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Role-Playing and Real-Time Strategy Games Associated with Greater Probability of Internet Gaming Disorder

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Abstract

Research indicates that a small subset of those who routinely play video games show signs of pathological habits, with side effects ranging from mild (e.g., being late) to quite severe (e.g., losing a job). However, it is still not clear whether individual types, or genres, of games are most strongly associated with Internet gaming disorder (IGD). A sample of 4,744 University of Wisconsin–Madison undergraduates ($M_{age} = 18.9$ years; $SD = 1.9$ years; 60.5% female) completed questionnaires on general video game playing habits and on symptoms of IGD. Consistent with previous reports: 5.9–10.8% (depending on classification criteria) of individuals who played video games show signs of pathological play. Furthermore, real-time strategy and role-playing video games were more strongly associated with pathological play, compared with action and other games (e.g., phone games). The current investigation adds support to the idea that not all video games are equal. Instead, certain genres of video games, specifically real-time strategy and role-playing/fantasy games, are disproportionately associated with IGD symptoms.

Introduction

Scientific interest in problematic video gaming has grown steadily since concerns about the addictive potential of video games were first raised in the early 1990s.[1,2] Over the past two decades, a significant body of work has outlined both the prevalence rate and the potentially severe consequences associated with problematic video gaming, with the weight of the evidence to date being sufficient for Internet gaming disorder (IGD) to be included in Section 3 of the newest version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5).[3–6] Critically, IGD involves more than simply ''playing a lot of video games.'' Instead, IGD involves a repetitive use of video games that results in significant issues with daily life function (e.g., reductions in academic and occupational performance, disturbed sleep, diminished decision-making skills, increased depression, and general social dysfunction[4,7]) and where the playing habits persist despite the presence of these negative outcomes.

Although there is a large and ever expanding body of literature outlining the general prevalence of IGD, as well as individual differences associated with IGD,[8,9] there is comparably less work examining whether certain *types* of games are more or less associated with an increased risk of IGD (in the same way that certain substances are associated with an increased risk of substance abuse). Instead, the bulk of the literature has tended simply to ask individuals how often they play video games in general[10] or have asked about subtypes of games played but then collapsed across this dimension.[11,12] This is despite the fact that the term ''video game'' encompasses an incredibly broad range of experiences. Indeed, there are extensive data in many other domains of psychology showing that ''video game play'' (at the superordinate category level) is essentially nonpredictive of either positive or negative behavioral outcomes. For instance, in the social domain, clear differences in outcome have been shown depending on whether individual games contain pro- or antisocial content.[13–16] In the cognitive domain, enhancements in perceptual and cognitive processing abilities are only observed after individuals play a select subset of highly demanding and active video games that require fast-paced, perceptually complex, and highly flexible user responses.[17–19]

While the data are still sparse, the literature to date is suggestive of a similar pattern with regard to IGD, with not all game types being equally associated with problematic gaming. For example, Bailey et al.[12] classified gamers into just two genres—action and strategy game players—and found positive correlations between amount of video game play and problematic video game play for both types of gamers. Studies by Elliott et al.,[11,20] examining a larger variety of game types,

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indicated that respondents who played massively multiplayer online role-playing games, ''other'' role playing games, first-person shooter, and ''other'' shooter games reported the greatest average levels of pathological video game play. However, Kim et al.[9] found that players of role-playing games had higher levels of problematic gaming than players of first-person shooter, real-time strategy, and sports games. Thus, while the current data are consistent with the idea that certain game types are disproportionately associated with IGD, there is not yet a consensus as to the relative ordering of game types.

This study aims to build on this knowledge base by examining the relationship between the types of games played by individuals and symptoms of IGD in a larger sample of subjects than utilized in previous work (e.g., Kim et al.[9] $N = 669$; Bailey et al.[12] $N = 149$; Elliott et al.[11] $N = 3,380$). Furthermore, to the authors' knowledge, no study has fully considered the fact that many individuals play games from multiple game genres (these studies having instead categorized individuals according to their favorite genre). Here, the relationship between genre-specific gaming times and problematic video game use will be probed specifically via multiple regression models, thus ensuring that no such information is lost.

