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Problematic gaming has been known to clinicians and researchers for decades. In recent years the phenomenon has received enough attention to give rise to a debate on classification as a disorder. The purpose of this study was to investigate the prevalence of problematic gaming within different games and describe the communities of high risk games in terms of demographics, monetary habits, gaming behavior and gaming motivations. The sample included 19183 respondents recruited through social media. A self-report instrument for Internet Gaming Disorder (IGD) was used to classify disordered gamers. The results showed an IGD prevalence ranging from 10,2% to 39,5% depending on the game, and varying gaming behavior within four high risk games which is discussed in relation to eSport, mobile gaming and design patterns.

A video game is a game played on a computing device such as a mobile phone, a PC or a console. In a rapidly changing technological environment, the development of more advanced computing devices has been accompanied by the rise of new genres and different ways of playing video games (Statista, 2018a), which has been inextricably intertwined with the social transformation facilitated by the internet that the world has experienced in the last decades (Hutchins, 2008). The gaming landscape is inconstant and as a result recently evolved gaming phenomena tend to be lacking scientific research (Gandolfi, 2016). The Massive Multiplayer Online Role-Playing Game (MMORPG) genre is an example of this, as it was well-researched in the years following the release of the game World of Warcraft (Blizzard Entertainment, 2004) and still is (Adams et al., 2018; Billieux et al., 2013; Ducheneaut, Yee, Nickell & Moore, 2006; Kaye, Kowert & Quinn, 2017), even though there are other genres like Battle Royale and Multiplayer Online Battle Arena (MOBA) that are occupying a larger segment of the player base in 2018 (Newzoo, 2018a).

The global games market is constantly growing (Newzoo, 2018b). In 2017, the total revenue was USD 121,7 billion and this number is expected to increase to USD 180,1 billion by the year 2021. The mobile gaming segment of the industry is quickly changing the playing field of gaming as it composed only 18% of the market by 2012, but is expected to surpass 50% by the end of 2018 (Newzoo, 2018c). This expansion is mainly due to the increase of active smartphone users in the Asia-Pacific region, primarily India and China (Newzoo, 2018b). Considering the rapid increase in mobile gaming in the last few years, mobile gaming and the motives for playing is yet a scarcely researched subject (Merikivi, Tuunainen & Nguyen, 2017).

Another newly formed phenomenon is gaming as a profession, with *streaming* and *eSport* as the two main career paths (Gandolfi, 2016; Witkowski, 2012). Streaming is a practice where the streamer shares videos on the internet of them playing games, either live or recorded, within a context that enables social interaction (Gandolfi, 2016). It is partially overlapping with eSport, as this is also broadcasted on the internet and popular streaming sites (Newzoo, 2018d). eSport however is organized and competitive much like any other sport (Hutchins, 2008; Witkowski, 2012), as opposed to streaming which is not organized on any larger scale, and is not always focused on the competitive aspects of gaming but often instead on other aspects, such as the streamer as an entertainer and the social bond between the streamer and the audience (Gandolfi, 2016). During 2017 eSport alone attracted a global audience of 335 million viewers and the revenue of the industry amounted to 655 million dollars, with the largest portion from sponsorships, advertising and media rights (Newzoo, 2018b).

Why do people play video games?

Usage patterns and in-game behaviors differ as a result of the motivations of play that can be attributed to the player (Yee, 2006a). In his research on MMORPG players, Yee (2006a) found that there are multiple components of motivations that are not mutually exclusive for the individual player. Ten subcomponents were originally grouped into the three motivation components *achievement, social* and *immersion* (Yee, 2006a), but the social component was later exchanged for *relationship* and the model was split up into two additional main components: *manipulation* and *escapism,* for a total of five overarching components (Yee, 2006b). *Achievement* is the drive to become a powerful player, accumulate valuable items, make progress by achieving goals and optimize game mechanics. The *relationship* factor measures motivation for casual social interaction and for forming meaningful and supportive friendships. *Immersion* refers to the extent to which the player enjoys being someone other than themselves in a fantasy world. The *manipulation* factor measures the preference to dominate and provoke other players. A player who measures high on *escapism* has avoidance of real-life stress and problems as an important motive for playing (Yee, 2006b).

Other researchers describe similar motives for playing games, across genres. The so called engaged gamer is someone who has a very active social life online, and frequent gaming thus satisfies a large portion of their need for social interaction (Carras et al, 2017). For some individuals, gaming has affordances such as the shaping of a social identity, *gamer identity*, which relates positively to self-esteem and social competence (Kaye et al., 2017).

Chou and Ting (2003) found that online interactive gaming can create a *flow experience* in the individual who is playing. In order to reach this state, a balance of individual skill and challenge within the game is required (Jin, 2011). Chou and Ting (2003) describe the phenomenon in the context of gaming as a pleasurable state of concentration and playfulness where the player has a sense of being somewhere else and the experience of time passing is distorted. There is also an exploratory component to the state where the player feels curiosity and is surprised by the experiences in-game. Another study examined how the flow state can be evoked in different ways depending on the game genre (Jin, 2011). It found spatial presence, a result of exploration and navigational experiences, to be a key factor in racing games. In the same study, physical presence was described as the moving, manipulating and controlling of virtual objects in a game that gives the player a feeling of interacting with them as if they were real. This factor was central in achieving flow in medical simulation games, and the authors speculate that the findings can be generalized to several other genres (Jin, 2011). In character-driven games, the identification with the virtual character on an affective level was an important predictor of flow. Reaching a state of flow has shown to be indicative of the intention to future replay of a game (Chou & Ting, 2003; Jin, 2011; Lee, Lee & Choi, 2012).

Gamers project parts of themselves onto the character, and can in that sense be considered cyborgs: part human, part machine (Owen, 2014). In story-driven games, the experience of self is a combination of the individual playing the game, the character being controlled in the game and the identity and story of this character. All of this extends the boundaries of the sense of self. The player is both witnessing a story unfold while at the same time creating it. For the player, being able to make meaningful changes within the world of the game is agency. Therefore, the *narrative* has a unique position in gaming that distinguishes it from other forms of culture such as art or literature (Owen, 2014).

Various central aspects of life intertwine with gaming (Corbeil, 2012; Laffan, 2016). Gaming as an expression of art is one of these, as both games and art deal with human needs (Bateman, 2015) and there is currently a debate on whether game designers should be

considered artists (Devine, Presnell & Miller, 2014). Friedman (2015) argues that in order for a game to be successful, the *aesthetics* are important. A central aesthetic component to gaming is the music within the game and some games, such as The Legend of Zelda, even integrate musical aspects into the gameplay itself (Laffan, 2016). Yet another aspect that contribute to the aesthetical value of games is the visual design, which is defined as the visual qualities that gives the player sensory pleasure (Friedman, 2015).

Perceived investment in a game is a reason to keep playing it (Kim & Lee, 2017). Two types of switching costs have shown a positive relation to the intention to future replay of a game among mobile gamers: sunk cost and continuity cost (Kim & Lee, 2017). These costs are the investments a player has made in order to build up a reputation within the community and acquire high level, the best items and currency within the game. Time spent playing is such an investment (Lee et al., 2012). Gamers also purchase virtual items and other goods with real money (Hamari & Keronen, 2017) and this indicates that the virtual goods have a real *value* to the individual.

Player satisfaction with a particular game is not the most accurate way of measuring actual gaming behavior, as the intention to future replay of a game is affected by other factors (Lee et al., 2012). Merikivi, Tuunainen and Nguyen (2017) found that perceived enjoyment explained 34% of the variance in intention to future replay among a group of mobile gamers. Gamers who are unsatisfied with their game may still retain it due to social connections within the gaming community, having collected virtual items in the game or because of difficulties in learning new games (Kim & Lee, 2017; Lee et al., 2012; Wei, Lee, Lu, Tzou & Weng, 2015).

The interests of the players and game developers don't always align (Björk, Lewis & Zagal, 2013). There are patterns in game design that are effective at keeping the player playing the game, but in doing so at the same time diminish the entertainment value. Björk et al. (2013) proposed the phrase "dark game design patterns" and defined it as "a pattern used intentionally by a game creator to cause negative experiences for players which are against their best interests and likely to happen without their consent" (Björk et al., 2013, p 3). What these elements in game design have in common is that they will push the player towards spending more time, money or social capital than they intended from the beginning, often leaving the player feeling regret or that time was wasted. Some games utilize real life social obligations towards friends and family, as all players will fall behind in their progress if one of them drops out of the game for too long. Björk et al. (2013) argue that if these design patterns were to be viewed as a contract between the individual and a system, one of the parties is being deceived, which at best is questionable and at worst unethical or even illegal.

