The Relationship Between Video Game Genres, Procrastination, and Internet Gaming Disorder: An Analysis of Reward Preferences and Behavioral Outcomes

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Abstract

The study examines the relationship between gaming disorder, procrastination, and game genres, focusing on the moderating effects of video game genres on the association between procrastination and video game addiction. The issue's relevance is increasing as gaming and internet gaming become dominant activities among young adults. They tend to spend a significant portion of their leisure time playing video games. The "gamer" subculture is expanding continuously and rapidly each year. This research utilized correlation analysis to investigate the connection between video game disorder and procrastination and moderated regression to explore how game genres may moderate the correlation between them. A significant positive correlation was revealed between internet gaming disorder and procrastination scores, indicating that individuals with high levels of gaming addiction tend to procrastinate more. However, no statistically significant moderation effects of game genres on the relationship were found. However, the analysis of the results suggests that there could be effects worth exploring further. The main drawback of the research was the insufficient sample size, which may have affected the ability to detect more minor effects. Regardless of the limitations, the analysis has shown important insights into the relationship between gaming behaviors and procrastination and has underlined the opportunity to find more interesting results with a larger sample size. Mental health professionals, game developers, policymakers, and educators may benefit from these findings and endorse healthier gaming habits, potentially reducing the adverse effects of excessive gaming.

Keywords: video gaming, internet gaming, procrastination, game genres, addiction.

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Introduction

The study intends to fill the gap in knowledge regarding the correlation between procrastination and gaming disorder and to explore how game genre explains this relationship. This research aims to expand scientific knowledge related to gamers' behaviors, seeking to determine whether the severity of procrastination in video game players is related to specific game genres and how gaming disorder relates to the trait of procrastination.

Definitions of Key Variables

Procrastination may be a significant obstacle not only in the academic lives of many students but also in the lives of others. It is commonly evident in the context of interest in computer games. The myth that short breaks for gaming can serve to relax and refresh the mind before returning to studies may be a thought pattern related to video game addiction. These theoretical 'short breaks' can quickly transform into long gaming sessions that hinder the completion of planned academic or other duties. The consequences of these decisions may be felt shortly before deadlines when students realize they lack the time to prepare for their university commitments. This behavior can affect the overall assessment of their academic work, necessitate requests for extensions, and increase stress and guilt. The psychological construct known as procrastination has received increasing attention in recent years; it has been associated with deficiencies in self-control. The idea of postponing or delaying tasks or decisions is a common theme among all conceptualizations, in line with the term's Latin roots' *pro* (forward, forth, or in favor of) and *crastinus* (of tomorrow). To be more precise, procrastination occurs when one intentionally delays starting or completing a planned action; it is a voluntary postponement of a planned action while experiencing a sense of being worse off due to the delay (Steel, 2007). Procrastination is also defined as the unreasonable postponement of planned actions despite an awareness of the adverse outcomes (Steel, 2010). Procrastination is sometimes viewed positively, with some writers referring to it as a functional delay or a way to avoid rushing. For instance, Bernstein (1996) argued that not acting immediately can hold value, especially when the outcome is uncertain and new information may arise. The scientific study of procrastination has led to various definitions, reflecting the diverse perspectives of researchers. While this may seem to complicate the understanding of procrastination, it can also lead to identifying new aspects of the phenomenon. Several attempts have been made to categorize this complex phenomenon into typologies; one of the results has been the differentiation of arousal and avoidance procrastinators.

This typology was questioned by Ferrari's foundational work (2001), which had difficulties replicating the topic despite numerous attempts. Schouwenburg (2004) proposed an alternative typology that has gained more support. He suggests that procrastination shares a common basis of impulsiveness and conscientiousness traits, which aligns with various fields such as twin research, evolutionary psychology, neurobiology, and TMT. The manifestation of procrastination may also vary based on levels of neuroticism and extraversion traits, resulting in four basic groups. Gueorguieva's work (2011) also supports Schouwenburg's typology,

indicating that procrastination tends to cluster around neuroticism and extraversion traits. The four stereotypes classified by this typology are anxious idealists (high in neuroticism, fear of failure, and judgment), daydreamers (high in extraversion, easily bored by tasks), avoidant postponers (high in neuroticism, postponing tasks to maintain their autonomy), and people pleasers (agreeable individuals who overcommit due to difficulty saying no).

A cluster analysis has been made by Rozental *et al.* (2015) involving procrastination, anxiety, depression, and quality of life measures. This research has revealed the following groups: severe procrastinators, well-adjusted procrastinators, primarily depressed procrastinators, average procrastinators, and mild procrastinators. The consciousness trait has explained 61% of the variance. Other personality traits do not seem to be significant factors (Steel & Klingsieck, 2016). However, Schouwenburg (2004) suggests that the remaining personality traits still may influence how procrastination manifests, even if they do not directly influence its degree.

Gustavson *et al.* (2014) used a behavior-genetics method to investigate the relationship between procrastination and impulsivity based on goal-management accounts. Significant overlap has been found between procrastination and impulsivity; the shared genetic influences explained most of the correlation between these traits. The genetic influences also considerably covered the general factors influencing goal-management ability. This may suggest that individuals who procrastinate are impulsive because they display diminished capability to manage their goals properly, which impacts their behavior. This aligns with the idea that procrastination could be an evolutionary byproduct of impulsivity. Finally, this research uncovered new ways to develop effective intervention methods to reduce procrastination.

When procrastinators must choose, they tend to pick immediate reward options over long-term ones; they need more time to shift their attention to the delayed reward information. This aligns with the idea that procrastinators have a present-time perspective and a reduced ability to withdraw their attention from immediate rewards. Some researchers indicate that there is a connection between this behavior and the reward-related medial orbitofrontal activity, which is affected by the midbrain dopamine system. The heightened sensitivity to reward information and time delay may relate to an increased level of impulsivity, causing them to overestimate delay times and favor immediate rewards. The preference for immediate rewards supports the hypothesis that procrastination is connected with higher levels of impulsivity (Wu *et al.*, 2016).

