, playing sports, playing round games, and reading books. Results concerning these measures will be reported in another article.

2 The peer-rating data for aggressive and prosocial behaviour have been adapted for statistical use with the help of the SOCSTAT program (Thissen-Pennings & Ten Brink, 1994).
total intelligence index and report marks for mathematics, spelling and silent reading averages respectively .58, .51 and .57 (Van Boxtel et al., 1982).

Results

Time spent on video game playing

About 70 per cent of the children indicated that they played video games at least once in the week concerned. Only 17 children (6 per cent) had been playing video games every day of the week.

Three groups were constructed, according to the amount of time the children had spent on playing video games: the non-players (who in their diaries indicated that they did not play video games during the whole week, \( N = 84 \)), the moderate players (who indicated that the time they played video games on average less than half an hour per day, \( N = 126 \)), and the heavy players (who indicated that they played more than half an hour per day, \( N = 67 \)).

Boys played video games significantly more often than girls (\( \chi^2 (2) = 33.87, p < .001 \)). The group of heavy players consisted mainly of boys (79 per cent), with only a few girls spending more than half an hour per day on video games (girls: 10 per cent; boys: 40 per cent).

In order to test the first two hypotheses, analyses of variance were performed. As can be seen from Table 1 for aggression no significant difference was found between the group of heavy players, moderate players and non-players. After a correction for the effect of the child's intelligence the difference remained non-significant. So the first hypothesis in which a higher level of aggression was predicted for the heavy players was not supported.

For prosocial behaviour, however, a significant difference between the three

<table>
<thead>
<tr>
<th></th>
<th>Non-players*</th>
<th>Moderate players</th>
<th>Heavy players</th>
<th>d.f.</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggressive behaviour</td>
<td>1.29, 1.39</td>
<td>1.28, 1.18</td>
<td>1.42, 1.44</td>
<td>(2,274)</td>
<td>0.78</td>
</tr>
<tr>
<td>Correction for IQ</td>
<td>1.30, 1.41</td>
<td>1.27, 1.19</td>
<td>1.52, 1.47</td>
<td>(2,263)</td>
<td>0.48</td>
</tr>
<tr>
<td>Prosocial behaviour</td>
<td>1.44, 0.60</td>
<td>1.45, 0.66</td>
<td>1.18, 0.67</td>
<td>(2,274)</td>
<td>4.19*</td>
</tr>
<tr>
<td>Correction for IQ</td>
<td>1.43, 0.60</td>
<td>1.46, 0.67</td>
<td>1.19, 0.69</td>
<td>(2,263)</td>
<td>3.60*</td>
</tr>
</tbody>
</table>

* \( p < .05 \).

Note. Higher values reflect more aggressive, or more prosocial, behaviour, respectively.

* Non-players did not play video games; moderate players' video game playing averaged less than half an hour per day; heavy players' video game playing averaged more than half an hour per day.

3 In testing, a significance level of \( p < .01 \) has been adopted because of the large number of calculations that have been performed in this survey.
groups existed. In contrast analyses a significant difference was found between the heavy players and the moderate players ($t(275) = 2.73, p < .01$): heavy players behaved less prosocially than moderate players. Heavy players also tended to behave less prosocially than non-players ($t(275) = 2.41, p = .02$). Heavy players showed less prosocial behaviour than the two other groups so the second hypothesis predicting that the amount of video game exposure was negatively related to prosocial behaviour is supported. However, separate analyses for boys and girls did not support the aforementioned significant results.

**Preference for aggressive video games**

As a result of our question regarding the five most preferred video games children played a total number of 404 different names of video games was mentioned. Of these video games 19 per cent could not be judged by the experts. The main reason why these games could not be scored by the experts was that children sometimes gave a self-invented name to a video game they liked to play, which was unknown to the experts. Of the 329 games the experts recognized, 40 per cent were regarded by them as video games with aggressive content. Four of the eight most frequently played games were judged by the experts to have aggressive content (Commander Keen, Streetfighter, Mortal Kombat and Turtles 1).

In order to test Hypotheses 3 and 4, three groups were constructed according to the children's preference for aggressive video games: the no preference group (who in their list of favourite video games mentioned no aggressive video games, $N = 128$), the moderate preference group (who in their list mentioned aggressive video games, but less than 50 per cent of their list contained aggressive video games, $N = 80$), and the high preference group (whose list of favourite video games contained 50 per cent or more aggressive video games, $N = 38$).

Boys had a significantly higher preference for aggressive video games than girls ($\chi^2 (2) = 50.73, p < .001$). The high preference group consisted mainly of boys (82 per cent), with only a few girls showing a high preference for aggressive video games (girls: 6 per cent; boys: 25 per cent).

Correlations demonstrated that children with a higher preference for aggressive video games tended to have a lower intelligence ($r = -.15, N = 238, p = .02$).