Internet Gaming Disorder

The Diagnostic and Statistical Manual of Mental Disorders (DSM) and the International Statistical Classification of Diseases and Relate Health Problems (ICD) are the two main diagnostic tools for classifying psychiatric disorders. For the ICD-11 (World Health Organization, 2018), which has not yet been released, the condition *Gaming Disorder* will be added as a new diagnosis. In DSM-5 (American Psychiatric Association, 2013) *Internet Gaming Disorder* (IGD) can be found in section three as one of the conditions for further study and is described as "persistent and recurrent use of the Internet to engage in games, often with other players, leading to clinically significant impairment or distress" (American Psychiatric Association, 2013, p 795). The proposed diagnostic criteria are similar to those for *Gambling Disorder*. For example, both disorders involve criteria such as unsuccessful attempts to control the activity, and having jeopardized or lost a significant relationship, job, or educational or career opportunity because of the activity. A full list of the criteria for IGD can be found in

attachment 1. DSM-5 states that the condition usually is related to specific games on the Internet but could involve offline games as well, and that it is still unclear whether the disorder has different characteristics depending on the game type or not. If added to the DSM, IGD will be the second non-substance-related disorder to be included as an addictive disorder, with Gambling Disorder currently being the only one. The argument for this classification is that IGD presents with loss of control over gaming, neglect of normal obligations such as school or work, neglect of the need for food or sleep and increased tolerance and withdrawal symptoms, and therefore share similarities with substance use disorders. DSM-5 states that the team aspect of gaming is usually central to the individual and that the gaming activities are often complex in their structure.

A Korean study (Wang, Cho & Kim, 2018) of adolescents and adults with IGD found that comorbid depression was common, in particular among women and older individuals. According to DSM (American Psychiatric Association, 2013), two additional diagnoses associated with IGD are ADHD and OCD. A systematic review of comorbid ADHD and behavioral addictions (Karaca, Saleh, Canan & Potenza, 2017) found support for this claim, as the rate of ADHD within IGD in three different studies from 2008, 2013 and 2014 was reported to be 32,2%, 83,3% and 26,8%. These rates are considerably higher than in the general population regardless of country (Karaca et al., 2017). A study on Swedish adolescents also found associations between problematic gaming and symptoms of ADHD, depression and anxiety (Vadlin, Åslund, Hellström & Nilsson, 2016).

The prevalence of IGD has shown to be the highest among adolescent males age 12-20 from Asian countries, particularly China and South Korea (American Psychiatric Association, 2013). Several other studies give support to male gender as a risk factor for developing IGD (Haagsma, Pieterse & Peters, 2012; Lemmens, Valkenburg & Gentile, 2015; Turner et al., 2012). Considering there is not yet a standardized way of measuring IGD, the prevalence varies greatly between studies depending on the region, samples and methodology (Karaca et al., 2017). One study examining Dutch adolescents and adults found a prevalence of 1,3% in the total sample and 3,3% among adolescents and young adults (Haagsma et al., 2012), while another study showed a prevalence among Canadian students of 15,1% among males and 3,1% among females (Turner et al., 2012). The DSM (American Psychiatric Association, 2013) refers to an Asian study that reported a prevalence of 8,4% among males and 4,5% among females.

Debate regarding problematic gaming as a diagnosis

The diagnosis is not without controversy. On November 9, 2016, several researches in the field sent an open letter questioning the proposal of Gaming Disorder for ICD-11 (Aarseth et al., 2017). They argue that even though problematic gaming behavior is an important issue it cannot be considered a unique disorder in its present form, considering the current state of the available research on the subject. According to the authors, the diagnostic criteria are too heavily derived from the diagnostic criteria for gambling and substance disorders and there is still no consensus regarding the assessment and symptomatology for the disorder. They argue that the inclusion of the disorder is premature and will have various negative consequences related to moral panic in society regarding gaming. Among these are the confirmatory bias that might shape future research, the stigma that the healthy majority of gamers might suffer and excessive application of diagnosis with wasted resources for treatment of individuals without pathological gaming behaviors. The authors argue that diagnostic criteria like using games to improve mood or thinking about them a lot are normal behaviors among individuals who play a lot, and should not be used to pathologize those that don't experience any harm related to their gaming. This is supported by a study showing that the escapism criterion is endorsed by a

majority of gamers and not just gamers diagnosed with IGD, indicating low specificity (Lemmens et al., 2015).

A study on personality patterns among gamers found a positive relation between problematic gaming and personality patterns that are usually associated with substance addictions (Spekman, Konijn, Roelofsma & Griffiths, 2013). Relying on these findings, the authors argue that gaming may have addictive qualities similar to alcohol and other drugs and that the same underlying psychological process is likely to explain both chemical and non-chemical addictions. From this point of view, gaming is not inherently addictive, but holds addictive potential for certain personalities. This view is supported by evidence that there are two distinct groups of gamers with the same high exposure to games: those with problematic symptoms and those without (Kaye et al., 2017; Spekman et al., 2013). However, among the debated diagnostic criteria of IGD the validity of the withdrawal and tolerance criteria are particularly disputed (Griffiths et al., 2016). Because there is no ingestion of any psychoactive substance, the neurochemical reaction in the case of behavioral addictions is created solely by the behavior. With the current body of research and lack of physiological data, establishing the difference between for example cravings and withdrawal symptoms is difficult (Griffiths et al., 2016). However, there are some indications that gaming differs from drugs on a physiological level. Dong, Wang, Du, and Potenza (2017) found in a study using functional magnetic resonance imaging that gaming increased the craving to play more, as opposed to drug use which reduces craving among addicts.

King, Herd and Delfabbro (2018a) have suggested that although the tolerance criteria is still relevant in the context of gaming, the translation into a need for increased time spent gaming might not be valid. They instead propose a three-factor model measuring an increasing need for accumulating in-game rewards, pursuing more difficult goals and to correct perceived shortcomings in gaming capability (King et al., 2018a).

Some authors argue that problematic gaming should be interpreted as a coping mechanism for other underlying problems rather than a unique disorder (Kardefelt-Winther, 2014). A study on gamers with IGD who had voluntarily sought treatment showed that those with mood symptoms, such as depression or anxiety, also reported more IGD symptoms and poorer quality of life (King, Adair, Saunders & Delfabbro, 2018b). In this study, 40% of the participants were classified as having mood disorders in addition to the IGD diagnosis, which could indicate that for many people gaming is a coping mechanism (Kardefelt-Winther, 2014). However, others consider it important to classify it as a formal diagnosis and an actual disorder in order to reduce the risk of problematic gamers being viewed as having personal weaknesses or lack of interest in important life matters (Király & Demetrovics, 2017). Furthermore, the clinical work with individuals suffering from problematic gaming has developed in a direction towards specialized treatment centers (Kuss & Griffiths, 2015) which could indicate that there is a need for a specific diagnosis in order to provide adequate treatment (Griffiths, Kuss, Lopez-Fernandez & Pontes, 2017).

Lemmens and Hendriks (2016) criticized the "Internet" in "Internet Gaming Disorder" on two accounts. Firstly, "Internet games" is a term usually reserved for browser games and therefore has the wrong connotations, and secondly, the diagnosis is not reserved for individuals who play online. They proposed it either be replaced by "online" or removed altogether.

Previous research on problematic gaming

Time spent playing games appears to be a predictor of IGD (Fuster, Carbonell, Pontes & Griffiths, 2016; Lemmens & Hendriks, 2016; Scharkow, Festl & Quandt, 2014). At the same time, on the contrary, time spent playing has shown to not be a predictor of IGD, which indicates

that time spent playing cannot alone be considered a viable way of assessment (Laconi, Pirès & Chabrol, 2017).