Procrastination is associated with less engagement in household safety behaviors. Household safety may not have a direct and immediate effect on health problems, but neglecting it can have long-term health consequences and may also put their families' health and safety at risk. The trait of procrastination is also linked to poor health in adults, with stress being the key factor that explains this relationship. Procrastination interferes with healthcare interactions and wellness activities, thereby increasing stress levels and consequently leading to more health issues (Sirois & Pychyl, 2013).

Both impulsivity and procrastination are related to a lack of self-control. Self-control constitutes a fundamental human trait characterized by the capacity to withstand immediate temptations to pursue long-term goals (Mischel, 1974). It often creates a vicious cycle – the daunting scope of pending tasks coupled with insufficient time to complete them can lead

to heightened anxiety. This anxiety, in turn, results in paralysis of action, impeding further progress. A main characteristic of procrastination is the absence of motivation, leading to avoidance rather than engagement. Understanding the mechanisms related to procrastination is essential for recovery from it (Jena & Kaur, 2021).

Neuropsychological findings from NFITl brain scans show significantly enlarged grey matter volumes in the frontal lobe and cingulate cortex among individuals with a high procrastination trait. While the network-based neuroanatomical patterns of individuals with a high procrastination trait were largely similar to those with a low procrastination trait, the local and global features in individuals with a high procrastination trait showed a slight increase in the frontal-parietal system compared to those with a low procrastination trait (Chen *et al.*, 2022).

The World Health Organization (WHO) recognized gaming disorder as a distinct nosological diagnosis in the 11th edition of the International Statistical Classification of Diseases and Related Health Problems (ICD-11) after the concept of computer game addiction sparked a debate (Aarseth *et al.*, 2017). This marks the first time that pathological gaming has been classified as an independent diagnosis, viewed as a behavioral addiction. Pathological gaming is distinguished from psychological alterations as it is more closely associated with a problematic usage pattern that is evident through diminished control over gaming, prioritization of gaming to the degree that it overshadows other interests and daily pursuits, and continuation or escalation of gaming despite the adverse repercussions. This disruptive behavior pattern must significantly affect crucial aspects of functioning (e.g., social connections, education, and employment) and is generally observed for a minimum of 12 months (World Health Organization, 2021).

The fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) by the American Psychiatric Association (APA) places internet gaming disorder (IGD) in a section for conditions warranting additional research. It outlines nine indicative symptoms of the disorder: obsession with gaming; experiencing withdrawal symptoms like irritability or anxiety when unable to play; developing tolerance through habitual play; failed efforts to curb gaming; loss of interest in other activities due to gaming; persisting in gaming despite its negative effects; deceiving therapists or family members about gaming duration; using gaming as an escape mechanism; and jeopardizing significant relationships or job or educational performance. Diagnosis requires the presence of at least five of these symptoms for no less than 12 months (Chew & Wong, 2022).

Although there are numerous other classifications, the taxonomy by Potard *et al.* (2020) was employed for the classification of game genres. The definitions below clarify specific game genres used in this research.

First-person shooter (FPS) games focus on player engagement, primarily experienced from the protagonist's perspective through combat. This category also includes games similar to FPS third-person shooter games. Both genres aim to provide a dynamic and action-oriented experience that challenges players' situational awareness, strategy, and reflexes. They engage players in tactical decision-making, navigating through levels and completing objectives in a virtual environment.

Action-adventure games accentuate overcoming both immediate and long-term challenges, with problem-solving and exploration combining elements of the action and adventure subgenres. Players utilize tools or items acquired throughout the gameplay, navigating through

exciting environments, solving puzzles, and engaging in combat. This category is often used to classify games that do not align strictly with other game definitions.

Sports games also include racing games. They simulate authentic real-life experiences in the field of athletic performance, tactical decision-making, and competition against time or opponents. Racing games prioritize precision, maneuvering skills, and speed. These games tend to mimic real-world mechanics and environments, balancing realism with engaging gameplay.

Role-playing games (RPGs), including sandbox games, were inspired by traditional tabletop role-playing games. They focus on creativity and open-ended exploration, character development, progression through experience points, skills, and abilities, and turn-based or real-time combat. Typically, RPGs offer rich storylines and narrative depth, aiming to engage players' imaginations and immerse them in an imagined world by allowing them to assume the roles of characters in virtual reality. Moreover, RPGs have had a significant influence on other game genres through the integration of elements of character growth and complex storytelling. Sandbox games enhance RPG gameplay by providing open-world exploration and the freedom to shape this world; each game is different as a new world is created with new objectives each time the player restarts.

Fighting games are typically set on a two-dimensional plane and feature a variety of martial arts and combat styles. They focus on close quarters combat between characters within defined areas, emphasizing mechanics such as attacking, executing combos, blocking, grappling, and counterattacking. Players must master precise timing, strategy, and character-specific techniques to defeat opponents.

Strategy games can be turn-based or real-time (RTS), and survival games may incorporate elements of tactics, economics, diplomacy, and exploration. They challenge players' high-level planning, resource management, and decision-making skills. Victory can be achieved through careful analysis, long-term thinking, managing limited resources, adapting to the dynamics of environments, and overcoming continuous threats.

Puzzle games' main feature is testing players' problem-solving skills, including cognitive skills like spatial awareness, sequence solving, pattern recognition, and logical thinking. Sometimes, these games incorporate real-time elements, such as scenarios that demand both mental agility and strategic thinking, to test players' quick thinking and adaptability.

Massively multiplayer online role-playing games (MMORPGs) combine the role-playing genre with a multiplayer feature. Players interact with each other in large-scale, persistent virtual environments that evolve and change regardless of or because of player activity. As in RPGs, players assume the roles of characters, engaging in cooperative (PVE – players versus environment) or competitive (PVP – players versus players) activities, exploring vast worlds, and contributing to an ever-changing shared universe.

