Electronic Gaming and Psychosocial Adjustment

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electronic games, children, psychosocial adjustment

ABBREVIATION
SDQ—Strengths and Difficulties Questionnaire

Dr Przybylski is the sole author of this work. He conceptualized the study, identified the data, secured rights to use it, and designed the analysis. Following data analysis he wrote the draft and final versions and approved the final manuscript as submitted.

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WHAT'S KNOWN ON THIS SUBJECT: Concerns as well as hopes regarding electronic games have led researchers to study the influence of games on children, yet studies to date have largely examined potential positive and negative effects in isolation and using samples of convenience.

WHAT THIS STUDY ADDS: Results from this nationally representative study of children 10 to 15 years indicated low levels of regular daily play related to better psychosocial adjustment, compared with no play, whereas the opposite was true for those engaging in high daily play.

abstract

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BACKGROUND AND OBJECTIVES: The rise of electronic games has driven both concerns and hopes regarding their potential to influence young people. Existing research identifies a series of isolated positive and negative effects, yet no research to date has examined the balance of these potential effects in a representative sample of children and adolescents. The objective of this study was to explore how time spent playing electronic games accounts for significant variation in positive and negative psychosocial adjustment using a representative cohort of children aged 10 to 15 years.

METHODS: A large sample of children and adolescents aged 10 to 15 years completed assessments of psychosocial adjustment and reported typical daily hours spent playing electronic games. Relations between different levels of engagement and indicators of positive and negative psychosocial adjustment were examined, controlling for participant age and gender and weighted for population representativeness.

RESULTS: Low levels (<1 hour daily) as well as high levels (>3 hours daily) of game engagement was linked to key indicators of psychosocial adjustment. Low engagement was associated with higher life satisfaction and prosocial behavior and lower externalizing and internalizing problems, whereas the opposite was found for high levels of play. No effects were observed for moderate play levels when compared with non-players.

CONCLUSIONS: The links between different levels of electronic game engagement and psychosocial adjustment were small (<1.6% of variance) yet statistically significant. Games consistently but not robustly associated with children's adjustment in both positive and negative ways, findings that inform policy-making as well as future avenues for research in the area. *Pediatrics* 2014;134:1–7

Electronic games are now a dominant entertainment medium for children and adolescents as >97% of teens now play games regularly.[1] This popularity has put games in the spotlight with media, policy, and research initiatives concerned about their possible negative effects[2] or, alternatively, hoping to harness their broad appeal for social goods.[3] Past research conducted on non-interactive forms of entertainment has led to professional recommendations for limits on children's exposure to electronic games,[4] yet these guidelines have little empirical basis, as both the motivational affordances and structural features of games vary widely.[5] Moreover, it is probable that the interactive nature of electronic games distinguishes these mediums for play from non-interactive forms of entertainment in terms of their positive and negative effects on children.

There are a number of reasons to expect that electronic games might negatively influence children's psychosocial adjustment. For example, time devoted to games may crowd out opportunities for growth and development, displacing face-to-face and group socializing and imaginative play, and as a result contribute to internalizing problems (problematic behaviors characterized by depression, anxiety, somatic symptoms, and withdrawal). The mature contents of some games are inappropriate for young players and may teach children that using virtual violence is an acceptable way to achieve goals, thereby eliciting externalizing problems, or acting out behaviors such as aggression and delinquency.[6] Previous research provides some basis for these concerns, suggesting that gaming may be linked to negative psychosocial indicators such as increased levels of hyperactivity,[7] hostile attribution and cognition,[8] as well as some laboratory-based measures of aggressive behavior[9] and desensitization to risky behavior.[10] This work suggests that, like other forms of media entertainment, electronic play may have distinct downsides.

At the same time, there are good reasons to think that electronic games, like traditional forms of play, have beneficial aspects that set them apart from non-interactive media entertainment. Games provide a wide range of novel cognitive challenges, opportunities for exploration, relaxation, and socialization with peers. Research focusing on the potential benefits of games indicates they may bolster adjustment by providing psychologically rewarding experiences[11] that dispel negative affect,[12] inspire prosocial behavior,[13] foster creativity,[14] as well as broaden self-concept[15] and build social connections.[16] In addition, playing some types of games may serve to minimize externalizing problems by building executive control,[17] attention skills,[18] healthy behavior,[3] and visuospatial abilities.[19] Thus, like nondigitally mediated forms of child play, games may encourage child well-being and healthy social adjustment.