A large body of research indicates support for the *achievement*, *immersion*, *manipulation*, *relationship* and *escapism* motivations having a positive relation to problematic gaming, IGD, distressful play or gaming addiction, depending on the terminology of the study (Ballabio et al., 2017; Hussain, Williams & Griffiths, 2015; Kuss, Louws & Wiers, 2012; Laconi et al., 2017; Snodgrass et al., 2012), although the relations between the variables show varying strength among the studies. Another indication of IGD is the rate of flow or absorption in the game the player experiences (Chou & Ting, 2003; Cole & Hooley, 2013). Chou and Ting (2003) even suggested that addiction is formed specifically when repetitive play triggers a state of flow, and they described the state as a central component in the transition from "preference based rational repetition" to "quasi-lunatic addiction" (Chou & Ting, 2003, p 12).

Lee, Lee and Choo (2017) suggested that there are clinical benefits to classifying individuals with IGD into different subtypes, and they proposed three different subtypes based on theory-derived typology of Gambling Disorder. The "impulsive/aggressive" type play games to seek sensation and release aggression. The "emotionally vulnerable" type are those that mainly use gaming as a means of escaping emotional suffering. Lee et al. (2017) argue that it is important to differ between those that use gaming as an effective coping tool for alleviating stress and improving normal functioning, and those that escape because of depression or anxiety disorders, as these symptoms can worsen as a result of untreated IGD (Gentile et al., 2011). The third subtype is the "socially conditioned" type (Lee et al., 2017). They either have low satisfaction of their social needs in the real world and gets these fulfilled through gaming, or they use gaming achievement as a means of gaining social recognition. Game genres with strong social components are theorized to be popular within this subtype. Lee, Lee & Choo (2017) also suggested a "not otherwise specified" subtype.

Studies have shown a positive relation between IGD symptoms and two similar aspects of game rewards: valuing game rewards highly, and having a need to collect game rewards of increasing novelty, quantity or rarity (King & Delfabbro, 2016; King et al., 2018a; King et al., 2018b). These results are supported by the fact that players who have accumulated in-game items and wealth are less prone to switch to another game (Kim & Lee, 2017).

Online games have shown to have a greater prevalence of individuals with IGD than offline games (Lemmens & Hendriks, 2016; Tejeiro, Espada, Gonzalvez, Christiansen & Gomez-Vallecillo, 2016). This has been attributed to the social interaction, social comparison and player versus player competitive elements usually available in online games. The online factor is not predictive of IGD in itself though, as there are online games that more closely resemble the game design of offline games (Király & Demetrovics, 2017).

There are indications that socioeconomic status is related to IGD. A systematic review on family factors found that poorer quality of the relationship between parent and child was associated with problematic gaming among adolescents, in particular the paternal relationship (Schneider, King & Delfabbro, 2017). Adolescents with parents that engaged in high levels of gaming were also at greater risk of problematic gaming, as well as those from single-parent families or families with step-parents.

Much of the previous research on problematic gaming has been centered around the MMORPG genre and in particular the game World of Warcraft, and the positive relation between this genre and IGD has a lot of support (Adams et al., 2018; Kaye et al., 2017; Kuss et al., 2012; Snodgrass et al., 2012). During the last decade, new genres have gained in popularity and the research is catching up, although research on differences between genres is scarce. In a study on Spanish-speaking gamers, those who played MMORPG or MOBA games spent more time playing and scored higher on an IGD scale, in comparison to other game genres such as Sports, Adventure, Strategy and Puzzle (Fuster et al., 2016). Another study found that

MMORPG and Real-Time Strategy Games presented the highest probability of IGD (Eichenbaum, Kattner, Bradford, Gentile & Green, 2015), while a third study found the strongest relation to IGD in MMORPG and Online First-Person Shooter (Lemmens & Hendriks, 2016). The research effort behind this paper has not been able to identify any research at all on the Battle Royale genre which has completely dominated the online gaming landscape since the release of Fortnite (Epic Games, 2017) and PLAYERUNKNOWN'S BATTLEGROUNDS (PUBG Corporation, 2017), as they are the first and third most watched games on the popular streaming site Twitch in April 2018 (Newzoo, 2018d).

Purpose and research questions

Research on differences in IGD prevalence between specific game titles is lacking. The purpose of this study is to provide an updated overview of the gaming landscape of 2018 and in particular the game titles with the highest prevalence of active players with IGD. These game titles are either gathering the interest of players with IGD, or alternatively they pose an increased risk for developing IGD. Since there are indications that IGD is a heterogeneous group (Lee et al., 2017) it is important to explore the differences between the communities of these game titles, specifically in terms of variables that have previously been linked to IGD. By focusing on specific game titles, the common problem of definitions and boundaries of genres (Lemmens & Hendriks, 2016) is avoided and need not be the subject of blurry interpretation.

The research questions of this study are a) what is the relationship between IGD and general well-being?, b) how does the prevalence of active players with IGD differ between popular game titles? and c) what are the differences between game titles with a high prevalence of active players with IGD, in terms of the demographics, monetary habits, gaming behavior and gaming motivations of the player base?

Method

Sample

A total of 19243 survey response cases were collected and 19183 respondents in ages between 10 and 82 were included in the study. Sixty cases were excluded from the sample. This was based on unrealistic reported ages, a survey completion time of less than three minutes or unreliable answers to the open ended gender question that called to question the authenticity of the answers from the respondent in the remainder of the survey. Examples of these unreliable answers can be found in attachment 2.

Distribution in terms of gender was towards a majority of men ($n = 16499$; 86%), with fewer women ($n = 2500$; 13%) and a small minority of other gender (n = 184; 1%), see table 1. Among the other genders the most common were agender, gender fluid, nonbinary and transgender. The mean age of the sample was 23,8 years with a standard deviation of 7,1 years.

Table 1 shows that a vast majority of the respondents in the sample reported being from either North America ($n = 9217$; 48%) or Europe ($n = 7674$; 40%). The restoring twelve percent reported being from Asia ($n = 870$; 4,6%), from Oceania ($n = 725$; 3,8%), from South America ($n = 563$; 2,9%) or from Africa ($n = 134$; 0,7%). The 23 most common countries made up for 90,3% of the respondents and these were in descending order USA, Sweden, Great Britain, Canada, Germany, Australia, Netherlands, Norway, Finland, France, Denmark, Poland, Brazil, Russia, Italy, New Zealand, Spain, India, Mexico, Austria, Philippines, Romania and Singapore. A total of 139 countries were represented in the sample.

The majority of the respondents were recruited through Reddit (n = 16420; 85,6%). The restoring respondents were recruited through either Facebook (n = 1801; 9,4%), through Twitter (n = 824; 4,3%) or through other means (n = 138; 0,7%), see table 1. For more background information of the total sample, see table 1.

A vast majority of the respondents reported they either completed upper secondary education (n = 8602; 44,8%) or higher education (n = 7254; 37,8%). Almost half of the respondents reported being students (n = 9377; 48,9%), while the second most common occupation was employed (n = 6900; 36%). A majority of the respondents reported being single (n = 11449; 59,7%), while most of the remaining respondents reported being in a relationship (n = 6633; 34,6%). Almost half of the respondents reported living with at least one parent or guardian (n = 9556; 49,8%) while a little under a quarter of the sample either reported living with a partner (n = 3039; 15,8%) or with a partner and children (n = 1278; 6,7%). One respondent reported living alone with two cats. For more information see table 1.

Measures

The survey was in English and targeted towards individuals who play video games at least once a year on any electronic devices, such as portable devices, consoles, mobile phones or computers. Games were considered to be video games as long as they weren't created for the purpose of gambling. The survey was created and distributed by Qualtrics research CORE (Qualtrics, 2002).

The full survey contained a total of 38 questions. Some of the questions were not connected to the specific research question and these were not used in the analysis. The first part of the survey gathered general demographic data. The second part gathered data concerning gaming habits such as time spent playing games in a normal week, online and offline gaming, solo and multiplayer gaming, title of the most played game in the last month, device used for gaming, the proportion of gaming time spent on a single game and engagement in gaming related activities. The last part of the survey comprised statements about motivation for playing games such as "I play games to socialize with other people" and "I get consumed by the game when playing and think of nothing else". The respondents chose their alternative on a seven point likert scale ranging from "strongly disagree" to "strongly agree". The last part of the survey also contained a scale for measuring IGD and a scale for measuring general well-being. The survey ended with an open ended question where the respondents were given the opportunity to share additional comments regarding the survey.