Theories Explaining the Relationships Between Variables

In 2011, the NPD Group reported that 91% of children aged 2 to 17 in the United States played video games. Another comprehensive study on American teenagers showed that the percentage of boys engaged in video games was 99%, while the percentage of girls was 94%. In 2010, the video game industry's revenue in the United States was $25 billion, surpassing

the combined earnings of the film industry in the United States and Canada, which was $10.8 billion (Granic, Lobel, & Engels, 2014).

Numerous authors have raised concerns that playing video games impacts the overall well-being of individuals. Experimental investigations have revealed a range of short-term effects on the well-being of consumers of specific games. Minimal or no significant mood changes were observed because of game exposure. However, the study identified mixed effects on self-esteem. Game exposure seems to cause feelings of fatigue or drain, which likely stem from mostly negative effects on vitality, but these effects were influenced by the satisfaction of psychological needs. Some individuals have provided insight into the positive effects of playing video games, as they experienced a sense of autonomy and competence during gameplay. These effects were only examined in short-term outcomes. Therefore, it would be premature to conclude that computer gaming has a universally negative effect on overall well-being. The short-term effects of playing video games seem to depend on individuals' ability to fulfill their psychological needs during gameplay (Ryan, Rigby, & Przybylski, 2006).

The potential negative effects on emotional and behavioral well-being from video game usage among early adolescents raised concerns due to externalized behavioral problems such as aggression and delinquency associated with Internet communication, online gaming, and playing first-person shooters. Approximately half of the participants who played fantasy games (role-playing games) reported experiencing problems related to internalizing behaviors. This ratio was significantly higher than that of non-fantasy game players. The research related fantasy game players to internalization and first-person shooter players to the externalization of problems (Holtz & Appel, 2011).

Multiple research projects published between 2002 and 2012 show that excessive video game playing can have potentially harmful effects on individuals who exhibit compulsive and/or addictive behaviors like traditional addictions. The results concluded that gaming addiction is associated with various coexisting disorders, such as attention deficit hyperactivity disorder, symptoms of generalized anxiety disorder, panic disorder, depression, social and school phobia, and other psychosomatic symptoms. fMRI scans have shown that gaming exhibits similar neural processes and heightened activity in brain regions linked to substance-related addictions and pathological gambling. Notable activation occurs in the left occipital lobe, parahippocampal gyrus, dorsolateral prefrontal cortex, nucleus accumbens, right orbitofrontal cortex, bilateral anterior cingulate, medial frontal cortex, and the caudate nucleus. Gaming addicts also have a higher occurrence of specific polymorphisms in the dopaminergic system (specifically, the Taq1A1 allele of the dopamine D2 receptor and the Val158Met in the catechol-O-methyltransferase). These results suggest that some players may have a genetic predisposition toward developing video game addiction (Griffiths, Kuss, & King, 2012).

Individuals diagnosed with IGD exhibit a pattern of behavior characterized by risky choices, which manifest as reduced sensitivity to punishment along with increased sensitivity to rewards. They also show higher discounting of delayed gains in a delay discounting task, like individuals suffering from substance dependence. The high level of discounting indicates difficulties in delaying gratification, suggesting a diminished ability to prioritize long-term rewards over immediate ones. Moreover, we may observe high levels of impulsivity among individuals with IGD. The heightened sensitivity to rewards, coupled with

low sensitivity to punishment, suggests a dysregulated reward system that may contribute to the addictive nature of excessive gaming. The predisposition to value delayed gains less suggests a weakened capacity for long-term planning and goal-oriented behavior, which may reinforce the cycle of excessive gaming. The high impulsivity observed in individuals with IGDs may lead to difficulties in impulse control and a tendency toward immediate gratification (Raiha *et al.*, 2020).

Student's academic knowledge suffers because of video games. The more time an individual spends on video games and the less time they spend on homework and studying, the higher their decline in academic performance. The immersive nature of video games can distract students from focusing on their educational responsibilities and hinder their ability to gain and apply knowledge, which has also been confirmed by a correlation between video game usage and lower grades shown by research (Gentile *et al.*, 2004; Anand, 2007).

Examining the relationship between health outcomes and video game playing in adolescent males indicates that weekday extensive video game players had poorer dietary habits compared to their less frequently playing peers as well as higher rates of obesity. They also exhibited lower physical fitness. These negative health consequences were boosted by the sedentary nature of video game playing, especially when combined with other unhealthy behaviors. More than three hours per day of video game play on weekdays resulted in lower physical activity levels, higher obesity, less fruit and vegetable consumption, and heightened sweetened soft drink consumption. As a result of the research, targeted health interventions for adolescent males were advised to raise awareness about the potential drawbacks of excessive video gaming (Puolitaival *et al.*, 2020).

The simultaneous use of video games and substances was related to substance use problems, even after controlling for other factors. The enthusiastic hobby of playing video games emerged as a potential factor associated with both simultaneous use and problematic video game playing. An indirect relationship was found between video gaming as a hobby and substance use problems through problematic video game playing and simultaneous use, and demographic factors were also found to be related to problematic video gaming behavior and substance addiction (Ream, Elliott, & Dunlap, 2011).

It seems that regular late-night playing of the computer game World of Warcraft (WoW) during specific hours is related to a higher risk of depression among adolescents and emerging adults. Adolescents are particularly vulnerable when playing between 10 PM and 12 AM, while emerging adults face greater risks when playing after 2 AM. The timing of gameplay has a more significant impact on depressive symptoms than the total duration of gameplay. However, the average level of depression syndrome among players does not exceed that of the general population, which seems to counter the belief that excessive computer game players are generally socially maladjusted (Lemola *et al.*, 2011).

