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Short Note
Investigation of the relationship between social isolation, self-esteem, aggression and computer game play in Japanese adolescents

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Some support for expressed concern over the negative consequences of computer game play was obtained by Colwell and Payne (2000) in a questionnaire survey of UK adolescents. A second study was carried out in Tokyo, Japan, to test for generality of findings. There was strong evidence of similarity in relation to play patterns, but in contrast to the UK sample, number of good friends and self-esteem did not relate to game play. A principal components analysis of a scale to measure needs met by game play resulted in the same two previously obtained factors; 'companionship' and 'prefer to friends'. However, in contrast to the UK sample, 'companionship' did not relate to play. A positive relation between the 'prefer to friends' factor and play was obtained for both boys and girls (boys only in the UK), thus providing support for the 'electronic friendship' hypothesis. There was evidence of a positive relation between play and aggression, but a preference for aggressive games was associated with lower aggression scores, and this raises questions for the 'causal hypothesis'.

Key words: aggression, computer games, friendship, Japanese adolescents.

Introduction

Despite occasional lower estimates (Weigman & van Schie, 1998), there is clear evidence of the popularity of computer games, and amount of time spent playing them, in the UK (Colwell & Payne, 2000) and elsewhere (Buchman & Funk, 1996; Sakamoto, 2000). Attention has focused on negative consequences of play, such as social isolation (Selnow, 1984), low self-esteem (Dominick, 1984) and, in particular, aggression (Anderson & Bushman, 2001).

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Social isolation

Computer games may take the place of friends, leading to social isolation (Zimbardo, 1982). This 'electronic friendship' hypothesis was investigated by Selnow (1984), by adapting a 'catalog of needs' scale (Greenberg, 1974) developed for television viewing. Five factors emerged from a principal components analysis (PCA) of the data: 'video games preferred to friends', 'learn about people', 'companionship', 'action' and 'solitude/escape'. All factors correlated positively with arcade game play and support for 'electronic friendship' was claimed. Support was found using the same scale by Colwell *et al.* (1995) for boys, but not for girls. However, a positive relationship was obtained between play in boys and how often friends were seen outside school (the measure of friendship). Also Shimai *et al.* (1990) asked parents about their experiences with the home game system, or as Japanese call them 'famicon', and found that children who played were more socially skilled than children with no experience.

A questionnaire survey of 12–14 year olds was conducted by Colwell and Payne (2000). The measure of friendship was the number of good friends in the class, and Selnow's needs' scale was included, along with one extra question, 'playing computer games is the best way I can think of to spend my time'. A PCA of this needs' scale resulted in two factors. The first factor (companionship) contained items from Selnow's 'companionship', 'solitude', 'learn about people' and 'action' factors, as well as the extra 'best way to spend time' item. Computer games appeared to be fulfilling a friendship function while being alone. The second factor (prefer to friends) contained Selnow's 'video games preferred to friends' factor items. 'Companionship' correlated positively with frequency of play, duration of play and total game exposure for boys. This finding is consistent with Selnow's results. However, like Colwell *et al.* (1995), Colwell and Payne (2000) found positive correlations for boys between the 'prefer to friends' factor and game play measures. It was concluded that there was some support for the electronic friendship hypothesis for boys.

A link between friendship and social isolation in boys was suggested by the negative correlation obtained by Colwell and Payne between a measure of a total dose of game play (game exposure) and the number of good friends in the class. This result is not consistent with results of earlier studies (Lin & Lepper, 1987; Colwell *et al.*, 1995), but different studies have used different measures of sociability and game play, making comparisons difficult. Given the fear that increased play may encourage social isolation, it could be argued that the 'total dose' measure used by Colwell and Payne is the most appropriate one. However, in contrast, neither needs' factor in the Colwell and Payne study was related to friendship, and so the suggestion that friendship needs were being met through play instead of social interaction did not receive support. Clearly, the relationships between social isolation, game play and needs met through play require further investigation.

Self-esteem

A negative relationship between self-esteem and play among males has been suggested, with game success a means of raising self-esteem (Long, 1983). Support for this hypothesis has been mixed. Gibb *et al.* (1983) found no relationship between the variables, but Dominick (1984) found a negative relationship between self-esteem and arcade game play (but not home play), which was strongest for males who went to arcades alone. Colwell and Payne (2000) obtained a negative relationship between self-esteem and frequency of play for boys. However, different studies have used different measures of self-esteem and play, making it difficult to account for variations in results.