The Internet Gaming Disorder Scale, a nine-item dichotomous screening tool for IGD with good psychometric properties (Lemmens et al., 2015), was used to identify disordered gamers. The respondents were asked to answer whether or not they experienced any of the symptoms during the last year, on questions such as "have there been periods when all you could think of was the moment that you could play a game?" and "have you experienced serious conflicts with family, friends or partner because of gaming?".

The WHO Well-Being Index (WHO-5), validated as a self-report screening tool for clinical depression (Krieger et al., 2014), was used to measure general well-being. The respondents gave their answers on a six point likert scale ranging from "at no time" to "all of the time", on five questions such as "over the last two weeks I have felt cheerful and in good spirits" and "over the last two weeks my daily life has been filled with things that interest me".

Table 1

Demographic statistics in the total sample

Variable	*n*	%
Gender		
Men	16499	86
Women	2500	13
Other	184	1
Continent		
North America	9217	48
Europe	7674	40
Asia	870	4,6
Oceania	725	3,8
South America	563	2,9
Africa	134	0,7
Recruited to the survey		
Reddit	16420	85,6
Facebook	1801	9,4
Twitter	824	4,3
Other	138	0,7
Highest degree or level of school completed		
No schooling completed	63	0,3
Primary education (up to age ~11)	292	1,5
Lower secondary education (up to age ~15)	2697	14,1
Upper secondary education (up to age ~19)	8602	44,8
Higher education (e.g. bachelor's, master's, doctorate)	7254	37,8
Other	275	1,4
Occupation		
Student	9377	48,9
Employed	6900	36
Self-employed	651	3,4
Unemployed and looking for work	1061	5,5
Unemployed but not currently looking for work	422	2,2
Unable to work (e.g. long-term sicklisted)	415	2,2
Retired	41	0,2
Other	316	1,6
Relationship status		
Single	11449	59,7
In a relationship	6633	34,6
Dating but not in a relationship	842	4,4
Other	259	1,4
Living conditions		
Live with parents/guardians	9556	49,8
Live with partner	3039	15,8
Live with partner and children	1278	6,7
Live alone	2725	14,2
Live with friends or others of similar age	2154	11,2
Other	431	2,2

Procedure

The survey was distributed through advertisement on the social media platforms Reddit, Facebook and Twitter for the duration of two weeks in early April 2018. These platforms are used by gamers to discuss experiences, questions and opinions concerning games. Above the first question of the survey, information was provided according to the ethical principles of scientific research. Respondents were informed that the survey aimed to gain understanding of the different aspects of gaming that affect psychological well-being and that it would form the basis for a master's thesis of Science in Psychology at the University of Gothenburg. The respondents received the contact information to the author of the study. They were also informed that their answers were anonymous, that the survey took 10-15 minutes to complete and that participation was voluntary and could be interrupted at any time.

Moderators of forums dedicated to individual games on Reddit and Facebook were contacted in order to receive permission for advertising the survey. They were also asked for assistance in spreading the survey by pinning it to the top of their respective forums, and by encouraging gamers to participate in the study. The participants were encouraged to share the survey with friends and in other forums. Individuals within eSports communities of a few popular games were contacted with a request to share the survey on Twitter. Outside of the social media platforms the most common ways of receiving the survey was from friends, family or partners. One individual received it from a stranger at a local video game shop.

The game forums were chosen based on statistics for the most played games of a wide variety of genres and on various devices, by the time the survey was distributed (Newzoo, 2018a; Overwolf Appstore, 2018; PlayStation.Blog, 2018; Statista, 2018b; Statista, 2018c; Statista, 2018d; Steam, 2018; Wikipedia, 2018). A total of 171 games were chosen and corresponding forums were contacted. A vast majority of the moderators gave their permission for advertising of the survey and a minority also agreed to assist in promoting it. Three professional eSports players and a few other individuals within eSports communities shared the survey on their Twitter accounts. In each forum a link to the survey was shared as well as a vague description of the purpose of the study, in order to avoid biased responses. The post can be found in attachment 3. After receiving questions from gamers of the first few forums, an FAQ was added to the further advertising of the study to clarify potential misinterpretations of the questions in the survey, the statistical analysis and regarding the purpose of the study. The FAQ can be found in attachment 4.

Data preparation and statistical Analysis

Since the DSM-5 uses a cutoff point of five or more criteria (American Psychiatric Association, 2013) the same threshold was used for identifying individuals who could be considered disordered. From this cutoff point, two groups were created: IGD and non-IGD. WHO-5 was used in a t-test for independent samples with the two groups created from the measures on the Internet Gaming Disorder Scale. In addition a correlation analysis was made without grouping the IGD variable. This was to measure the relationship between IGD and general well-being.

Game titles the respondents chose as the most played game within the last month were coded if $n \geq 5$ for a total of 178 different games represented in the sample. Other games comprised 3,6% of the sample. For the analysis of the game titles, a lower limit of $n \geq 100$ was set in order to achieve significance. This limit was lowered to $n > 85$ to accommodate the requirement of including a broad variety of games in the analysis, considering the list had very few mobile games and one of the more popular mobile game titles had $n = 86$. Fifty-four game

titles fit this criterion, see figure 1 where IGD is referred to as "yes" and non-IGD as "no". Not all known gaming genres could be represented, e.g. "puzzle" and "adventure", as no game titles fit the criterion of a large enough sample size.

A chi-square analysis was done to measure the varying prevalence of IGD between all game titles with $n > 85$. A cutoff point of 30% prevalence was used for identifying game titles with a large proportion of gamers with IGD. This rather high cutoff point was chosen for pragmatic reasons, since a lower cutoff point would include several more game titles, making it difficult for the reader to grasp the comparison between the games. The following four games fit the criterion: Clash of Clans/Clash Royale, MARVEL Contest of Champions, Black Desert Online and League of Legends. The comparison in demographics and gaming habits of these four games was done using chi-square combined with standardized residuals for comparisons of frequencies (χ^2), and one-way ANOVA with Tukey's post hoc-test for comparisons between mean values (F). Effect sizes for chi-square comparisons were calculated using Cramérs V (φ_C) with cutoff values for negligible ($< ,09$), weak ($,1 - ,19$), moderate ($,2 - ,39$) and relatively strong ($,4 - ,59$) associations (Rea & Parker, 2014). Effect sizes for one-way ANOVA comparisons were calculated using eta-square (η^2) with cutoff values for small ($< ,059$), medium ($,06 - ,139$) and large ($> ,14$) proportion of variance explained (Cohen, 1988). Relation between general well-being and IGD was analyzed using Pearson correlation coefficient (r) with the effect sizes small (0,1), medium (0,3) and large (0,5) (Cohen, 1988), as well as one-way ANOVA and eta-square. The statistical analysis was generated in IBM SPSS Statistics (IBM Corporation, version 25, 2017).

Results

Total sample

Research questions. The research questions in this study were: a) what is the relationship between IGD and general well-being?, b) how does the prevalence of active players with IGD differ between popular game titles? and c) what are the differences between game titles with a high prevalence of active players with IGD, in terms of the demographics, monetary habits, gaming behavior and gaming motivations of the player base? The results of the analysis showed a statistical significance between disordered and non-disordered individuals in the mean general well-being of the total sample. Statistically significant differences between several popular game titles in terms of IGD prevalence was found. The four game titles with the highest prevalence of IGD showed statistically significant differences in demographics and gaming related variables. The results are presented below.

General well-being. Out of the total sample ($n = 19183$) a minority ($n = 3907$) reported five or more criteria on the IGD scale and were therefore classified as part of the IGD group. The general well-being could be observed statistically significantly lower ($p < ,001$, $F = 470,18$, $df = 1$ and 19181, $\eta^2 = ,024$) in the IGD group ($M = 2,6$, $SD = 1$) as compared to the non-disordered group ($M = 3$, $SD = 0,9$). The correlation between the number of items on the IGD scale and the WHO-5 scale was significant ($p < ,001$) and negative ($r = -,22$).