Expert video game players tend to outperform non-players in basic attention and performance measures, but there is uncertainty regarding whether these differences arise solely from video game exposure or from other differences between gamers and non-gamers. Scientists have found evidence for a causal relationship between visual and attentional skills and playing video games. The differences between expert gamers and non-gamers are revealed in various cognitive skills. Experts display improved detection of changes in visual short-term memory, better tracking abilities for fast-moving objects, faster task-switching abilities, and

more efficient mental rotation of objects. Most of the non-gamer cognitive skills were not enhanced significantly by practicing extensively video games, besides slight improvement in mental rotation. It is uncertain if the cognitive performance difference between expert gamers and non-gamers comes from the significantly more extensive experience of gamers or pre-existing differences in abilities that lead to self-selection of gaming. Another research suggests that even a relatively short time spent on video gaming can enhance various tasks that measure visual and attentional abilities. Other studies have shown that 10 hours of video game play can exhibit improved performance in unrelated laboratory tasks. Summarizing, it seems that skills that can be applied to novel tasks and stimuli can be enhanced by video game experience. These findings have also highlighted the positive impact of video games on perceptual and cognitive abilities. For example, older individuals who played games like Donkey Kong and Pac-Man showed significantly improved reaction times than non-players. Video game training tools, like Space Fortress, demonstrated transferable skills to other tasks. Young adults who played Space Fortress outperformed controls on a physics knowledge test, while Israeli Air Force cadets exhibited better flight performance after playing the game. Green, Gorman and Bavelier's research (2016) showed that playing action video games improved performance on perceptual and attention tasks, like the extent of visual attention and attentional flexibility over time. All the above studies indicate that video game playing has the potential for performance enhancement across an extensive range of tasks. The video game experience transfer seems to be extensive, even when the tasks differ from the games themselves; improvements in skills can occur relatively quickly, often with as little as 10 hours of game experience (Boot *et al.*, 2008).

Individuals experiencing stress may exhibit negative moods, which tend to increase the tendency for self-gratification and self-reward compared to those with neutral moods. Research indicates that negative emotions may cause a preference for immediate, smaller rewards over larger, delayed ones. From this, we can conclude that procrastinators may prioritize short-term emotion regulation over long-term gains (Tice & Bratslavsky, 2000).

These emotions can be regulated through video games and media usage by procrastinating individuals, providing them with a short-term boost and a way to avoid everyday responsibilities. Their intrinsic needs can be fulfilled by consuming interactive or non-interactive entertaining media, which may offer positive recovery outcomes, but only if the consumption is not prolonged. Prolonged gaming sessions can lead to exhaustion rather than beneficial recovery effects, which is difficult for procrastinating individuals to control due to a reduced ability to manage usage. This can impair well-being, leading to stress, anxiety, and depression (Reinecke, Klatt, J., & Krämer, 2011; Reinecke *et al.*, 2018). The temporary reduction or complete abandonment of social internet consumption has been found to reduce procrastination (Hinsch & Sheldon, 2013). There is a correlation between the time spent using different applications or functions of media and variables such as self-control, guilt, and time spent on schoolwork by students. These findings indicate the need to conceptualize further research with a medium-specific approach (Panek, 2014). Finally, evidence suggests a relation between Internet procrastination, problematic Internet usage, and the concept of flow on the Internet (Thatcher, Wretschko, & Fridjhon, 2008).

Review of Research on the Relationship Between Variables in Similar Populations Research Objective, Questions, and Hypotheses

This study is connected to fundamental theories concerning the impulsiveness trait, which relates both to reward preference among procrastinating individuals and gaming addiction. Gustavson *et al.* (2014) established a correlation between the impulsiveness trait and procrastination, indicating that individuals who exhibit higher impulsiveness are more likely to procrastinate. Wu *et al.* (2016) revealed that procrastinating individuals have a stronger preference for immediate rewards, which may lead to a tendency to delay tasks. The research of Zhu *et al*. (2023) shows a significant relationship between IGD and the tendency for immediate rewards over delayed ones. These results suggest that individuals with IGD exhibit increased impulsivity and risk-taking behaviors, favoring smaller, immediate rewards rather than greater, delayed rewards. This behavioral pattern implies that the scale of IGD may serve as an indicator of individuals' preference for delayed rewards.

In this research, procrastination is measured by the pure procrastination scale (PPS) and is used as a dependent variable, which may indicate the severity of task delays. For measuring the independent variable IGD, the IGD-20 scale is used, which evaluates the level of gaming-related behaviors and the impact of gaming on daily functioning. The favorite game genre, a categorial independent variable, is used to sort participants based on their favorite game genre into eight game-predefined categories. This categorization enables an exploration of how various game genres may relate to both procrastination traits and the severity of gaming disorder.

Kim, Nam, & Keum (2022) have introduced a categorization attempt of game genres by gaming addiction, indicating that genres like RTS and FPS connection to IGD are stronger than others. The study examines how different game genres correlate with various psychological and social characteristics. Higher impulsivity and lower self-control were examined in FPS players, while strategy game players exhibited lower impulsivity. These findings suggest that gaming addiction symptoms may be influenced by game genres.

Nordby, Løkken, & Pfuhl (2019) suggest that video games offering delayed rewards are negatively correlated with procrastination. The research assumes that procrastinators' natural inclinations for immediate rewards could potentially be counteracted by engagement in video games that provide delayed rewards. According to the hypothesis, the structure of delayed reward delivery in these games might encourage procrastinators to develop patience and long-term goal orientation, which oppose the typical features of procrastination.

Video game-related research indicates that immediate rewards (such as progress indicators, points, or achievements) are often preferred over delayed rewards (such as story progression or unlocking levels). The preference for immediate rewards is much more robust in genres where rapid feedback is essential (Harvey, Jensen, & Anderson, 2024), such as FPS and action games. FPS games, due to their high demand for quick decision-making and rapid responses, are associated with improvements in selective attention and working memory. Adventure games tend to have more narrative-driven delayed rewards, which relate to attention and cognitive control improvements. Strategic games promote probabilistic learning and prob-

lem-solving skills because they require players to make long-term decisions and manage re-sources (Gui *et al.*, 2016).

H1: Higher scores on the IGD Scale will correlate with higher scores on the procrastina-tion scale. This study hypothesizes that individuals with a stronger tendency toward gaming addiction will also exhibit a higher tendency for impulsive decisions and a preference for im-mediate rewards.