Taken together, findings in this developing literature suggest both favorable and unfavorable effects of gameplay, outcomes that could inform decisions made by health care professionals, parents, and policymakers. Yet nearly all of these studies examine the potential upsides or downsides of games in isolation, generalized from convenience samples such as undergraduate populations. Reviews of these studies highlight methodologic and conceptual shortcomings present in the literature and caution researchers against drawing overly broad generalizations in future studies.[20] With this in mind little is known about the net effects that different levels of electronic gameplay have on children's psychosocial adjustment, or about the extent that these effects are meaningful or significant on a broader level.

The present research addressed this gap in our understanding by testing 3 hypotheses concerned with varying levels of electronic game engagement and positive and negative indicators of children's psychosocial adjustment across the general population. First, it was hypothesized that low levels of play would facilitate child adjustment. Research indicates that roughly half of young people are light players, that is, they regularly spend up to 1 hour each day playing games,[1] less than one-third of their daily free time.[21] Gaming at this low level may have many of the benefits identified in laboratory-based research without crowding out other rich developmental opportunities. Second, it was hypothesized that moderate levels of play may carry positive as well as negatives effects. Nearly one-third of children spend between 1 and 3 hours playing electronic games daily[1]; this level of engagement consumes between one-third and one-half of adolescent free time.[21] Moderate players may show higher levels of positive adjustment linked to the enhanced skills and social connections derived from play, yet they also exhibit negative adjustment from exposure to inappropriate game content compared with nonplayers. Finally, it was hypothesized that high levels of daily play would have broadly negative effects on psychosocial adjustment. Roughly 10% to 15% of young people invest more than half of their free time, >3 hours each day, playing,[1,21] a proportion of the population who may have a problematic relationship with gaming.[22] Heavy players may miss important developmental opportunities available to nonplayers and may be at greater risk for encountering inappropriate experiences that overshadow the potential upsides of gaming. To capture representative effects of electronic play these hypotheses were tested considering children's use of 2 dominant gaming mediums[23]: Console-based games (eg, Nintendo Wii) and computer-based games (eg, personal computer).

METHODS

Participants

A nationally representative subsample of 2436 male and 2463 female young people, ranging in age from 10 to 15 years (mean, 12.51 years; SD, 1.70 years) was drawn from data collected by the UK Understanding Society Household Longitudinal Study.[24] Understanding Society is an initiative by the Economic and Social Research Council, with scientific leadership by the Institute for Social and Economic Research, University of Essex, and survey delivery by the National Centre for Social Research. This project recruits participants from England, Northern Ireland, Scotland, and Wales, and includes social, behavioral, and health data from participants aged 10 years and older. Data from 10- to 15-year-olds measuring their electronic game engagement and psychosocial adjustment was provided through self-report by paper survey.

Measures

Electronic Game Engagement

The typical amount of time participants devoted to electronic games was assessed through 2 self-report items. The first asked about engagement with console-based games (eg, Sony PlayStation) and a second asked about computer-based games (eg, personal computer). For both mediums, participants selected 1 of the 6 response options that best represented the amount of time they spend playing on a normal school day: none, <1 hour, 1–3 hours, 4–6 hours, 7 or more hours. Because very few participants reported playing 7 or more hours (<1.5% of cases), responses falling into the latter 2 groups were bucketed into a single 3 or more hours each day category. Table 1 presents the frequencies of typical daily play reported for each type of electronic gaming.

TABLE 1 Frequency of Different Levels of Play

	Overall	Gender		Age				
	Total	Boys	Girls	10 y	11 y	12 y	13 y	14 y	15 y
Daily hours of console game engagement									
None, %	25.8	11.6	41.9	18.9	19.6	20.5	27.4	31.4	36.7
<1, %	36.0	31.1	41.7	42.9	42.3	39.0	34.6	29.7	27.4
1 to 3, %	31.5	45.8	15.2	33.3	34.1	33.2	29.3	30.7	28.7
>3, %	6.7	9.8	1.2	4.8	4.1	7.3	8.7	8.1	3.4
Daily hours of computer game engagement									
None	14.2	12.2	16.4	8.4	9.1	11.6	16.4	16.8	21.8
<1, %	35.5	35.8	35.3	50.0	47.0	35.0	28.7	29.1	25.5
1 to 3, %	41.4	42.3	40.4	38.2	40.3	44.5	44.8	40.6	39.6
>3, %	8.9	9.8	7.9	3.4	3.6	8.9	10.1	13.5	13.0

Percentages reflect adjusted and valid proportions of children at different levels of game engagement as weighted by representativeness across the United Kingdom.