Differences in IGD prevalence between game titles. Fifty-four game titles were ranked on the basis of IGD prevalence. There were significant differences between different game titles regarding the prevalence of IGD ($p < ,001$, $\chi^2 = 252,2$, $df = 53$, $\varphi_C = ,13$). The following four game titles had a prevalence above the cutoff value ($> 30\%$ of IGD): Clash of Clans/Clash Royale (IGD = 39,5%), MARVEL Contest of Champions (IGD = 36%), Black Desert Online (IGD = 31,2%) and League of Legends (IGD = 30,7%). The complete list of games can be observed in figure 1.
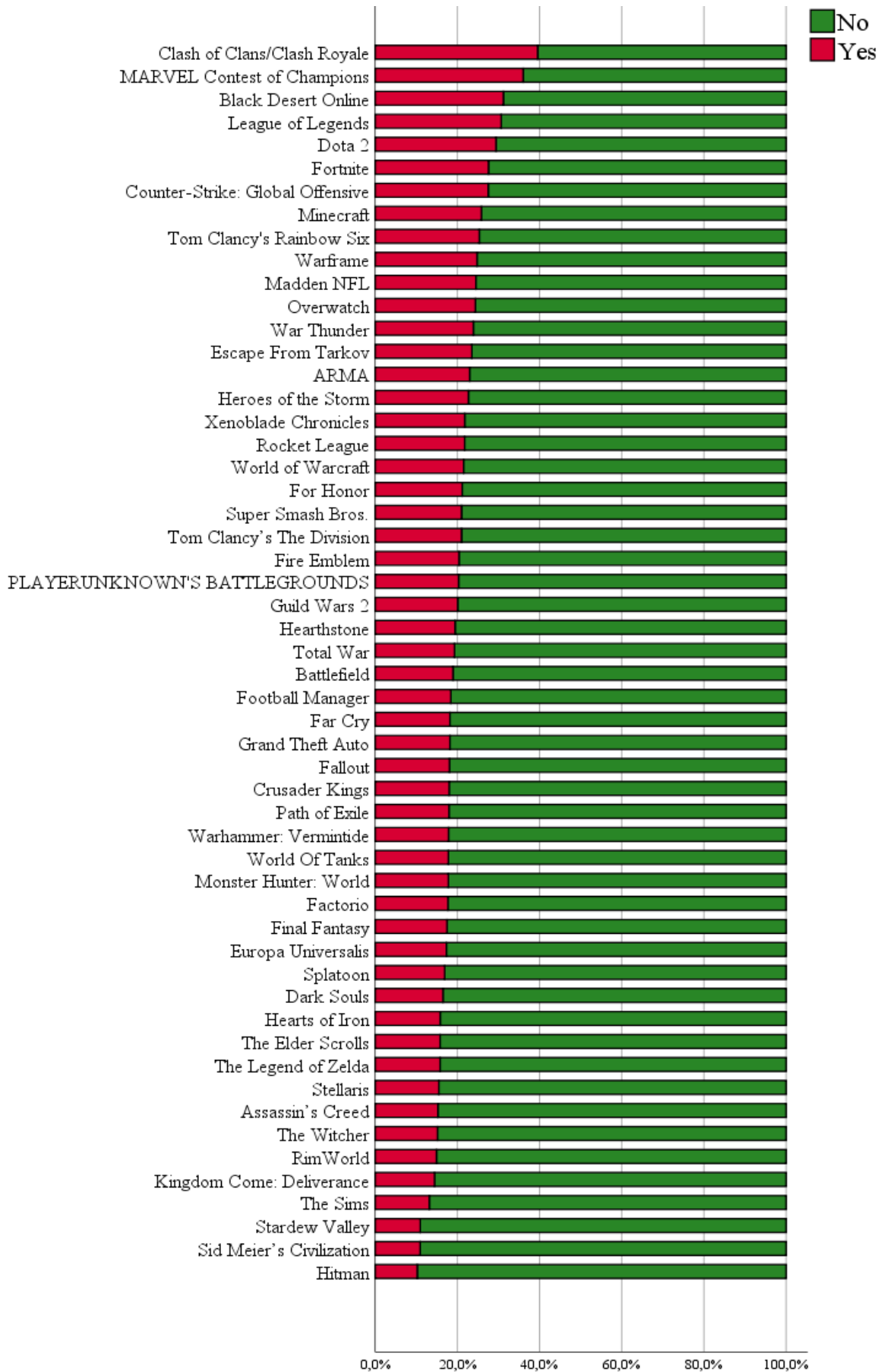
Figure 1. Differences in IGD prevalence between 54 game titles

Top four games in terms of IGD prevalence

Descriptive demographic statistics. Table 2 shows descriptive demographic statistics of the gamers of the top four games in terms of IGD prevalence, that were chosen for further analysis: Clash of Clans/Clash Royale (Clash), MARVEL Contest of Champions (MARVEL), Black Desert Online (BDO) and League of Legends (LoL). There was a significant difference between the groups in regards to mean age ($p < ,001$). LoL was younger ($M = 20,9$) than the other groups, while MARVEL was older ($M = 29$) than the other groups. Clash and BDO did not differ significantly ($M = 24,5$ and $M = 24,2$) from each other. All groups had a majority of men and MARVEL differed from the other groups with a vast minority of women (3,6%), the difference was significant ($p < ,05$).

The difference in relationship status was significant as well ($p < ,001$) and MARVEL showed the greatest difference from the expected values for both single (33,3%) and in a relationship (66,7%). A similar significant ($p < ,001$) pattern could be observed for living conditions, where MARVEL had a lower percentage living with parents (31,5%) and a greater percentage living with partner and/or children (50,5%) while the opposite pattern could be observed in LoL for living with parents (59,8%) and living with partner and/or children (16,5%). The difference between occupation was significant ($p < ,001$) and Clash and MARVEL presented a considerably lower percentage than the expected value for unemployed, retired or other (3,5% and 3,6%). MARVEL also presented more employed (60,4%) while LoL presented fewer employed 27,8%). Significantly fewer in MARVEL were students (36%).

The continents of the respondents differed significantly between the groups ($p < ,001$). More of the respondents from Clash and MARVEL were from North America (50% and 55,9%) or Asia (18,6% and 12,6%) than the expected value, while fewer than the expected value from those groups were from Europe (22,1% and 22,5%). LoL presented the opposite pattern, with more respondents from Europe (57,2%) and fewer from North America (30,8%). BDO had a greater percentage than expected from Oceania (5,5%) and MARVEL presented more from Africa than expected (4,5%).

The general well-being as measured by the WHO-5 presented a significant difference ($p < ,05$) of mean value between BDO ($M = 2,8$) and MARVEL ($M = 3,1$).

Table 2

Differences in demographic statistics within four groups of gamers (in percentage if no other is stated)

Variable	Clash of Clans/Clash Royale (%) (*n* = 86)	MARVEL Contest of Champions (%) (*n* = 111)	Black Desert Online (%) (*n* = 218)	League of Legends (%) (*n* = 799)	df	χ^2/F	η^2/φ_C	*p*
Gender					6	14,74	,08	,022*
Man	90,7	96,4	85,3	85,4				
Woman	8,1	**3,6-**	14,7	13,8				
Other	1,2	0	0	0,9				
Age: *M* (*s*)	24,5 (9,7)	29 (8,6)	24,2 (6,7)	20,9 (4,1)	3, 1210	78,29	,16	,000***acdef
Relationship status					3	36,16	,17	,000***
Single	50	**33,3-**	63,3	61,3				
In a relationship, dating or other	50	**66,7+**	36,7	38,7				
Occupation					6	57,89	,15	,000***
Student	58,1	**36-**	49,1	60,5				
Employed or self-employed	38,4	**60,4+**	37,6	**27,8-**				
Unemployed, retired or other	**3,5-**	**3,6-**	13,3	11,8				
Living conditions					6	77,57	,18	,000***
Live with parents/guardians	50	**31,5-**	47,2	**59,8+**				
Live with partner and/or children	27,9	**50,5+**	22	**16,5-**				
Live alone, with friends or other	22,1	18	30,7	23,7				
Continent					15	116,25	,18	,000***
Europe	**22,1-**	**22,5-**	45	**57,2+**				
North America	**50+**	**55,9+**	43,1	**30,8-**				
Asia	**18,6+**	**12,6+**	4,1	6,1				
Oceania	1,2	0,9	**5,5+**	2,3				
South America	**7+**	3,6	2,3	2				
Africa	1,2	**4,5+**	0	1,6				
WHO Well-Being Index: *M* (*s*)	3 (0,9)	3,1 (0,9)	2,8 (1)	3 (0,9)	3, 1210	3,62	,01	,013*d

Bold: R > ±1,96 = indicate important contribution to the significance, + and – indicate more or less than expected count
p < 0,05, **p* < 0,01, ***p* < 0,001, *ns:* non-significant
Letters a, b, c indicate significant difference (*p* < 0,05) between: a Clash and MARVEL, b Clash and BDO, c Clash and LoL, d MARVEL and BDO, e MARVEL and LoL, f BDO and LoL

Differences in gaming habits. Statistics related to monetary habits, gaming behavior and gaming motivations of the top four games in terms of IGD prevalence can be found in table 3. There were significant differences between the groups in terms of time spent gaming in an average week ($p < ,001$). BDO made out fewer light and medium gamers (6,4% and 39,9%) while at the same time having considerably more heavy gamers (53,7%). Both Clash and MARVEL had fewer heavy gamers (15,1% and 11,7%), while Clash also presented significantly more light gamers (41,9%). MARVEL differed significantly from the other games as it had more respondents than expected to consider themselves playing too much (36,9%) while LoL presented the opposite, with fewer respondents than expected (16%). The LoL group contributed the most to the significant difference ($p < ,001$) in years of playing the game with a great majority having played it for longer than three years (69%), as opposed to the smaller percentage within Clash (30,2%), MARVEL (4,5%) and BDO (7,8%).