Exploratory Analysis: This study will explore whether a favorite game genre moderates the relationship between gaming disorder and procrastination without making specific predictions about which genres will show stronger or weaker correlations. Specifically, it will investigate whether game genres that offer more immediate rewards tend to have a stronger correlation with procrastination, while genres requiring delayed rewards might display a weaker or even inverse relationship with procrastination.

Method

Participants

A total of 193 participants completed the survey; however, only those who reported having a favorite game were included in the research. This criterion was necessary to ensure a clear preference for a specific game genre. As a result, 21 responses were excluded for not meeting the inclusion criterion, and 1 response was excluded for indicating a non-existent favorite game. Consequently, the statistical analysis was conducted on 171 responses. Of these, 47 participants completed the survey in Polish, while the remaining 124 completed it in English. The demographic characteristics of the participants were not restricted, with ages ranging from 16 to 54 years. 43.3% of the participants were female, 50.3% were male, and 5.8% iden-tified as another gender or preferred not to disclose their gender. Ninety-eight participants, representing 57.31% of the total valid participants, scored 71 or higher on the IGD-20 scale, suggesting a high probability of gaming addiction at a clinically significant level. Participation was voluntary, anonymous, and confidential. Participants read a consent form describing the nature and purpose of the study and then had to provide their consent. No participant IP ad-dresses were collected, and no payment was provided.

Procedure

The data for this research was gathered through advertisements posted on social media groups utilizing an online survey platform (Qualtrics). The survey was prepared in both English and Polish based on the validation of the PPS and IGD-20 scales, allowing participants to choose their preferred language. Participants were recruited using the convenience sampling meth-od, with the inclusion criteria requiring them to specify a favorite game. Data were collected over three months, from July to September 2024. Demographic information requested from participants was age and gender. They were asked to specify their favorite game and fill out the pure procrastination scale (PPS) and internet gaming disorder scale (IGD-20). The order of these tasks was randomized.

The data analysis involved manually categorizing the favorite games declared by partici-pants into the best-fitting predefined game genres. The data was cleaned of invalid responses,

such as non-existent games and responses with no favorite game. Finally, using SPSS software, PPS and IGD-20 scores were calculated considering the reverse items.

Statistical Approach

Before data collection, a power analysis was conducted for correlation ($r = .30$, $p = .03$, $a = .05$, $1-b = .80$) using the G*Power application version 3.1.9.7 resulting a minimum sample size of 84 for a small-to-medium effect size. For moderated regression ($f2 = .15$, $a = .05$, $1-b = .80$, *predictor number* = 3) resulting in a minimum sample size of 68 for each game genre for small-to-medium effect size. Descriptive statistics of central tendency (mean, median) and dispersion (standard deviation, range, and variance) were calculated from the ready-for-analysis response database for the whole database and by game genre. The normality of the variables was tested with the Shapiro-Wilk method (Shapiro & Wilk, 1965). Q-Q charts were created to observe visually if the distributions of PPS and IGD-20 scores deviated significantly from normality. Next, Pearson's correlation between PPS and IGD was calculated for the whole database and by game genre. The results of this analysis were used to answer H1 hypothesis. Finally, the dummy variables were created by game genre and the IGD scores were mean-centred. Andrew F. Haynes's PROCESS macro was used to calculate moderated regression by each game genre category. The IDG-20 score was used as the predictor variable (X), and PPS score was used as the outcome variable (Y). The moderation variables (W) were the dummy variables created for each favorite game genre. In total, eight calculations were made with the Process macro for each dummy variable. The analysis was conducted at a 95% confidence interval (CI), and significance was determined at the $p < .05$ level. Moreover, a simple contrast-coded moderation analysis was made with the same PROCESS macro using the contrast-coded game genre variable for the RPG genre. The results of these analyses were used to conduct an exploratory assessment. All analyses were performed using IBM SPSS Statistics Version 29.0.0.0 (241).

Materials

As a part of the survey, a question related to the most frequently played and favorite game was included. The responses of participants to this question were sorted into best-fitting game genres manually. This was conducted because several game qualifications exist, so players might not be familiar with the proper classification of games into game genres. In this study, eight game genres were used: first-person shooter (FPS), action and adventure, sports and racing, pole playing, fighting, strategy, puzzle, and massive multiplayer, and online role-playing game (MMORPG) (Potard *et al.*, 2020).

The pure procrastination scale (Svartdal & Steel, 2017) examines the tendency to procrastinate in three dimensions, i.e., decisional procrastination, arousal procrastination, and avoidant procrastination. Sample items of the scale were: "I delay making decisions because I cannot decide what to do" – this item is related to decisional procrastination; "I have a tendency to procrastinate, even if I know I will regret it" – this item is related to arousal procrastination; "I delay starting difficult projects, even when I know I should start earlier" – this item is related to avoidant procrastination.

In this study, only the general procrastination results were used. The scale contained 12 items, and respondents rated their answers on a Likert scale from 1 to 5, where 1 means *strongly disagree* and 5 means strongly agree. The mean (M) of the overall score of this scale

was 2,83, and the standard deviation (SD) of the overall score was .77. Cronbach's alpha for the total Procrastination score was .92, also .88 for decisional procrastination, .86 for arousal procrastination and finally .87 for avoidant procrastination. On his website, Professor Piers Steel consents to use PPS.

The Polish version of the PPS is similar to the original. It was validated by Svartdal *et al.* (2016) and consists of 12 items rated on a Likert scale from 1 (*strongly disagree*) to 5 (*strongly agree*). The scale measures three dimensions of procrastination: decisional procrastination, arousal procrastination, and avoidant procrastination. However, for this research only the general score was used. The mean (M) of the overall score of this scale was 2,97, the standard deviation (SD) was .82, the reliability coefficients (Cronbach's alpha) for the total score was .89,.84 for decisional procrastination dimension, .81 for arousal procrastination dimension, and .86 for avoidant procrastination dimension. These statistics indicate that the PPS is a reliable measure of procrastination in the Polish context.