Table 2 shows that a significant difference existed for aggressive behaviour between the three groups. After a correction for intelligence this difference remained significant. Children with a high preference for aggressive video games showed the highest level of aggression. Contrast analyses showed that for aggressive behaviour the differences between the high preference group and the no preference group were significant ($t(245) = 3.60, p < .001$); the high preference group tended to differ from the moderate preference group ($t(245) = 2.14, p = .03$). No significant difference existed between the no preference group and the moderate preference group.

Separate analyses of variance for boys and girls did not demonstrate the same results mentioned above. However, for boys contrast analyses showed a tendency: boys with a high preference for aggressive video games behaved more aggressively ($M = 2.09$) than boys with no preference for aggressive video games ($M = 1.36$; $t(123) = 1.92, p = .05$). No further significant differences regarding aggressive
Table 2. Analyses of variance and mean scores of the three different groups of preference for aggressive video games for aggressive and prosocial behaviour (N = 278)

<table>
<thead>
<tr>
<th>Preference</th>
<th>Aggressive behaviour</th>
<th>Moderate preference</th>
<th>High preference</th>
<th>d.f.</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>No preference*</td>
<td>1.11</td>
<td>1.08</td>
<td>1.42</td>
<td>1.35</td>
<td>1.96</td>
</tr>
<tr>
<td>Correction for IQ</td>
<td>1.11</td>
<td>1.09</td>
<td>1.46</td>
<td>1.36</td>
<td>1.96</td>
</tr>
<tr>
<td>Prosocial behaviour</td>
<td>1.54</td>
<td>0.59</td>
<td>1.21</td>
<td>0.68</td>
<td>1.16</td>
</tr>
<tr>
<td>Correction for IQ</td>
<td>1.54</td>
<td>0.59</td>
<td>1.22</td>
<td>0.68</td>
<td>1.16</td>
</tr>
</tbody>
</table>

*p < .01; **p < .001.
Note. Higher values reflect more aggressive, or more prosocial, behaviour, respectively.
* No preference: children who in their list of favourite video games mentioned no aggressive video games; moderate preference: children who in their list mentioned aggressive video games, but less than 50 per cent of their list contained aggressive video games; high preference: children whose list of favourite video games contained 50 per cent or more aggressive video games.

Behaviour of boys were found between the three preference groups. For girls, contrast analyses showed no significant differences between the three preference groups. So the third hypothesis in which a higher level of aggression was predicted for the children with the high preference for aggressive video games was supported mainly for boys.

Table 2 also shows that for prosocial behaviour a significant difference existed between the three groups and that this difference remained significant after correcting for intelligence. Contrast analyses showed that children with no preference for aggressive video games behaved significantly more prosocially than children with a moderate preference (t(245) = 3.72, p < .001); these analyses further showed that children with no preference for aggressive video games also behaved more prosocially than children with a high preference for aggressive video games (t(245) = 3.28, p < .01). The moderate preference group and the high preference group did not differ significantly in their prosocial behaviour.

Separate analyses of variance for boys and girls did not reveal the significant results for prosocial behaviour in relation to preference for aggressive video games. Contrast analyses, however, showed that boys with no preference for aggressive video games tended to behave more prosocially (M = 1.23) than boys with a moderate preference (M = 0.98; t(123) = 2.19, p = .03); no significant difference in prosocial behaviour occurred between boys with no preference for aggressive video games and boys with high preference for these games. For girls contrast analyses showed no significant differences between the three preference groups in relation to their prosocial behaviour. So the fourth hypothesis, which predicted a lower level of prosocial behaviour for children who prefer aggressive video games, was supported only for boys.

Finally, to find out if there was a relation between the preference for aggressive
video games and the time children spent on playing these video games (as an indication of aggressive video game exposure) a correlational analysis for these variables was performed. This correlation was significantly positive ($r = .20$, $N = 246, p < .01$); children who liked to play aggressive video games also spent more time on playing these video games. This correlation remained significant after correcting for a child's intelligence ($r = .19$, $N = 235, p < .01$).

Discussion

In this study about 70 per cent of the children indicated that they played video games at least once in the week concerned; 6 per cent reported they played video games every day of the week. This is a rather low percentage in comparison to the results found by Phillips, Rolls, Rouse & Griffiths (1995) and Griffiths & Hunt (1995), who reported that 24 and 31 per cent of their adolescent participants played every day respectively. Joossens (1994) found that in Flanders 14 per cent of his participants, 10-to-13 year olds, played video games daily. We assume the lower percentage we found was related to the diary method we used, in contrast to the other studies mentioned in which questionnaires were administered. The accuracy of the diary method may be better because systematic reporting of daily activities is less difficult for children.