The MARVEL group and BDO group were more likely to spend a majority of their gaming time on those particular games (71,2% and 78%) while LoL had a greater than expected value of respondents splitting their gaming time more even among two or more games (55,8%). The results were significant ($p < ,001$). The groups also differed in their main company for gaming online ($p < ,001$), where LoL was significantly more likely to play with real life friends (50,6%) than Clash (9,3%), MARVEL (8,1%) and BDO (18,3%). At the same time, the opposite pattern could be observed for play with online friends as LoL had a lower percentage (17,4%) than Clash (48,8%), MARVEL (60,4%) and BDO (58,3%). The BDO group was significantly less likely than the other groups to mainly play with strangers (18,3%).

There was a significant difference in the ways the groups communicate through games in regards to real life discussions with friends ($p < ,001$) and discussions on forums ($p < ,001$). The most notable observation was that LoL and MARVEL presented opposing patterns in both variables: MARVEL had significantly fewer than expected talking about games with friends in real life (30,6%) and LoL had significantly more than expected (60,6%), while at the same time the opposite could be observed for forum discussions where LoL had fewer than expected (20,7%) and MARVEL had more (44,1%), together with both Clash (40,7%) and BDO (35,8%). The difference between the groups for reading articles or listening to podcasts about the game was not significant.

A significant result was found related to watching eSport ($p < ,001$) and other entertainment ($p < ,001$) on stream. A large proportion of Clash and MARVEL reported they never watch eSport (75,6% and 77,5%) or other entertainment (62,8% and 68,5%) on stream. The opposite observation was made for LoL as fewer than expected reported they never watched eSport on stream (36,8%). The interest in eSport among the majority of the LoL group could be observed in the higher percentage of players wanting to be professional players (9,6%) as this group differed significantly from the others ($p < ,001$). The percentage of BDO players for this variable was lower than expected (1,8%). The difference in streaming activity between the groups was significant ($p < ,01$) with Clash as particularly less likely than the other groups to stream as a hobby (2,3%).

BDO reported spending a significantly higher amount of money on games in a normal week ($p < ,001$) with a larger proportion in all three groups of higher expenditure (30,3%, 18,3% and 17,9%) while fewer than in the other groups reported spending only 0-3 Euro in a normal week (33,5%). Aligned with these results, BDO was the significantly more likely ($p < ,001$) to report spending more money on games than they wanted to (28,4%), as compared to the other groups. In Clash, more players than expected spent only 0-3 Euro in a normal week (84,9%) and this group was also significantly less likely to feel they spent too much money on games (5,8%). Clash, MARVEL and BDO were significantly more likely ($p < ,001$) to mainly spend their money on in-game upgrades (27,9%, 33,3% and 21,1%) as opposed to LoL where fewer mainly spent their money on upgrades (0,9%). However, the players from LoL were more likely

than the other groups to mainly spend their money on in-game cosmetic attributes (34,7%). The BDO group had a higher percentage of players spending the majority of their gaming money on subscription fees (14,7%) than the other groups. MARVEL differed greatly from the other groups with a higher proportion of players mainly spending their money on in-game random rewards (30,6%). Almost half of the LoL group mainly spent their money on other new games (48,3%), which was more than in the other groups.

There was a statistically significant difference ($p < ,01$) in the mean reported flow between MARVEL ($M = 4,8$) and BDO ($M = 5,4$). BDO ($M = 5,6$) reported valuing items in their games higher ($p < ,001$) than Clash ($M = 4,5$) and LoL ($M = 4,5$). As for the achievement motivation for playing games, no statistical significant difference between the groups could be found. The MARVEL group ($M = 4$) rated the variable manipulation lower ($p < ,001$) than the other groups and therefore prioritized dominating other players lower than those groups. Exploring a fantasy world was a more important motivator for playing ($p < ,001$) in the BDO group ($M = 6,1$) than the other groups, in particular compared to Clash ($M = 5$). Playing when stressed or bored was a significantly ($p < ,05$) less important motivator to MARVEL ($M = 5,3$) compared to Clash ($M = 5,8$) and BDO ($M = 5,8$). The social elements of playing games was particularly important ($p < ,001$) to BDO ($M = 5$) and LoL ($M = 5$). The narrative and story of the game was considered less important ($p < ,001$) to the Clash group ($M = 4,6$) than the other groups, and a similar pattern was observed in regards to the aesthetics of the game ($p < ,001$), where Clash ($M = 4,4$) reported less motivated by this variable than the other groups and in particular BDO ($M = 5,6$). The gamer identity was stronger ($p < ,001$) in the BDO group ($M = 6,5$) and LoL group ($M = 6,3$) as compared to Clash ($M = 5,4$) and MARVEL ($M = 5,7$).

Table 3

Differences in gaming habits within four groups of gamers (in percentage if no other is stated)

Variable	Clash of Clans/Clash Royale (%) ($n = 86$)	MARVEL Contest of Champions (%) ($n = 111$)	Black Desert Online (%) ($n = 218$)	League of Legends (%) ($n = 799$)	df	χ^2/ F	η^2 / φ_C	p
Prevalence of IGD					3	3,8	-	,284ns
Yes	39,5	36	31,2	30,7				
No	60,5	64	68,8	69,3				
Time spent on gaming								
Average hours gaming per day					6	110,3	,21	,000***
Light gamer (0-2 hours)	**41,9+**	27	**6,4-**	18,9				
Medium gamer (3-5 hours)	43	61,3	**39,9-**	51,4				
Heavy gamer (6 or more hours)	**15,1-**	**11,7-**	**53,7+**	29,7				
Distribution of gaming time					3	99,94	,29	,000***
Mainly plays this game	66,3	**71,2+**	**78+**	**44,2-**				
Plays this and other games	33,7	**28,8-**	**22-**	**55,8+**				
Mainly plays games					9	250,95	,26	,000***
With real life friends online	**9,3-**	**8,1-**	**18,3-**	**50,6+**				
With online friends online	**48,8+**	**60,4+**	**58,3+**	**17,4-**				
With strangers online	34,9	27,9	**18,3-**	28,2				
Offline or other	7	3,6	5	3,9				
Time played this game					6	449,6	,43	,000***
0-1 year	18,6	9	**38,5+**	**6,9-**				
1-3 years	**51,2+**	**86,5+**	**53,7+**	**24,2-**				
More than 3 years	**30,2-**	**4,5-**	**7,8-**	**69+**				
Plays more than they want to					3	28,8	,15	,000***
Yes	20,9	**36,9+**	22	**16-**				
No	79,1	**63,1-**	78	84				