Internalizing and Externalizing Problems

The internalizing and externalizing problems subscales of the Strengths and Difficulty Questionnaire (SDQ)[25] provided indicators of negative psychosocial adjustment.[6] The SDQ is among the most widely validated behavioral screening questionnaires used by researchers, educators, and clinicians to assess the functioning of children and adolescents ranging in age from 3 to 16 years.[6] Participants used a 3-point response scale: 1 = "not true," 2 = "somewhat true," 3 = "very true" to rate a list of personal statements. Divided across 5-item subscales, responses were summed to create individual emotional symptoms (mean, 3.28; SD, 1.97), conduct problems (mean, 2.75; SD = 1.67), hyperactivity and inattention (mean, 4.30; SD, 2.14), and peer relationship problems (mean, 2.37; SD, 1.50). Following best practice recommendations for general population samples,[21] 2 psychosocial adjustment scores were generated for each participant; internalizing problems scores (mean, 4.85; SD, 3.05; α, 0.70) were created by summing emotional symptoms and peer relationship subscales, and externalizing problems scores (mean, 6.66; SD, 3.49; α, 0.79) were similarly computed from conduct problems and hyperactivity and inattention subscales.

Prosocial Behavior

The 5-item prosocial behavior subscale of the SDQ[25] was used to measure a positive aspect of psychosocial adjustment. This scale uses the same response format and anchors as the other SDQ subscales but focuses on personal statements that reflect empathic and helpful thoughts and actions such as, "I try to be nice to people. I care about their feelings." Following best practice recommendations,[6] prosocial behavior scores were computed by summing responses across all 5 items (mean, 7.63; SD, 1.87; α, 0.67).

Life Satisfaction

Satisfaction with life was measured as a positive aspect of adjustment with 6 items that asked participants to rate their level of happiness overall and across 5 life domains (school, school work, appearance, family, and friends), all using a 7-point visual analog scale of faces ranging from: 1 = "completely happy" (a wide smile) to 7 = "not at all happy" (a frown). Principle axis factoring indicated these items fit well onto a single factor accounting for 45.37% of observed variance. In line with this, a reliable composite measure was created by reverse scoring and then averaging across the item scores so that higher values indicted higher levels of satisfaction (mean, 5.94; SD, 0.86; α, 0.68).

RESULTS

Analytic Approach

Because the assessments of typical daily electronic game engagement were not continuous, 3 contrast-coded regression coefficients were created and evaluated as predictors in ordinary least squares regression models to compare the effects of low, moderate, and high levels of gaming to nonplay. The first contrast compared children who typically play <1 hour each day (light players) to nonplayers; this coding tested the prediction that low levels of game engagement may be beneficial over not playing at all. The second contrast compared those who play between 1 and 3 hours each day (moderate players) to nonplayers; this coding tested the prediction that moderate levels of game play may carry both positive and negative influences. The final contrast compared those who play >3 hours each day (heavy players) to nonplayers and tested the hypothesis that high levels of engagement would have detrimental effects. When included as simultaneous predictors these contrast-coded coefficients provided sensitive and meaningful comparisons that minimized the number of statistical tests used and estimated the size and significance of effects at distinct levels of console- and computer-based play. All analyses used cross-sectional UK Household Survey weightings that adjusted for design weight, nonresponse rate, post-stratification, and representativeness of household location. Weighting the models in this way provides greater confidence that the results derived generalize to children nationwide.

Effects of Low Levels of Game Engagement

Models comparing light players (<1 hour daily) to nonplayers holding variability in participant age and gender constant are presented in Table 2. Across the 2 types of games, light players showed higher levels of prosocial behavior (bs = 0.19 to 0.31; r^2 = 0.0034 to 0.0092) and life satisfaction (bs = 0.10 to 0.12; r^2 = 0.0053 to 0.0077) and lower levels of internalizing (bs = −0.37 to −0.52; r^2 = 0.0050 to 0.0090) and externalizing problems (bs = −0.64 to −0.68; r^2 = 0.0108 to 0.0127) compared with nonplayers (all ps <0.001). Low levels of game engagement accounted for between 0.5% and 0.9% of variability in positive psychosocial indicators and between 0.5% and 1.3% of variability in negative indicators of adjustment.