Methods

Participants

A regional sample of 4,744 (2,869 females) Introduction to Psychology students from the University of Wisconsin–Madison, aged 17–54 years ($M = 18.9$ years, $SD = 1.9$ years, $MD = 18$ years; 99% of the sample being between 18 and 25 years; the pattern of results was not contingent on whether older participants were included in the analyses), filled out surveys as part of a course requirement. The majority (77.8%) self-identified as white, 1.6% as black/African American, 14.1% as Asian/Asian American, 0.1% as American Indian/Native American, 2.3% as Hispanic/Latino, 0.9% as ''other,'' and 3.2% as multiracial.

Procedure

IGD and video game playing questionnaires were completed as part of a department-wide data collection program. All data were collected between September 2012 and September 2014 (five semesters). All surveys were completed online at a time of the participants' choosing within the first month of each semester. All protocol and experimental procedures were approved by the University of Wisconsin Institutional Review Board and are in accordance with all guidelines for the use of human subjects.

Measures

Because survey instruments in this domain are still evolving, three versions of the IGD questionnaire were used during the data collection period (see Supplementary Fig. S1–S3; Supplementary Data are available online at www.liebertpub.com/cyber). All three versions were either based directly on Gentile's[6] IGD scale (Fall 2012) or were evolutions of that scale (Spring 2013 until Spring 2014[7]; and Fall 2014[21]). Questions on the scales were modeled after the DSM-V criteria for pathological gambling, as well as Brown's[22] core facets of addiction, and thus included items related to preoccupation and/or persistent thoughts about video games, an inability to stop playing video games, and negative life events associated with video gaming (damaged relationships, problems with school work, sleeping problems).

IGD scores were computed for each participant as the total number of symptoms reported in the respective pathological gaming questionnaires (with, as per the previous recommendations,[6] ''yes'' being coded as 1, ''sometimes'' being coded as 0.5, and both ''no'' and ''don't know'' responses coded as 0).

There were two Gaming Habits forms used to assess respondents' weekly video game playing habits (see Supplementary Fig. S4 and S5). In both versions, respondents were asked to indicate how many hours per week, on average, they had played several genres of games (with slight differences in the genres/example games between the versions). Respondents could indicate that they ''Never'' played that genre, or that they played for 0–1, 2–3, 3–5, 5–10, or 10+ hours per week.

Participant responses on the Gaming Habits form were used to estimate the hours spent video gaming in four main groups of genres: action/shooter/sports/fighting games (Action), real-time strategy games (RTS), role-playing/fantasy games (RPF), and turn-based strategy/puzzle/music/other games (Other). Games categorized into each of the three main groups above (Action, RTS, RPF) all share similar game play mechanisms. For instance, in Action games, the player is tasked with making many split-second decisions while processing numerous fast-moving items on screen, in addition to executing the correct button press for each action. The games in the RPF group do not include fast-paced sequences, but instead require players to focus on a single character, which is improved through time, and may also include a social component in which collaboration with other human players is required for progression. The RTS group is a set of games that require the player to simultaneously manage many ''units'' that each possess distinct abilities. Similar to a game of chess, RTS games require tactical planning and online maintenance of numerous temporal hierarchies, usually against another human opponent. Games in the Other category are those that do not share game mechanics found in the Action, RTS, or RPF groups. For categories that represented time ranges (e.g. ''3–5 hours''), the mean of the range was used as the estimated time (e.g., 4 hours/week). A constant value of 11 hours/week was defined for the category ''10+ hours.''