The IGD-20 scale, developed by Halley M. Pontes and his colleagues in 2014, was designed to assess IGD (Pontes *et al.*, 2014) based on the DSM-5 criteria. The IGD-20 scale measures IGD across six dimensions. Salience – preoccupation with gaming. Mood modification – sing gaming to change the mood. Tolerance – needing to play more to achieve the same effect. Withdrawal symptoms – negative feelings when unable to play. Conflict – problems caused by gaming in personal or social life. Relapse – reverting to problematic gaming behavior after attempts to reduce or stop. The scale consists of 20 items, example items as follows: "I often lose sleep because of long gaming sessions" – salience (factor loading = .61); "I play games to help me cope with any bad feelings I might have" – mood modification (factor loading = .87); "I need to spend increasing amounts of time engaged in playing games" – tolerance (factor loading = .64); "I feel sad if I am not able to play games" – withdrawal symptoms (factor loading = .71); "I have lied to my family members because of the amount of gaming I do" – conflict (factor loading = .65); "I often try to play games less but find I cannot" – relapse (Factor loading = .66).

Respondents rated each item on a 5-point Likert scale, ranging from 1, meaning they *strongly disagree*, to 5 – *strongly agree*. The mean (M) and standard deviation (SD) for each dimension were as follows: salience: $M = 2.81$, $SD = .93$; mood modification: $M = 3.06$, $SD = .98$; tolerance: $M = 2.29$, $SD = .87$; withdrawal symptoms: $M = 2.08$, $SD = .88$; conflict: $M = 2.18$, $SD = .81$; relapse: $M = 2.35$, $SD = .83$. No overall mean and standard deviation were published by the authors of the research. The reliability coefficients (Cronbach's alpha) for the overall results and subscale results were as follows: salience: $\alpha = .64$; mood modification: $\alpha = .78$; tolerance: $\alpha = .63$; withdrawal symptoms: $\alpha = .80$; conflict: $\alpha = .74$; relapse: $\alpha = .63$. Overall Cronbach's alpha for IGD-20: $\alpha = .88$. On his website, Halley M. Pontes gives permission to use his tools without restriction.

The Polish validation of the IGD-20 scale by Grajewski and Dragan (2021)Zaburzenie Grania w Internecie-20 assessed 652 Polish gamers using confirmatory factor analysis, confirming a five-factor structure consistent with the original. The mean and standard deviation for each dimension were salience ($M = 2.81$, $SD = .93$), mood modification ($M = 3.06$, $SD = .98$), tolerance ($M = 2.29$, $SD = .87$), withdrawal symptoms ($M = 2.08$, $SD = .88$), conflict ($M = 2.18$, $SD = .81$), relapse ($M = 2.35$, $SD = .83$). Reliability coefficients showed strong internal consistency ($\omega = .93$). This study confirms the IGD-20's reliability for Polish populations.

Results

Results of Preliminary Analyses

Descriptive statistics were generated for the pure procrastination (PPS) and the internet gaming disorder (IGD-20) scales, including central tendency, variability, and data distribution.

The mean score of the PPS was 30.64, with a median of 29. The stem-and-leaf plot showed a mode of 22 for the PPS scale. The standard deviation was 11.49, indicating high variability in participants' procrastination levels. The skewness for the PPS was slightly positive (.451), while the kurtosis value (-.470) indicated a distribution somewhat flatter than normal. The Shapiro-Wilk (S-W) test $p < .001$ indicated that the PPS results deviate from normality, while the Kolmogorov-Smirnov (K-S) test $p = .009$ also suggested deviation from normality. Given the moderately large sample size ($N = 171$). Therefore, the PPS scale was assumed *not* to follow a normal distribution based on these results.

The mean score of the IGD-20 scale was 70.10, with a median of 74. The stem-and-leaf plot showed no distinct mode for the IGD-20 scale; however, the range 70–79 (stem 7) appeared most frequently, making it the most common interval. The standard deviation was 14.441, indicating medium variability in participants' procrastination levels. The skewness for the IGD-20 scale was slightly negative (-.767), while the kurtosis value (.561) indicated a distribution somewhat more peaked than normal. The S-W test $p < .001$ suggested deviation from normality for the PPS results, while the K-S test $p = .009$ was consistent with this finding. Consequently, the IGD-20 scale was not assumed to follow a normal distribution.

Results of Main Analyses

The PPS – IGD-20 correlation was measured using the Pearson's method. A moderate but statistically significant correlation was discovered ($r = .388$ with a $p < .001$). This indicated a moderate, positive, and statistically significant correlation between the procrastination trait and gaming addiction. This indicates that as procrastination is increasing, gaming addiction tends to increase as well, and vice versa. The results of the PPS – IGD-20 correlation were measured for each game genre as well, and the following results were discovered.

Results in the FPS category ($N = 24$) have shown a moderate and statistically significant correlation ($r = .415$ with a $p = .044$). This indicated a moderate and positive but statistically significant correlation between the procrastination trait and gaming addiction. The sample size was smaller than the recommended minimum, which limited the study's ability to detect significant effects or accurately estimate the correlation.

Results in the action and adventure category ($N = 18$) have shown a moderate and statistically significant correlation ($r = .555$ with a $p = .017$). This indicated a moderate and positive but statistically significant correlation between the procrastination trait and gaming addiction. The sample size was smaller than the recommended minimum, which limited the study's ability to detect significant effects or accurately estimate the correlation.

Results in the RPG category ($N = 71$) have shown a moderate and statistically significant correlation ($r = .358$ with a $p = .002$). This indicated a moderate and positive but statistically significant correlation between the procrastination trait and gaming addiction.

Results in the strategy category (*N* = 28) have shown a moderate and statistically insignificant correlation (*r* = .333 with a *p* = .083). This indicated a moderate and positive but statistically insignificant correlation between the procrastination trait and gaming addiction. The sample size was smaller than the recommended minimum, which limits the study's ability to detect significant effects or accurately estimate the correlation.

Results in the MMORPG category (*N* = 13) have shown a moderate and statistically insignificant correlation (*r* = .388 with a *p* = .190). This indicated a moderate and positive but statistically insignificant correlation between the procrastination trait and gaming addiction. The sample size was smaller than the recommended minimum, which limited the study's ability to detect significant effects or accurately estimate the correlation.