Effects of Moderate Levels of Game Engagement

Analyses comparing moderate players (1 to 3 hours daily) to nonplayers provided null results across all adjustment observations (all bs < ±0.08; ps >0.350). Moderate levels of play were not associated with either positive or negative indicators of children's adjustment.

TABLE 2 Contrast Coded Regression Models Comparing Effects of Low, Moderate, and High Levels of Engagement to Nonengagement

	Life Satisfaction					Prosocial Behavior				
	B	*SE*	95% CI	*P*	r^2	*B*	*SE*	95% CI	*P*	r^2
Daily hours of console game engagement										
<1 vs none	0.10	0.021	0.06 to 0.14	<.001	0.0053	0.31	0.046	0.22 to 0.40	<.001	0.0092
1 to 3 vs none	0.01	0.022	−0.03 to 0.05	.658	n/a	−0.03	0.048	−0.12 to 0.07	.545	n/a
>3 vs none	−0.17	0.037	−0.24 to −0.10	<.001	0.0046	−0.50	0.082	−0.66 to −0.33	<.001	0.0074
Daily hours of computer game engagement										
<1 vs none	0.12	0.020	0.08 to 0.16	<.001	0.0077	0.19	0.045	0.10 to 0.27	<.001	0.0034
1 to 3 vs none	−0.01	0.029	−0.05 to 0.02	.464	n/a	−0.02	0.042	−0.11 to 0.06	.566	n/a
>3 vs none	−0.20	0.031	−0.26 to −0.13	<.001	0.0081	−0.27	0.070	−0.40 to −0.13	<.001	0.0029

	Internalizing Problems					Externalizing Problems				
	B	*SE*	95% CI	*P*	r^2	*B*	*SE*	95% CI	*P*	r^2
Daily hours of console game engagement										
<1 vs none	−0.52	0.083	−0.68 to −0.35	<.001	0.0090	−0.64	−0.142	−0.82 to −0.46	<.001	0.0108
1 to 3 vs none	0.04	0.086	−0.13 to 0.21	.651	n/a	0.03	0.006	0.16 to 0.21	.768	n/a
>3 vs none	0.92	0.148	0.63 to 1.20	<.001	0.0090	1.17	0.180	0.86 to 1.49	<.001	0.0118
Daily hours of computer game engagement										
<1 vs none	−0.37	0.080	−0.53 to −0.21	<.001	0.0050	−0.68	0.089	−0.86 to −0.51	<.001	0.0127
1 to 3 vs none	0.02	0.075	−0.13 to 0.17	.797	n/a	0.07	0.084	−0.09 to 0.24	.383	n/a
>3 vs none	0.72	0.124	0.54 to 1.03	<.001	0.0900	1.12	0.136	0.85 to 1.39	<.001	0.0146

Coefficients reflect values adjusted and weighted by representativeness of participants across the United Kingdom. *B*, unstandardized regression slope coefficients; n/a, not applicable.

Effects of High Levels of Game Engagement

Results comparing heavy players (>3 hours daily) to nonplayers showed a mirror image of the pattern observed for light players. Heavy players reported higher levels of internalizing (bs = 0.72 to 0.92; r^2 = 0.0090) and externalizing problems (bs = 1.12 to 1.17; r^2 = 0.0118 to 0.0146) and lower levels of prosocial behavior (bs = −0.27 to −0.50; r^2 = 0.0029 to 0.0074) and life satisfaction (bs = −0.17 to −0.20; r^2 = 0.0046 to 0.0081) compared with nonplayers (all ps <0.001). High levels of game engagement accounted for between 0.3% and 0.8% of variability in positive psychosocial indicators and between 0.9% and 1.5% of negative indicators after adjusting for participant age and gender.

DISCUSSION

Broadly speaking, findings from the present research indicated that different levels of electronic game engagement may indeed positively or negatively influence children's psychosocial adjustment. Results provided support for 2 of the 3 hypotheses, suggesting that low levels of daily game engagement expose children to the benefits of gaming, whereas high levels of daily play may be more consistently linked to negative outcomes. Interestingly, no significant trends were in evidence for children who typically played games for between 1 and 3 hours each day; these moderate players did not differ from their nonplaying peers. These findings provided empirical weight and important ecological validity to existing studies focused exclusively on either the potential downsides or upsides of gaming and delivered a much needed perspective to understand the broader influences of games on children.