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Aggression

There is agreement over the aggressive nature of many computer games (Provenzo, 1991); the debate concerns the effect on aggressive behavior (Anderson & Bushman, 2001). This echoes the suspected effects of media violence, along with the fear of a more pronounced effect because of the greater direct involvement and rewards associated with computer game play (Sakamoto, 2000). Recent reviews of the literature on computer game play and aggression have been conducted (Griffiths, 1998) and the main findings are discussed briefly.

Some experimental studies have demonstrated short-term effects (Irwin & Gross, 1995; Sakamoto *et al.*, 1998a), while others (Graybill *et al.*, 1987) have found no effect of such play. Mixed results have also been obtained in correlational research. For example Gibb *et al.* (1983) found no relationship between weekly computer game play (home+arcade) and hostility. In contrast, Fling *et al.* (1992), using Dominick's (1984) 13-item aggression scale and an index of home and arcade play, obtained positive correlations between the variables. Dominick's 13-item scale was also used by Colwell and Payne (2000), and children were asked for their three favorite games. A 'total dose' play score (game exposure[1]), an index of the total amount of time each child has spent playing computer games, was computed as the product of frequency, duration and years of play, and aggression was found to correlate with game exposure. This score was multiplied by the number of aggressive computer games named in three favorite games, producing an 'aggressive game exposure' score. A preference for aggressive games was not related to aggression, but it did correlate with frequency of play in boys, and aggressive game exposure correlated significantly with aggression. A multiple regression analysis found that game exposure and sex were significant predictors of aggression. Colwell and Payne concluded that there was a growing body of evidence linking aggression with computer game play, and that further investigation of the causal hypothesis was justified. Correlational research in Japan has produced a similar pattern of results, with evidence both for (Kobayashi *et al.*, unpubl. data, 1999) and against (Sakamoto *et al.*, unpubl. data, 1998) a link between playing computer games and aggression.

The present study was a replication of Colwell and Payne's (2000) study using a sample of Japanese school students. The aim was to obtain data, using the same measures, in order to compare findings. There is recent concern over youth violence in Japan, and this underlines the need to further investigate further the role of playing aggressive computer games in explaining such violence, in what is the home of the computer game industry. Also, past Japanese research has focused almost exclusively on aggression and it was of interest to obtain data on friendship and self-esteem.

Method

Participants

An opportunity sample consisted of 305 (159 boys and 146 girls) 12–13-year-old Japanese students in four mixed junior high schools in Tokyo in 2000.

Questionnaire

The questionnaire used by Colwell and Payne was translated into Japanese by one of the authors (MK) and the translation was checked independently for meaning by two (Japanese) judges.

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Part 1 was filled in only by computer game players. The children were asked to tick any systems they possessed, name three favorite computer games, say who they usually played with (friends, family, alone, other) and choose one leisure activity (from: play computer games alone, go out with friends, read, play computer games with friends, watch television) if they had some spare time. The following scales were also included.

1 Computer game play items:
   Years of play: How long have you been playing regularly on a system? (1) Less than 6 months; (2) 6 months to 1 year; (3) 1–2 years; (4) more than 2 years.
   Frequency: In an average school week how many times do you play on a game system? (1) Less than once; (2) one to two times; (3) three to five times; (4) every day; (4) more than once a day.
   Duration: On average, when you play, how long do you play for?
   (1) Less than 30 min; (2) 30 min to 1 h; (3) 1–2 h; (4) 2–3 h; (5) more than 3 h.
2 Parental attitudes items:
   Five-point scales (coded 1–5) to measure: (a) concern over time spent on computer play (no–always); (b) attempts to control computer game play (never–always); (c) parent's approval of computer game play (strongly disapprove–strongly approve).
3 Selnow's (1984) needs' scale:
   Five-point scale. From strongly disagree to strongly agree, along with the extra item used by Colwell and Payne (10 of 13 items shown in Table 1).

Part 2 included demographic data, Rosenberg's (1965) seven-item self-esteem scale (e.g. 'I take a positive attitude toward myself'), Dominick's (1984) 13-item aggression scale, consisting of three subcategories: six physical aggression items (e.g. 'If somebody hits me first I let them have it'); three items on aggressive behavioral delinquency (e.g. 'Getting into a serious fight with someone at school'); and four hypothetical aggressive reactions (e.g. 'What if someone cut in front of you in a long line, what would you do?'). At the end of the questionnaire, the number of good friends was asked for as a measure of friendship.

Procedure

The questionnaire was given by the year tutor (home room teacher in Japan). The participants were told that the questionnaire was confidential and encouraged to answer as quickly as possible.