Results

Overall descriptive statistics on pathological video game use

On average, subjects reported 0.88 ($SD = 1.70$) symptoms of IGD, with males showing significantly higher scores ($M = 1.71$; $SD = 2.11$) than females ($M = 0.34$; $SD = 1.06$), $F(1, 4,734) = 872.57$, $p < 0.001$. According to previously used conservative criteria of pathological video game use (i.e., reporting at least six criteria on the symptom checklist, with ''sometimes'' responses being considered as 0.5[6]), 3.0% of the total sample (males 6.3%; females 0.9%) and 5.9% of the ''gamers'' (males 8.2%; females 2.5%) were classified as ''pathological gamers'' (note that the pattern of results does not change if rather than six criteria the definition is ''half or more of the questions''). A less conservative estimate of pathological gaming, considering ''sometimes'' responses to be equivalent to ''yes'' responses, revealed

5.6% pathological gamers in the whole sample (males 11.1%; females 2.0%), and 10.8% in the subsample of ''gamers'' (males 14.4%; females 5.6%). The prevalence of addicted individuals did not vary as a factor of the form used, as evidenced by a 2×3 (Gender×IGD form) analysis of variance on the percentage of people classified as addicted, $F(2, 4{,}738) = 0.32$, $p = 0.72$. In addition, there was no interaction with gender, $F(2, 4{,}738) = 0.16$, $p = 0.85$, indicating that the number of subjects classified as addicted did not depend on the form used.

Pathological video game use as a function of gaming time

As noted in the introduction, pathological gaming status implies more than simply playing many hours per week of video games. Nonetheless, there is interest in modeling the extent to which problems develop as a function of hours spent playing—particularly for clinical/advisory purposes. Two different regression models accounting for the relation between IGD and total gaming time t_{total} were evaluated. A simple linear regression model (Eq. 1) explained almost one fourth of the variance in IGD scores ($R^2 = 0.23$; AIC = 17,280; BIC = 17,299).

$$IGD = 0.33 + 0.12 \cdot t_{total} \quad (1)$$

Interestingly, an exponential regression, as defined by Eq. 2, reached a better fit than the linear model and accounted for an additional 4% of the variance ($R^2 = 0.27$; AIC = 17,006; BIC = 17,025).

$$IGD = 3.81 \cdot \left(1 - e^{\frac{-t_{total}}{12.84}}\right) \quad (2)$$

It thus appears that, as expected, negative outcomes grow with the number of hours spent gaming, although the rate at which this occurs may flatten beyond a certain number of hours (with the point of inflection between the quickly rising phase and the more slowly rising phase being between 5 and 10 hours per week of gaming).

Base risk of IGD for different game genres

Table 1 depicts the average gaming durations and the number of male and female individuals for the four different genres of interest. As a first pass, and in order for some comparison with previous work in the field, individuals were simply separated into categories according to the genre of games they reported playing most often. IGD scores were then tabulated within those categories. This analysis ($n = 3{,}282$; subjects who did not report any preferential game genre were not included) revealed that individuals who reported spending the most time playing RPF games ($n = 82$) showed the highest number of IGD symptoms ($M_{IGD} = 2.81$; $SD_{IGD} = 2.66$). Second were participants who reported spending the most hours on RTS games ($M_{IGD} = 2.73$; $SD_{IGD} = 2.56$; $n = 152$). Lower IGD scores were found for Action gamers ($M_{IGD} = 1.52$; $SD_{IGD} = 1.91$; $n = 1{,}400$), and Other gamers ($M_{IGD} = 0.47$; $SD_{IGD} = 1.25$; $n = 1{,}648$). The IGD scores differed significantly between these four groups of participants, $F(3, 3{,}129) = 68.80$; $p < 0.001$, as well as between male and female gamers, $F(1, 3{,}129) = 173.91$, $p < 0.001$, but there was no gender×genre interaction, $F(4, 3{,}129) = 1.25$, $p = 0.29$. Post hoc tests revealed that the IGD scores were significantly lower in Action players than they were in RPF players, $t(1{,}480) = -5.79$, $p < 0.001$, Cohen's $d = 0.55$, and RTS players, $t(1{,}550) = -7.11$, $p < 0.001$, Cohen's $d = 0.53$. However, IGD scores did not differ significantly between RPF and RTS players, $t(232) = 0.24$, $p = 0.81$, Cohen's $d = 0.03$. Moreover, players of Other game genres had significantly lower IGD scores than any other group of gamers, $t > 15$, $p < 0.001$, Cohen's $d > 0.65$.