This study's theoretical framework is based on Bandura's social cognitive theory in which it is assumed that aggressive but also its opposite prosocial behaviour can be activated by modelling. Because Bowman & Rotter (1983), Braun & Giroux (1989) and Provenzo (1991) reported that most video games require the player to act violently and Fling et al. (1992) established a positive relationship between time spent on playing video games and aggression the first hypothesis also predicted such a positive relationship. Heavy players of video games, defined here as those children who on average played more than half an hour per day, did show a higher level of aggression than those who played less frequently but the difference between non-players and moderate players (who played less than half an hour per day) was not significant and so the first hypothesis could not be supported.

The second hypothesis predicted a negative relationship between video game playing and prosocial behaviour. For the whole group of children it was found that heavy players of video games showed significantly less prosocial behaviour than either the non-players or the moderate players groups. When separate analyses for boys and girls were performed no such relationship emerged. This result might be attributed to the fact that only few girls ($N = 14$) reported spending a lot of time playing video games, so caution in interpreting this result concerning the relationship between time spent on video games and prosocial behaviour is recommended.

Children were asked to write down their five most favourite video games. This resulted in a list of 404 different video games. These games were judged on their aggressive content by three video game experts who recognized 329 games on this list. These experts regarded 40 per cent of these games as a video game with an aggressive content. This percentage is not as high as the one reported by Bowman & Rotter (1983), who did a survey of video game machines in one shopping mall arcade and established that 85 per cent of the 28 games they found involved the
player in acts of violence. It is also not as high as the percentages reported by Braun & Giroux (1989) and Provenzo (1991). The percentage of aggressive video games found here is noticeably lower. A possible explanation for this is that in this study children's preference and use of home video games in daily life were looked at directly instead of examining games generally available in the market place.

Braun & Giroux (1989) established no difference between boys' and girls' preference for violent video games. In the present study, however, a significant gender difference was found: boys had a much higher preference for video games with an aggressive content. This finding is in accordance with Griffiths & Hunt (1995), who also established that adolescent boys preferred the more aggressive video games. The fact that gender differences in preference as well as the amount of time spent playing video games were found in this study (boys spent significantly more time on playing video games) can be explained by Eagly's (1987) social role theory. Eagly's research into gender stereotypes showed that there is strong agreement about definitions of masculine and feminine characteristics, constituted in positive and negative gender stereotypes. Women and men identify with their positive and negative gender stereotypes and think it desirable to behave in accordance with these stereotypes. For individuals to behave according to their stereotype can even be rewarding and those behaving in a deviant way are often negatively evaluated. The present study shows that video games' themes often revolve around aggression and many video games contain aggressive behaviour. Thus, a great deal of video games correspond to the masculine gender stereotype, making them less appealing for girls.

As predicted by the third hypothesis, children who preferred aggressive video games were more aggressive, and in accordance with the fourth hypothesis they showed less prosocial behaviour. For the whole group of children both hypotheses were supported, but separate analyses showed that there was only a significant tendency for boys. These results appear to be in agreement with the findings of Silvern & Williamson (1987) who demonstrated that after playing an aggressive video game the children became more aggressive and also showed less prosocial behaviour. In addition, Chambers & Ascione's (1987) finding that aggressive video games tend to suppress prosocial behaviour is in concordance with the present results. In general, the results with regard to preference for aggressive video games are more consistent than those concerning the amount of time children spent on video game playing as described in the first two hypotheses. One reason could be that only children who strongly prefer aggressive video games are necessarily exposed to aggressive or violent themes.

In the present study corrections were made to the correlations with children's intelligence. Intelligence was measured because a former study (Wiegman et al., 1992) showed that this factor played an important moderating role between viewing television violence and aggression. In this former study a highly significant positive correlation was found between aggression and viewing television violence, but when corrections for intelligence were applied this positive relationship almost completely disappeared. It is noteworthy that in the present study significant relationships remained significant after correcting for the effect of intelligence. In contrast to television research it seems to be that intelligence is not a moderating factor in the relationship between (aggressive) video game playing and aggression.
In earlier television research Wiegman et al. (1986) established a significant negative correlation between viewing television violence and intelligence; children who watched a lot of violence on television were less intelligent than low television violence consumers. In the present study a comparable result was demonstrated; children who showed a high preference for aggressive video games also tended to have a lower intelligence quotient.

In the present survey among young children, relations between playing video games and aggressive and prosocial behaviour as well as a child's intelligence were studied. Relationships with the aggressive content of video games were also taken into account. However, to gain more insight into effects of playing video games, in particular aggressive video games, on children's social, cognitive and mental development further experimental research needs to be done in order to establish causal relations. Finally, longitudinal research is needed to establish if there are any long-term effects of playing different types of video games on children's behaviour, as recommended by many other researchers in this area (e.g. Anderson & Ford, 1986; Graybill et al., 1987; Griffiths, 1991).

References


Received 5 August 1996; revised version received 4 August 1997.