Results

Most participants (96.9% of boys and 87.7% of girls) played computer games, with play significantly higher among boys ($\chi^2=9.2$, $p<0.002$). Home video (90.1%) was the most popular system, followed by handheld (81.6%) and 29.4% of participants (33.1% of boys and 25% of girls) played arcade games as well. The most common duration of play was 1–2 h (33.3%), followed by 30 min to 1 h (28.0%). The most common frequency of play was one to two times a week (29.1%), followed by three to five times a week (23.8%). However, separate analyses by sex revealed that boys' most common frequency was more than once a day (32.5%), whereas for girls it was one to two times a week (43%). The majority of boys (84.3%) and girls (42.1%) had been playing computer games for more than 5 years. Boys played more frequently, $t(280)=9.03$, $p<0.001$, for longer in each play session, $t(279.37)=4.75$, $p<0.001$, and had been playing computer games for longer than girls, $t(242.56)=9.23$, $p<0.001$. Game exposure, a measure of 'total dose' of game playing, was

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calculated as the product of frequency, duration and years of play and, again, boys had higher scores than girls, $t(229.06) = 10.11$, $p < 0.001$.

Some children (21.3%) reported that their parents thought they spent too much time playing computer games, but only 14.6% of parents were said to have attempted to control play. A minority of children (12.1%) indicated that their parents disapproved of playing computer games, but more children (24.5%) thought their parents actually approved of such play. More children said that they usually played computer games alone (53.5%) than with family or friends (46.5%). However, when asked to choose from a number of different leisure activities, playing computers alone was indicated by 22.0%, compared with 7.8% children who chose playing with friends. Other activities, for example, watching television or reading, were chosen by 70.2% of children. Frequency of play correlated highly with duration ($r = 0.45$), and years of play with frequency ($r = 0.39$) and duration ($r = 0.29$). A similar pattern held for each gender, and game exposure correlated highly with each play dimension.

Friendship

The number of good friends reported ranged from one (1.1%) to 50 (2.5%) with 10 (15.2%) the most popular choice. However, the distribution was heavily skewed and, therefore, a median split was conducted, resulting in 'those with less' (low) and 'those with more' (high) friends' groups. No differences were obtained between the groups in relation to frequency, duration or years of play or, indeed, total exposure to game play. Also, those with low game exposure (bottom 20.6%) did not have significantly fewer friends than those with high game exposure scores (top 19.5%). Similar results were obtained for boys and girls separately. Thus, there is no evidence of computer game play being related to number of good friends.

A PCA, with varimax rotation, was conducted on the needs' scale items and three factors emerged with eigenvalues larger than 1.0, accounting for 59% of the variance. However, a two-factor solution was apparent, after inspection of the scree plot (Table 1). The first factor accounted for 23.2% of the variance and contained the same items as the 'prefer to friends' factor in Colwell and Payne (2000), with the addition of two items: 'playing computer games is a chance for me to be by myself' and 'computer games are good company for me'. The label 'prefer to friends' was retained. The second factor accounted for 18.3% of the variance, and included the same items as Colwell & Payne's 'companionship' factor, except that three items: 'playing computer games is a chance for me to be by myself', 'playing computer games lets me do things rather than just watch others do things' and 'I play computer games because

Table 1 Principal components analysis of the needs' scale items

Item	Factor 1	Factor 2
Playing computer games is better than being with people	0.84	
Playing computer games is more exciting than being with people	0.76	
Playing computer games is the best way I can think of to spend my time	0.73	
It's more fun playing computer games than being with friends	0.73	
Playing computer games is a chance for me to be by myself	0.54	
When I play computer games it is like being with another person		0.83
Playing computer games is almost like being with a friend		0.82
Computer games are good company for me	0.42	0.49
Playing computer games makes me feel part of the action		0.51
Playing computer games helps me to forget I'm alone		0.49

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Table 2 Zero order correlations between game play, needs met by playing computer games and self-esteem

	Frequency	duration	Years of play	Game exposure	Self-esteem
Whole sample					
Companionship	−0.03	0.10	0.00	0.02	0.06
Prefer to friends	0.39**	0.34**	0.15	0.37**	−0.05
Self-esteem	0.08	0.01	0.10	0.06	
Boys					
Companionship	−0.01	0.11	0.03	0.06	0.01
Prefer to friends	0.23*	0.34**	−0.04	0.29**	−0.07
Self-esteem	−0.06	−0.05	0.09	−0.04	
Girls					
Companionship	0.02	0.12	0.02	0.06	0.16
Prefer to friends	0.43**	0.23*	0.10	0.34**	−0.11
Self-esteem	0.10	0.02	−0.01	0.08	

**$p<0.001$, *$p<0.01$.

it lets me think by myself' were not included. This smaller factor is arguably a purer measure of 'companionship', as the discarded items do not relate directly to companionship and, therefore, that label is retained. The same factors were extracted in separate analyses for boys and girls.