Because the analysis above simply categorized participants according to most commonly played genre, without considering whether there were differences in the number of hours spent playing the favorite genre, an additional analysis was conducted on samples matched for hours spent playing the favorite genre. Specifically, IGD scores were compared in individuals who reported >5 hours/week of game play (i.e., reasonably constant players) for a given genre. Consistent with the analysis of all gamers, the highest number of symptoms ($M_{IGD} = 3.90$; $SD_{IGD} = 2.95$) and the highest proportion of pathological gamers (20.6%) were found for RPF players ($n = 34$), followed by RTS gamers ($n = 72$; $M_{IGD} = 3.45$; $SD_{IGD} = 2.69$; 18.0% pathological gamers). Lower values were found for Action ($n = 432$; $M_{IGD} = 2.45$; $SD_{IGD} = 2.22$; 10.1% pathological gamers), and Other gamers ($n = 228$; $M_{IGD} = 1.43$; $SD_{IGD} = 2.96$; 6.1% pathological gamers). Again, the IGD scores differed significantly between these four groups of gamers, $F(3, 731) = 11.58$, $p < 0.001$. Post hoc comparisons revealed that Action gamers had lower IGD scores than RPF, $t(464) = -3.55$, $p < 0.001$, Cohen's $d = 0.55$, and RTS gamers, $t(502) = -3.41$, $p < 0.001$, Cohen's $d = 0.40$. There was again no significant difference between RPF and RTS gamers, $t(104) = -0.77$, $p = 0.44$, Cohen's $d = 0.16$. The group of Other players had the lowest IGD scores, $t > 5$, $p < 0.001$, Cohen's $d > 0.46$.

Table 1. Extent of Video Game Use in Male and Female Gamers for Different Genre Groups

	Mean gaming time (hours/week)		
Genre	*Female*	*Male*	*Average*
Action	1.56 ($n = 968$)	4.17 ($n = 1{,}674$)	3.22
RTS	2.04 ($n = 344$)	2.80 ($n = 620$)	2.53
RPF	2.28 ($n = 239$)	2.52 ($n = 550$)	2.45
Other	2.27 ($n = 1{,}901$)	2.23 ($n = 1{,}243$)	2.25

Action, action/shooter/sports/fighting games; RPF, role-playing/fantasy games; RTS, real-time strategy games; Other, turn-based strategy/puzzle/music/other games.

Modeling the relationship between hours spent playing a genre and IGD

Finally, because many individuals play games from multiple genres (in the current sample, 91.5%), it is essential that any model take this into account rather than simply associating any symptoms with an individual's favorite genre. To address the question of whether various game genres lead to different degrees of problematic gaming, a linear multiple regression model was used to fit IGD scores as a function of the time playing Action (t_{Action}), RPF (t_{RPF}), RTS (t_{RTS}), and Other (t_{Other}) games.