TABLE 1. Correlation Between Procrastination and Gaming Disorder Across Different Game Genres

Game genre	N	r	p
Total sample	171	.388**	<.001
FPS (MSS)	24	.415*	.044
Action and adventure (MSS)	18	.555*	.017
RPG	71	.358**	.002
Strategy (MSS)	28	.333	.083
MMORPG (MSS)	13	.333	.190

Note. N = Sample size; r = Pearson correlation coefficient; p-value indicates the significance level. (MSS) – the correlation analyses had smaller sample sizes than the recommended minimum (30) for Pearson analysis, which may affect the accuracy and significance of the results.

Source: own elaboration.

In conclusion, a positive, statistically significant, and moderate correlation was found between procrastination and gaming disorder in the total sample. This suggests suggesting that as procrastination increases, gaming addiction tends to increase as well, and vice versa. This holds true across game genres. However, nearly all genre-specific correlation analyses were based on sample sizes smaller than the recommended minimum for reliable Pearson correlation analysis. Thus, the accuracy and significance of these results remain uncertain.

Only the RPG game genre met the recommended sample size, where a moderate, positive, and statistically significant correlation was observed between procrastination and gaming disorder. Despite insufficient sample sizes in the FPS and action/adventure game genres, both categories still showed a moderate, positive, and statistically significant correlation between procrastination and gaming disorder.

Results of Additional Analyses

To explore potential moderators of the relationship between gaming addiction (CIGD_20) and procrastination (PPS), a series of moderated regression analyses across all game genres were conducted. Moderated regression allows for the examination of interaction effects, specifically testing whether the strength or direction of the relationship between an independent variable (in this case, CIGD_20) and a dependent variable (PPS) varies as a function of a categorical moderator (game genre).

In this analysis, each game genre was tested individually to observe conditional effects. For each model, the interaction term (CIGD_20 * Game Genre) was included to assess whether game genre significantly moderated the relationship between gaming addiction and procrastination. A significant interaction would indicate that the effect of gaming addiction on procrastination differs across genres, potentially suggesting genre-specific influences on this association. The results are presented in Table 2 and Figure 1.

TABLE 2. Conditional effects of CIGD_20 on PPS across different game genres

Game genre	Sample size	Overall model			Predictor CIGD_20				Game genre predictor (GG*)			
		R2	F(3, 167)	p	B	SE	t	p	B	SE	t	p
FPS	24	.152	9.981	< .001	.322	.063	5.130	< .001	.582	2.362	.246	.806
Action and adventure	18	.159	10.569	< .001	.287	.060	4.800	< .001	-1.614	2.655	-.608	.544
Racing	9	.158	10.412	< .001	.300	.058	5.196	< .001	2.873	3.822	-.752	.453
RPG	71	.157	10.418	< .001	.306	.069	4.457	< .001	-1.932	1.653	-1.169	.244
Fighting	2	.171	11.500	< .001	.302	.0565	5.351	< .001	45.533	26.998	1.686	.0936
Strategy	28	.158	10.461	< .001	.327	.064	5.116	< .001	2.374	2.204	1.077	.283
Puzzle	6	.154	10.128	< .001	.313	.058	5.388	< .001	-4.876	6.488	-.756	.451
MMORPG	13	.157	10.363	< .001	.325	.0600	5.464	< .001	2.353	3.220	.731	.466

Note. This table presents the conditional effects of gaming addiction on procrastination across different game genres. The sample size of each genre is reported under the "sample size" column. The *R2* value shows the proportion of variance explained in procrastination (PPS) by the overall model, including centered internet gaming disorder scores (CIGD_20) representing gaming addiction level and the game genre predictor. The overall model fit is tested by the *F* statistic, with the corresponding *p-values* indicating the statistical significance. The CIGD_20 *B* coefficients represent the effect of gaming addiction on procrastination within each game genre (predictor), and the GG* (GGFPD, GGAA, GGR, etc.) reflect the main effects of game genres on procrastination. Standard errors (*SE*), *t*-values, and *p*-values are reported for each predictor.

Source: own elaboration.

FIGURE 1. Scatter Plot of Procrastination and Gaming Addiction by Game Genre with Linear Fit Lines
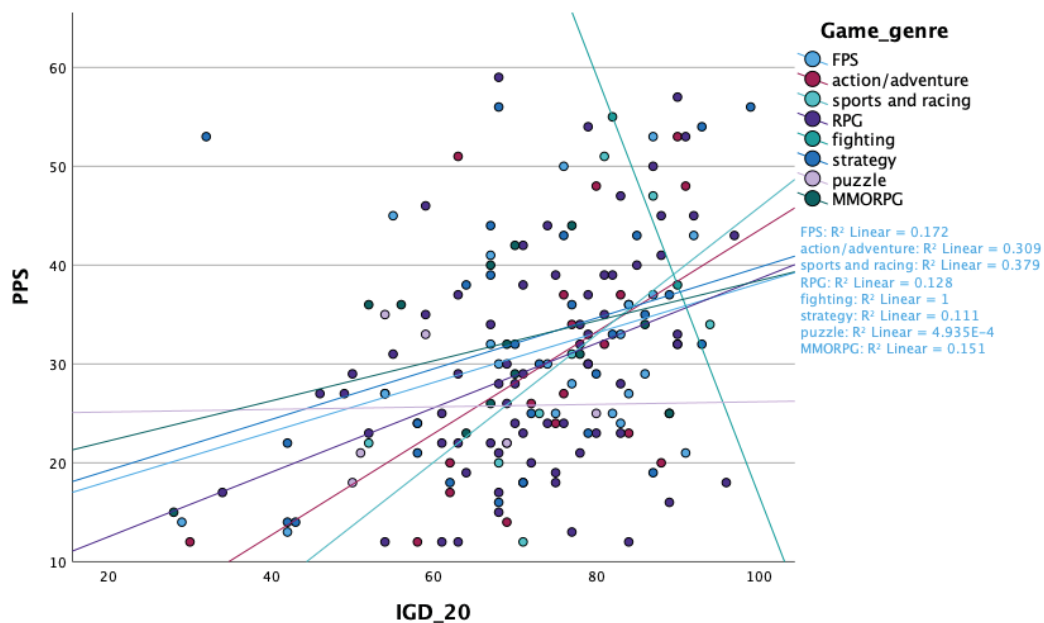
Source: own elaboration.