Correlations between the two needs' factors and game play measures are shown in Table 2. 'Companionship' was not related to computer game play for the whole sample or for boys and girls separately. However, strong positive correlations were obtained between 'prefer to friends' and frequency of play ($r=0.39$, $p<0.001$), duration of play ($r=0.34$, $p<0.001$) and game exposure ($r=0.37$, $p<0.001$). The same correlations were obtained for boys and girls, but some gender differences were apparent. For boys the correlation was stronger for duration than frequency, whereas for girls the correlation was stronger for frequency.

Self-esteem

Zero order correlations between self-esteem (alpha coefficient 0.62), game play measures, and needs met through play are also shown in Table 2. There was no evidence of self-esteem being related to any of the other variables for the whole sample, or for boys and girls separately.

Aggression

Scores were computed for each of the aggression subscales. Physical aggression correlated positively with aggressive delinquency ($r=0.31$, $p<0.001$) and with hypothetical aggression ($r=0.42$, $p<0.001$). Also, there was a positive correlation between aggressive delinquency and hypothetical aggression ($r=0.37$, $p<0.001$). The three subscales were summed to produce a total score for aggression (alpha coefficient 0.70) and boys displayed significantly higher scores than girls ($t=6.44$, $p<0.001$). Zero order correlations between aggression and

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Table 3 Zero order correlations between aggression and measures of game play†

	Years of play	Frequency	Duration	Game exposure
Whole sample aggression	0.18** (0.01)	0.28*** (0.14)*	0.14* (0.05)	0.26*** (0.10)
Boys' aggression	0.03	0.15	0.00	0.08
Girls' aggression	−0.01	0.12	0.12	0.12

***$p<0.001$, **$p<0.01$, *$p<0.05$.
†Partial correlations, controlling for sex, are shown in parentheses.

Table 4 Number of favorite games chosen with aggressive content†

Number	0	1	2	3
Boys ($N=152$)	31.2	28.6	29.9	10.4
Girls ($N=124$)	71.9	18.0	9.4	0.8
Whole ($N=276$)	49.6	23.8	20.6	6.0

†All values in percent.

other measures are shown in Table 3. For the whole sample, aggression correlated significantly with game exposure ($r=0.26$, $p<0.001$), with the strongest contribution coming from frequency of play ($r=0.28$, $p<0.001$), but when sex was partialled out (Table 3), these correlations were reduced. Only the correlation between aggression and frequency of play remained significant ($r=0.14$, $p<0.02$), although there was a trend for a correlation between aggression and game exposure ($r=0.10$, $p<0.08$).

A count of the three favorite games named by children, which included aggressive actions, are shown in Table 4. Games were assessed by two judges, with 93% agreement, and anomalies were resolved through discussion. The majority of children (73.4%) listed none or one aggressive game, and boys reported more aggressive games than girls, $t(280)=7.72$, $p<0.001$).

The distribution of games with aggressive content was heavily skewed in a positive direction, with 49.6% of children choosing none. This skew could not be corrected with the use of transformations, and so the distribution was partitioned into those who nominated none versus those who nominated one or more aggressive games. The aggressive games group had been playing for a longer period of time, $t(271.5)=6.83$, $p<0.001$; played more frequently, $t(280)=4.55$, $p<0.001$; for longer on each occasion, $t(280)=4.21$, $p<0.001$; and had higher game exposure scores, $t(280)=6.94$, $p<0.001$, than the no aggressive games group. Similar directional differences were obtained for boys and girls separately, except that mean differences did not always reach significance. The exception, with little displayed difference between the no aggressive and aggressive games groups, was for frequency of play for boys. The mean for aggression for the aggressive games group was lower than that for the non-aggressive games group for boys and, in particular, for girls, where there was evidence of a trend, $t(126)=1.73$, $p<0.08$, although the mean difference for the whole sample was not significant.

An index of total amount of time spent playing aggressive computer games (aggressive game exposure) was derived through the product of game exposure and number of reported favorite games with aggressive content (range 0–3). The resulting variable was also heavily

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skewed and was partitioned into those with a score of zero, and those with a positive score. There was no difference in aggression between the two groups for the whole sample, or for boys and girls separately.