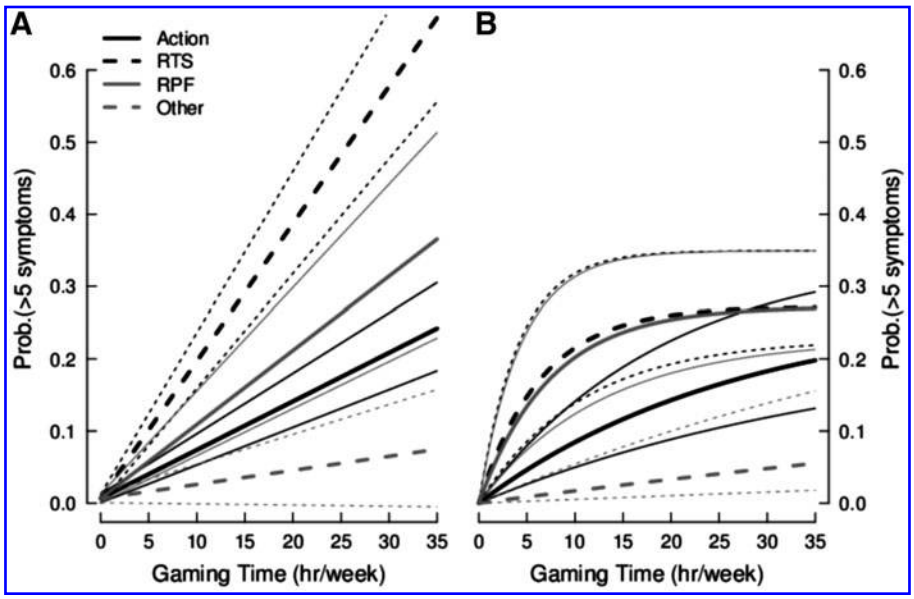

FIG. 1. Probability of Internet gaming disorder (IGD; more than five symptoms) as a function of gaming hours for different video game genres based on (**A**) a linear multiple regression model, and (**B**) an exponential multiple regression model. IGD, Internet gaming disorder.

First, the probability of being classified as addicted to video games was modeled to be a function of the weekly time playing RTS, Action, RPF, and Other games. Both linear and exponential multiple regression models (see Fig. 1) revealed that the probability of IGD clearly increases with gaming time for RTS, RPF, and Action games, but much less so for Other genres. Moreover, there is an accelerated increase associated with playing RTS and RPF video games as compared with Action video games.

In order to obtain a more continuous measure of pathological video game use (compared to the dichotomous measure of either reaching the criteria for IGD or not), the same multiple regression analysis was conducted with the absolute number of reported symptoms. The regression analysis revealed the best linear predictor of the number of symptoms combined the genre-specific gaming times as defined in Eq. 3 ($R^2 = 0.27$; AIC = 17,040; BIC = 17,079; see Fig. 2a).

$$IGD = 0.41 + 0.26 \cdot t_{RTS} + 0.17 \cdot t_{RPF} + 0.14 \cdot t_{Action} + 0.02 \cdot t_{other} \quad (3)$$

That indicates that an increase in IGD symptoms was driven most by the time playing RTS, RPF, and Action games and almost not at all by the time playing Other games. An exponential multiple regression model (Eq. 4) reached a better fit and accounted for approximately 8% more variance ($R^2 = 0.35$; AIC = 16,478; BIC = 16,517; see Fig. 2b).

$$IGD = 3.53 \cdot \left(1 - e^{-(0.30 \cdot t_{RPF} + 0.29 \cdot t_{RTS} + 0.11 \cdot t_{Action} + 0.02 \cdot t_{other})}\right) \quad (4)$$

Consistent with the linear model, RTS and RPF gaming hours were associated with greater gains in IGD symptoms than Action gaming hours, and Other games hardly contributed