Table 3 continues on the next page

Table 3 continued

Variable	Clash of Clans/Clash Royale (%) ($n = 86$)	MARVEL Contest of Champions (%) ($n = 111$)	Black Desert Online (%) ($n = 218$)	League of Legends (%) ($n = 799$)	df	χ^2 / F	η^2 / φ_C	p
Communicating through games								
Talks about games with friends in real life					3	38,71	,18	,000***
Yes	52,3	**30,6-**	50,5	**60,6+**				
No	47,7	**69,4+**	49,5	**39,4-**				
Participates in discussions on forums about this game					3	49,68	,2	,000***
Yes	**40,7+**	**44,1+**	**35,8+**	**20,7-**				
No	59,3	**55,9-**	64,2	**79,3+**				
Reads articles or listens to podcasts about this game					3	7,1	-	,069*ns*
Yes	30,2	19,8	33,9	29,5				
No	69,8	80,2	66,1	70,5				
eSport and streaming								
Watches eSport on stream					3	110,06	,3	,000***
Yes	**24,4-**	**22,5-**	44	**63,2+**				
No	**75,6+**	**77,5+**	**56+**	**36,8-**				
Watches other gaming entertainment on stream					3	34,18	,17	,000***
Yes	37,2	**31,5-**	60,1	54,7				
No	**62,8+**	**68,5+**	39,9	45,3				
Competition in eSport					6	36,58	,12	,000***
No	87,2	90,1	82,1	72,3				
Competes as a hobby	9,3	**7,2-**	16,1	18				
Wants to be a professional	3,5	2,7	**1,8-**	**9,6+**				
Streaming when playing games					6	18,48	,09	,005**
No	93	93,7	83,5	81,4				
Streams as a hobby	**2,3-**	4,5	11	11				
Wants to be a professional	4,7	1,8	5,5	7,6				

Table 3 continues on the next page

18

Table 3 continued

Variable	Clash of Clans/Clash Royale (%) ($n = 86$)	MARVEL Contest of Champions (%) ($n = 111$)	Black Desert Online (%) ($n = 218$)	League of Legends (%) ($n = 799$)	df	χ^2/ F	η^2 / φ_C	p
Expenditure on games								
Average expenditure per week								
0-3 Euro	**84,9+**	69,4	**33,5-**	67				
4-10 Euro	12,8	13,5	**30,3+**	21,8				
11-30 Euro	**1,2-**	9,9	**18,3+**	8,8				
31 Euro or more	1,2	7,2	**17,9+**	**2,5-**				
Main type of gaming expenditure					15	427,48	,34	,000***
New games	34,9	**23,4-**	**24,3-**	**48,3+**				
Monthly subscription fees	2,3	**0,9-**	**14,7+**	4				
Microtransaction: random reward	14	**30,6+**	5	**5,5-**				
Microtransaction: upgrades	**27,9+**	**33,3+**	**21,1+**	**0,9-**				
Microtransaction: cosmetics	**3,5-**	**0-**	29,8	**34,7+**				
Other	**17,4+**	11,7	5	6,6				
Spends more than they want to					3	29,12	,16	,000***
Yes	**5,8-**	19,8	**28,4+**	15,4				
No	94,2	80,2	71,6	84,6				
Motivations and attitudes								
Flow: *M* (*s*)	5,2 (1,7)	4,8 (1,6)	5,4 (1,5)	5,2 (1,6)	3, 1210	3,94	,1	,008**ad
Virtual value: *M* (*s*)	4,5 (1,9)	4,9 (1,5)	5,6 (1,1)	4,5 (1,8)	3, 1210	29,92	,26	,000***bdf
Achievement: *M* (*s*)	6 (1)	6,1 (0,8)	5,9 (1,1)	5,9 (1,2)	3, 1210	1,9	-	,127ns
Manipulation: *M* (*s*)	4,5 (1,6)	4 (1,7)	4,7 (1,9)	4,8 (1,7)	3, 1210	8,18	,14	,000***de
Immersion: *M* (*s*)	5 (1,7)	5,2 (1,5)	6,1 (1,1)	5,5 (1,6)	3, 1210	16,39	,2	,000***bcf
Escapism: *M* (*s*)	5,8 (1,3)	5,3 (1,5)	5,8 (1,3)	5,7 (1,6)	3, 1210	2,62	,08	,049*ad
Relationship: *M* (*s*)	4,5 (1,6)	4,2 (1,9)	5 (1,5)	5 (1,8)	3, 1210	9,17	,02	,000***bde
Narrative: *M* (*s*)	4,6 (1,8)	5,3 (1,6)	5 (1,6)	5,3 (1,6)	3, 1210	6,66	,13	,000***ac
Aesthetics: *M* (*s*)	4,4 (1,7)	5,1 (1,4)	5,6 (1,4)	5,1 (1,7)	3, 1210	12,84	,18	,000***abcdf
Gamer identity: *M* (*s*)	5,4 (1,6)	5,7 (1,4)	6,5 (1)	6,3 (1,1)	3, 1210	23,78	,06	,000***bcde

Bold: R > ±1,96 = indicate important contribution to the significance, + and – indicate more or less than expected count

*p < 0,05, **p < 0,01, ***p < 0,001, *ns:* non-significant

Letters [a, b, c] indicate significant difference (*p* < 0,05) between: [a] Clash and MARVEL, [b] Clash and BDO, [c] Clash and LoL, [d] MARVEL and BDO, [e] MARVEL and LoL, [f] BDO and LoL

Discussion

Internet Gaming Disorder within different game titles

The study showed a significant difference in prevalence of IGD between a number of popular game titles. Most notably, in concurrence with previous research, online games rated higher than offline games (Lemmens & Hendriks, 2016; Tejeiro et al., 2016). No significant difference could be found between the four game titles with the highest prevalence of IGD within the total sample of the study. Despite being similar on the IGD variable, four very different games emerged in terms of both demographic statistics and gaming related habits of the players.

Differences between four game titles

MARVEL Contest of Champions. The respondents who chose MARVEL Contest of Champions as their most played game in the last month differed vastly from the other three game titles with the highest prevalence of IGD. The mean age was closer to 30 and a considerably higher percentage of the respondents were in some sort of relationship and living together with a partner. Almost all the players were men and a majority of them were employed rather than students. Compared to the other gamers they spent fewer hours playing games, but they were still more likely to feel they played too much. Research shows that time spent gaming is related to IGD (Fuster et al., 2016; Lemmens & Hendriks, 2016; Scharkow et al., 2014), however mere hours gaming has not proven enough to identify IGD. This group of gamers is a relevant example of this as the prevalence of IGD did not significantly differ from other game titles where the player base spent several hours more on gaming in a normal week. How can this be understood? One explanation is that the threshold for what amount of time spent gaming is considered normal and accepted at older ages. The criteria for IGD rely partially on relational symptoms such as lying to others about gaming or getting into conflicts regarding gaming. As a person becomes older and is expected to handle more responsibilities in life in general, the environment might react stronger to excessive gaming than earlier which would then result in more symptoms on the IGD scale. Younger people living alone would not exhibit these symptoms, even though they could be as occupied by games as the older gamers or even more, as they are not in the same environment.

The MARVEL group primarily played with online friends rather than friends from real life, and they did not identify as strongly as gamers. It is possible that the high prevalence of IGD partially is a result of the individuals not identifying as gamers and therefore feel that the time they spend on games in some sense is wasted. This was supported by the fact that they did not talk about games with real friends to the same extent as the other groups and that a large proportion of the players felt they played too much. They also experienced less flow than the other groups and were not as motivated to play through dominating other players or by avoiding real life stress. The player base stands out as more mature in terms of age, relationship status and living conditions, but the game ranked number two out of all 54 games for the highest prevalence of IGD and therefore many of these players would be considered either disordered or part of a high risk group. These results are in contrast to previous research showing that young age is a risk factor for IGD (American Psychiatric Association, 2013).

MARVEL Contest of Champions is a mobile game. The game relies heavily on a system that is known unofficially as "pay-to-win" (Wikipedia, 2018b), as observed by the results of the study showing that a majority of the players spent their money on in-game upgrades and random rewards. The key component of the revenue system is that players make purchases

within the game in order to become stronger and thereby able to beat other players. By doing this, the player essentially purchases time, as gathering the same resources in the game is very time consuming, albeit possible. There is no previous research on the payment system in relation to IGD. However, there is support for the presence of continuity cost within mobile gaming which indicates that gamers will be less likely to give up a game if they have invested time and money into gathering in game items (Kim & Lee, 2017). Since the items are context bound, they are only valuable within the context of a particular game (Hamari & Keronen, 2017). Therefore the quality of a game has a direct effect on the intent of the individual player to purchase in-game goods (Hamari & Keronen, 2017). It is possible that MARVEL Contest of Champions is a game that, by using the pay-to-win system in combination with having actual gameplay quality, creates a sort of vortex that attracts players and then keeps pulling them in. The game is free-to-play and always available on the phone, wherever you are. The availability of mobile gaming is the main aspect that distinguishes it from other types of gaming (Kim & Lee, 2017).