Across all genres, the overall model significantly explains a portion of the variance in procrastination (PPS), as indicated by R^2 values around .152–.171 and F statistics with $p < .001$. The B coefficients for CIGD_20 were consistently positive and statistically significant ($p < .001$), thus suggesting a positive relationship between gaming addiction and procrastination across genres.

Finally, a contrast-coded moderation analysis was conducted to investigate whether the relationship between gaming addiction (CIGD_20) and procrastination (PPS) differs significantly between RPG players and players of other game genres. This analysis used contrast coding to create a binary variable distinguishing RPG players from non-RPG players, which allowed for the examination of genre-specific differences in the association between gaming addiction and procrastination.

The contrast-coded moderation analysis resulted in a positive and statistically significant effect between gaming addiction (CIGD_20) and procrastination (PPS) ($B = .316$, $p < .001$), but the main effect contrasting RPG players with players of other game genres (GG_KONTR) was not statistically significant ($B = -.966$, $p = .248$), indicating no overall difference in procrastination between RPG players and others. The interaction effect (CIGD_20 * GG_KONTR) was also not significant ($B = .010$, $p = .877$), which indicates that the procrastination and gaming addiction relationship does not differ significantly between RPG players and players of other genres.

The exploratory study did not find any moderating effects of game genres on the relationship between gaming addiction symptoms and procrastination, nor did the contrast-coded moderation produce confirming results. These findings highlight the importance of exploring other moderators with game genres and conducting the analysis with a larger sample size in future research.

Discussion

Presentation of Results for Each Hypothesis

The correlation analysis results show partial support for the H1 hypothesis, which proposed that higher procrastination scores (PPS) correlate with higher gaming disorder symptom scores (IGD-20). The findings are in accordance with previous research indicating that gaming addiction is related to impulsivity and self-regulation problems, both of which are closely connected to procrastination tendencies (Steel, 2007; Gustavson *et al.*, 2014). A main but unrelated correlation effect between procrastination and gaming disorder symptoms was observed through parametric and non-parametric correlation analyses, which indicate a moderate positive and statistically significant correlation between procrastination and gaming disorder symptoms.

Aside from the RPG, FPS, and action/adventure game genre categories, no statistically significant correlations between gaming disorder symptoms and procrastination were found, indicating that individuals who favor RPG, FPS, and action/adventure games and have higher gaming disorder symptoms also tend to exhibit higher levels of procrastination. This supports previous research suggesting that a stronger inclination toward gaming addiction is associated with increased procrastination likelihood (Kim, Nam, & Keum, 2022). For other game genres like sports and racing, fighting, strategy, puzzle, and MMORPG, correlations were not

statistically significant, indicating the relationship between gaming disorder symptoms and procrastination is not consistent across game genres.

The exploratory analysis discovered a statistically significant positive relationship between gaming disorder symptoms and procrastination scores. Neither game genre showed statistically significant effects. From these results, it can be concluded that the influence of gaming disorder symptoms on procrastination scores was consistent across all predefined game genres in this research and that game genres do not significantly alter or enhance this relationship. The assumption that certain game genres might strengthen or weaken the relationship between gaming disorder symptoms and procrastination scores is not validated by these findings, suggesting that other factors, such as in-game behavior or impulsivity, may be more relevant in explaining the relationship (Gustavson *et al.*, 2014; Kim, Nam, & Keum, 2022).

Research Limitations

The validity and reliability of this research could be influenced by several potential challenges. The most important limitation was the insufficient sample size. Although the sample size was estimated in advance to achieve adequate statistical power for detecting potential effects, the number of participants did not meet the target. The analysis may lack the power needed to identify small or moderate effects, so the findings of this research should be interpreted with caution. The sports and racing ($N = 9$), fighting ($N = 2$), and puzzle ($N = 6$) game genres were not considered due to too few observations for meaningful results. The confirmation of the findings of this research should be conducted with a larger sample size to provide more solid insights into the relationships between the variables.

A lack of self-awareness and social desirability bias could impact the potential for self-report bias. This means that participants may not accurately disclose their gaming behaviors, procrastination levels, or game preferences (Podsakoff *et al.*, 2003). This can affect the validity of the collected data, potentially leading to underreporting or overreporting behaviors. The predefined game genres used for categorizing participants' favorite games may not fit precisely into the genres or may have characteristics that fit into several genres (Apperley, 2006). This may cause subjective bias during the manual classification of favorite games.

The diversity of game genre categories was high (ranging from 2 results to 71), which led to the presence of categories with insufficient sample sizes required for analysis. This may have impacted the generalizability of the study's findings (Faber & Fonseca, 2014). Acquiring balanced group sizes is challenging because certain game genres may not be very popular among participants, which could potentially affect the statistical power of the results. Due to potential sampling bias, convenience sampling may also limit the generalizability of the findings to the broader population (Bornstein, Jager, & Putnick, 2013).

Implications for Practice

The results of this study may offer several practical implications across various domains, such as mental health, education, game design, and policymaking. For mental health professionals, these results indicate that interventions targeting gaming addiction and procrastination should focus more on the gaming behaviors and tendencies of individuals rather than the specific game genres they prefer. In education, the findings suggest focusing on efforts to raise awareness of the overall impact of gaming addiction and procrastination in terms of improv-

ing time management and study skills rather than discouraging interaction with specific game genres. For game developers, these results indicate that different game reward structures may not directly relate to procrastination levels, and the developed game genre may not be significant regarding procrastination. Policymakers could use these findings to advocate for general healthy gaming habits and self-regulation, preparing guidelines, especially for adolescents and other vulnerable groups.

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