Compared with nonplayers, children who typically invest less than one-third of their daily free time playing games showed higher levels of prosocial behavior and life satisfaction and lower levels of conduct problems, hyperactivity, peer problems, and emotional symptoms. This pattern of results supports the idea that electronic play has salutary functions similar to traditional forms of play; they present opportunities for identity development[15] as well as cognitive and social challenges.[16] Furthermore, these results conceptually replicate recent laboratory-based studies suggesting games have beneficial effects.[18] Results from the current study also showed that children who spend more than half their daily free time showed more negative adjustment. Compared with nonplayers, these players reported higher levels of both externalizing and internalizing problems and lower levels of prosocial behavior and life satisfaction. This suggests a large share of time devoted to games may crowd out engagement in other enriching activities and risk exposure to content meant for mature audiences. These findings provide convergent evidence for laboratory-based studies identifying short-term negative effects of some gaming experiences.[7] However, compared with factors shown to have robust and enduring effects on child well-being such as family functioning,[26] social dynamics at school,[27] and material deprivations,[28] the current study suggests the influences of electronic gaming, for good or ill, are not practically significant. Understanding this, this study informs 3 specific issues facing the study and societal understanding of games: controversies concerning their negative impact, hopes about their positive potential, and the scientific legitimation for present and future policy guidelines.

The current study's findings speak to the heated debates regarding the existence of gaming-related aggression. Researchers disagree sharply on the effects of games on children, some finding links to hostility measures,[29] some report null effects,[30] and still others argue the links may exist but are small and detectable only at some levels or kinds of engagement.[31] If indeed the overall effects of high levels of game engagement are weakly related to children's conduct problems, as is suggested in the present findings, this may explain part of why studies extrapolating from convenience samples of university students demonstrate inconsistent results. This pattern of findings indicates the negative effects of age-inappropriate gaming on hostile thoughts, feelings, and real-world behaviors are substantively smaller than those observed for passive forms of media entertainment.[31] It is a positive sign that researchers are increasingly careful to avoid broad statements that directly link gaming to real-world incidents of violence.[32]

In a similar vein, the small positive effects observed for low levels of regular electronic play do not support the position that games provide a universal solution to the challenges of development and modern life.[33] Many of the positives attributed to games have been demonstrated using a narrow range of action gaming contexts and may depend on specific structural and motivational affordances not widely present in electronic games.[19] Likewise, although the salutatory effects of play on recovery and emotions have been shown for short-term outcomes[11,12] the present research suggests modest broader effects. Optimism expressed by some theorists about the transformative nature of gaming may be tempered when viewed in light of the small effects linking positive child outcomes to low levels of daily game engagement.

Finally, the present results advance the idea that the link between electronic game play and psychosocial functioning is nuanced and suggests that the limits-focused guidelines advanced by the American Academy of Pediatrics,[4] American Medical Association,[34] and Royal College of Pediatrics[35] may need further

evaluation. The current study suggests guidelines may not be as simple as limiting exposure. Indeed, responsible guidelines may require an evidence-based approach that weighs the relative benefits and drawbacks of varying levels of engagement and different forms electronic games.[5]

This research presents limitations that provide rich avenues for future research. First, although the present research was based on UK Understanding Society methodology and SDQ measures, both gold standards in assessment and data collection convergent data from sources such as parents and teachers would provide advantage in future work. Second, children's electronic game engagement was operationalized as the typical time devoted to games, and although time-based measures of engagement are often a key part of practitioner guidelines regarding media engagement,[4] future work must consider alternative ways to operationalize engagement, such as assessing its relative salience among other childhood activities, and take smartphone and tablet-based play into consideration. Finally, the cross-sectional nature of the data limits causal inferences, and future representative longitudinal data collections would add to the empirical picture presented here.

CONCLUSIONS

Until new forms of recreation supplant electronic games, they will remain a prominent part of modern childhood. The current study moved beyond the methodologies and foci of past work and provides an important empirically based perspective that explores the broader positive and negative effects of games. Results suggested there are potential benefits for children who engage in low levels of daily game play and downsides for those who play excessively. This research provides a new standpoint for parents and policymakers to understand electronic play. The overall effects are consistent yet small, indicating that both the broad fears and hopes about gaming may be exaggerated. Electronic games might best be thought of as a new variety of toys offering a range of distinct play experiences and not a new embodiment of traditional media entertainment. Other aspects of gaming, such as children's motivations for play[16] and the structural affordances of different kinds of gaming contexts,[5] must be investigated to further our understanding of how exactly they impact on children's well-being and behavior and inform improved evidence-based guidelines for electronic play.

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