A standard multiple regression analysis was conducted with aggression scores as the dependent variable (DV) and preferred favorite games (no aggressive *vs* one or more aggressive games), game exposure and sex as independent variables. Three variables, sex (unique variance 7.8%, $t=-5.05$ $p<0.001$), favorite games (unique variance 1.8%, $t=-2.4$ $p<0.02$) and game exposure (unique variance 1.3%, $t=2.09$ $p<0.04$), significantly accounted for a total of 14.2% explained variance. Higher aggression scores were obtained by boys (than girls), those with higher (than lower) game exposure, and those who preferred non-aggressive games (compared to aggressive games).

Discussion

Computer game play is clearly very popular among Japanese adolescents, with the obtained incidence (92.5%) almost exactly the same as that found by Colwell and Payne (92.6%). Heavier use by boys was also repeated, and the data for play are consistent with past research. Home video systems and handheld types were most popular, and almost all children had access to one or more game types. Arcade game play was relatively low, considering the large number of game centers in Japan, but this is to be expected, as regulations prevent anyone under the age of 16 entering a game center without their parents. Concern by parents over amount of time spent playing appeared to be higher in Japan (21.3%) compared to Britain (11.3%), but reported attempts to control were similar (14.6% *vs* 15.5%).

Friendship was not related to any of the game-playing measures, and this contrasts with previous results where there has been evidence of both weak positive and weak negative relations. Therefore, the fear that computer games may be taking the place of real friends is not receiving much support in the West, and none in Japan. However, one concern is that the measure of sociability used, the single item asking for number of friends, may not be a good measure of the construct.

In contrast, the notion that computers fulfill similar needs to those provided by real friends does again receive some support. Two factors emerged from a PCA of the needs' scale. The 'companionship' factor suggests that playing computer games is like being with a friend, although there was no evidence of it being related to any of the game play measures. This contrasts with Colwell and Payne's (2000) finding of a positive relationship between 'companionship' and frequency of play ($r=0.32$), duration of play ($r=0.36$) and game exposure ($r=0.33$) in boys. The implication is that Japanese boys, in contrast to British boys, do not view computer game play as fulfilling needs similar to those provided by friends. In contrast the 'prefer to friend' factor correlated strongly with frequency of play, duration of play and game exposure, but not with years of play, for both boys and girls. This result is consistent with that found by Colwell and Payne (2000), although the correlations were weaker in the UK sample and obtained for boys only. The pattern of results in the Japanese sample would seem to be consistent with the 'electronic friendship' hypothesis. However, there was no difference in the number of good friends between those who scored high and those who scored low on the 'prefer to friends' factor. Therefore, a stated preference for playing computer games over being with friends does not seem to lead to fewer friends or social isolation. Thus 'electronic friendship' may be a substitute for real friendship while alone, but not at the expense of friends. However, given the stated concern over the validity

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of the measure of friendship, future research could attempt to develop a multidimensional measure. Also, independent ratings (e.g. teacher or peer ratings) could be used, although loss of anonymity may produce socially desirable data.

Self-esteem did not relate to game play, whereas Colwell and Payne obtained a weak positive correlation between self-esteem and frequency of play ($r=-0.21$), 'companionship' ($r=-0.20$) and 'prefer to friends' ($r=-0.19$). Given that identical measures were used to Colwell and Payne (2000), the conclusion must be that self-esteem in Japanese children is not related to game play or, indeed, the needs fulfilled by play.

More children preferred non-aggressive computer games than in Colwell and Payne's British sample, especially among girls (71.9% in Japan *vs* 48.9% in the UK). Fewer Japanese children nominated three aggressive games (6.0% *vs* 9.3%), and this would seem to indicate a preference for less aggressive computer games. However, it may simply be due to a greater cultural concern over the possible effect of such play. In Japan, computer games with aggressive content are labeled 'this game involves violence', which may deter parents from buying them.

Correlations between aggression and game play measures were similar to those obtained by Colwell and Payne, and the multiple regression analysis produced similar results for sex and game exposure. However, in contrast, preferred aggressive games significantly predicted lower aggression. All this suggests that the positive relation between playing computer games and aggression may simply be correlational and not causal; aggressive children like playing computer games, many of which are aggressive. Furthermore, the evidence actually supports a catharsis mechanism, that playing aggressive computer games may lead to lowered aggression (Feshbach & Singer, 1971), a finding in line with data obtained by Sakamoto *et al.* (unpubl. data, 1998). However, in two other studies that separated amount of play from type of game played, evidence to support a causal link was obtained (Kobayashi *et al.*, unpubl. data, 1999; Naito *et al.*, 1999).

The present study set out to investigate negative correlates of computer game play among Japanese adolescents. Although there is good evidence of cross-cultural similarity, particularly in relation to patterns of play, some interesting differences emerged that could be explored in future research.

End note

1. Patterns of play can vary over time and so there may be measurement error in this calculation.

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