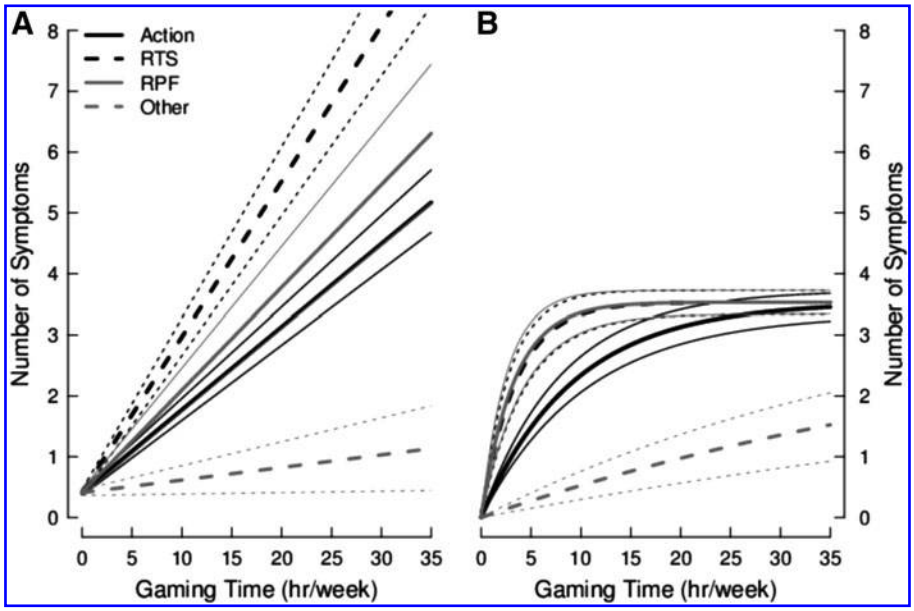

FIG. 2. Predicted number of symptoms of IGD as a function of gaming hours for different video game genres based on (**A**) a linear multiple regression model, and (**B**) an exponential multiple regression model (thin lines indicate bootstrapped confidence intervals for the estimates; see text for the exact model definitions).

to an increase in IGD. It is important though to note that although the beta value for Action gaming was numerically smaller than for RTS and RPF games, this is not meant to imply that such games are benign as the Action variable does indeed capture a significant amount of variance in the model.

Discussion

The present study focused on the relationship between time playing specific types of video games and the incidence of symptoms of IGD. Building on previous studies that employed categorization methods,[12] multiple regression models were used to account for the relationship between problematic video game use and the gaming times for different video game genres. These analyses indicated a faster elevation of IGD scores with respect to time spent playing RTS and RPF games than for Action games, while the lowest elevation of IGD was predicted for the Other group of video games. Furthermore, in terms of direct clinical relevance, the probability that a given individual would exceed the threshold for clinical relevance was also greater in individuals who played a large amount of RTS and RPF games than Action games or Other games. In terms of the functional form of the relationship, an exponential function mapping hours of game play to number of IGD symptoms offered the best fit to the data (with the curve flattening at around 5–10 hours per week of play). However, given that the highest category was 10+ hours, this estimate of the inflection point should be treated with caution (and given the increasing popularity of video games, future surveys will likely need to utilize higher maximum categories—perhaps even as high as 30+ hours).

Due to the correlational nature of the current investigation, it is unclear, of course, whether the extensive play of RTS, RPF, or Action games actually causes certain symptoms of problematic gaming. That is, the present data cannot tell whether the mechanics of RTS games are more addictive than the mechanics that are typical for different genres (e.g., Action or RPF games), or whether RTS or RPF game players possess certain traits that may predispose them to addictive behaviors (e.g., individuals who are prone to behavioral addictions might also have a tendency to play certain games due to, perhaps, the particular reward structure inherent to those games). Nevertheless, there seems to be a relationship between the extent of playing certain game types and the probability of problematic video game use. Further studies will be required to investigate whether (a) there is a causal relationship between given genres of games and the development of symptoms of problematic video game use, or (b) if certain game genres share critical features that attract individuals with an enhanced likelihood for addictive disorders.

Furthermore, even though classifying games by genres proved to be an effective approach here, future research may nonetheless have to consider the individual characteristics of specific games within each genre—in particular the specific reward structures of individual games. This is especially true given that many games today now contain features of more than one genre. For instance, although the extremely popular game *The Elder Scrolls V: Skyrim* is classically labeled as a role-playing game, it contains a great number of action/first-person/third-person shooter dynamics. As game developers continue to mix and match elements from various genres, it will increasingly be the case that effective predictions require coding at the level of those elements, rather than at the level of genres. Furthermore, the survey methodology employed did not allow how individuals interacted with the given games to be determined—for instance, whether they typically played the games online or offline (as the vast majority of games today offer the opportunity to do both), and if the game was played online, whether the interpersonal interactions were primarily cooperative, competitive, or a mixture of both. This will be an important area for further study given the research suggesting that many video games are capable of satisfying the basic psychological need for social connectedness[23] and thus the presence of social interaction in general, or specific types of social interactions, might play a role in determining the addictiveness of particular games.

Author Disclosure Statement

No competing financial interests exist.

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