Clash of Clans/Clash Royale. Clash is a mobile game just like MARVEL and in most ways the groups were similar, both regarding demographics and gaming behavior. Both groups had few players playing six or more hours per day, they mainly played with online friends rather than real life friends, around 40 percent took part in forum discussions, they were rather uninterested in eSport and their expenditure on games was quite low compared to the other groups. The differences between the two games were mostly related to demographics, as Clash has a younger player base with a mean age in the mid-twenties and were more likely than MARVEL to be single, student and living with parents. The main difference in gaming behavior as compared to the other groups is the monetary habits. Clash had a vast majority spending a maximum of three euro in a week, and the group had the lowest proportion of players reporting spending more money than they wanted to. It is notable that even though Clash reported the highest prevalence of IGD in the total sample, the group spent both less time and money on the game than the other three groups at the top of the list.

Black Desert Online. The most notable difference between Black Desert Online and the other three games was monetary habits. This group was significantly more likely to spend money each week and almost one fifth of the players spent more than 30 Euro in a regular week. The BDO players in this study were also more likely to report regretting their gaming related purchases, as compared to the other game titles with a high prevalence of IGD. Spending more money than intended is an indication of a "dark design pattern" within a game (Björk et al., 2013). BDO uses both in-game purchases and a subscription fee as means of gaining revenue. Like MARVEL, these purchases will give the player advantages and are therefore highly motivating in terms of goal completion within the game.

Another indication that dark design patterns might be present in BDO is the proportion of players spending more than an average of six hours per day, which in this group was more than 50 percent and significantly more than the other three games. Like many other MMORPG games, a central component to becoming a stronger player in BDO is farming. This is an activity that revolves around repeating the same unchallenging task for a longer period of time. Farming is described by Björk et al. (2013) as an example of a dark game design pattern as it does not add to the gaming experience but still demands attention from the player. In BDO this is exemplified by a system where the player needs to be online in order for a particular progress to become activated. Time spent offline is equal to lost progress in certain aspects of the game. However, it is important to note that the BDO players in this study were not more likely to report spending more time than they wanted to on gaming compared to the other three groups. About one fifth of the respondents wanted to play less than they did. They did however report a lower mean score on general well-being, although the difference was small compared to the other groups and only significant compared to MARVEL.

It is notable that the World of Warcraft, which for many years has been considered to be one of the most addictive games (Adams et al., 2018; Kaye et al., 2017; Kuss et al., 2012; Snodgrass et al., 2012), showed a prevalence of IGD close to the mean in this sample. As it is an MMORPG just like BDO, the two games are in many ways comparable. One difference is the system for in-game purchases, as World of Warcraft does not use the pay-to-win system for in-game purchases. Another difference is that it is much older, and therefore might simply not gather the same interest among heavy gamers in 2018 as it did a decade ago.

League of Legends. Contrasting MARVEL Contest of Champions, the League of Legends respondents of the survey were on average much younger with a mean age of a little over 20 years. A bigger proportion of the players were single and living with their parents, and close to fifteen percent were women. They were also unemployed to another extent. In this study, the average age and employment status of the respondents playing LoL indicated that many of them were in a state in life in between school and employment. It is possible this phase in life is a risk factor for developing IGD, as much time and effort can be focused on gaming which in turn can be very rewarding in terms of in-game progress (King et al., 2018a).

LoL differed significantly from the other games in the eSport variables of the survey. More than 60 percent of the players watched eSport on stream, almost a tenth wanted to become a professional player and close to a fifth competed in eSports as a hobby. Could there be a link between eSport and IGD? Research shows that addictive patterns in gaming differ from other behavioral addictions such as gambling (King et al., 2018a). Gamers are goal oriented, the activity they engage in is skill-based and the tolerance symptoms in gaming can therefore be conceptualized as the need to achieve certain goals and to avoid failure, in contrast to gambling where the activity has an uncertain outcome. For a gamer, staying competitive with other players or raising the self-expectation of performance is essential. The primary loss in gambling is financial, as opposed to loss in gaming which primarily consists of loss or lack of in-game progress or failure to achieve a particular goal. Therefore the consequences are vastly different: in gambling the distress results from losing too much money, whereas in gaming the distress is contingent on frustrating gaming experiences that negatively affect the self-evaluation of the gamer, resulting in a feeling of inadequacy and failure (King et al., 2018a).

Clinical experience supports the link between eSport and IGD as it is not uncommon of those seeking treatment to have invested time and effort towards becoming professional players (O. Foldevi, personal communication, May 5, 2018). It could be speculated that the IGD prevalence in LoL, as opposed to the other top rated games in terms of IGD prevalence, is related to the ambition among players to become professionals. There is a lot of money and fame waiting for those who succeed (Newzoo, 2018b) and for someone who strongly identifies as a gamer it might be perceived as the obvious way to garner respect and admiration (King et al., 2018a). It is also possible that the general view on eSport as a legitimate career path has not yet caught up with traditional sports, which can affect the way parents communicate with their children about gaming.

Professional gaming is highly skill-based, and even for players below the threshold of professionalism competitive games require ability, focus and goal orientation (King et al., 2018a). Is it then reasonable to consider problematic gaming an addiction? The scientific and clinical community agrees that problematic gaming exists (Griffiths et al., 2017), however gaming is not escapism in the same way as an addict uses drugs (King et al., 2018a). Regardless of the consequences and immediate concern for treatment, it might not be valid on a categorical level to compare the act of investing time and effort into reaching a goal and eventually fail, to for example alcohol or drug addiction.

Internet Gaming Disorder as a future diagnosis

The study showed a significant difference in general well-being between the disordered and non-disordered players in the total sample. The difference however was quite small. This indicates that while there is a relation between IGD and general well-being, IGD is probably not the most relevant variable to the outcome. What does this mean for the raison d'etre of IGD as a future diagnosis? The purpose of a psychiatric diagnosis is to describe a phenomenon that causes "clinically significant distress or impairment in social, occupational, or other important areas of functioning" (American Psychiatric Association, 2013). If the individuals classified as disordered do not suffer, the diagnosis serves no purpose.

In the total sample in this study, more than one fifth of the players reported having five or more criteria on the IGD scale and were therefore classified as disordered. Many of the studies on the prevalence of IGD examine a sample from the total population of either adults or adolescents (Haagsma et al., 2012; Turner et al., 2012). This study however gathered the sample from active gamers only, and in particular gamers that actively participate on internet forums such as Twitter, Reddit and Facebook. The sample is therefore skewed which might explain the abnormally high prevalence of IGD. Another explanation could be that the criteria for IGD as suggested by the DSM-5 are low on specificity. Scholars agree that problematic gaming as a phenomenon exists, but they disagree widely on the diagnostic criteria or whether it should even be a diagnosis at all (Aarseth et al., 2017; Lemmens et al., 2015). Several of the criteria are still actively debated and it is not unlikely that DSM will rewrite them further on should it be introduced as a diagnosis for DSM-6.

The purpose of the study was to investigate the differences between specific game titles and IGD. The results show that there are apparent differences, as some popular game titles have a prevalence of three to four times the amount of disordered gamers as other game titles. However, no conclusions regarding causality can be drawn based in this sample. The question still stands whether some game titles have a higher addictive potential than others, or whether these game titles simply attract players prone to IGD. Suggestion for future research is to investigate this subject within a longitudinal frame.

The two top rated games of IGD prevalence in the study were both mobile games. Mobile gaming is expected to surpass 50% of the total revenue of the gaming industry by the end of 2018 (Newzoo, 2018c). There are indications that mobile gaming differs from other types of gaming. Merikivi, Tuunainen and Nguyen (2017) found that the three most important factors for gaming enjoyment within a group of mobile gamers were perceived ease of use, novelty and the visual aesthetics of the game. They also found that challenge was less important to the mobile players. They argue that this might be because the mobile gamer often is on the move and needs to be attentive to the environment, which is a condition that does not allow for the higher level of concentration necessary to master a challenging game. The research is still scarce on mobile gaming and in particular on the relationship with IGD. A suggestion for future research is to explore similarities and differences between mobile gaming and other types of gaming in regards to IGD.

Some of the most popular eSports titles in the world, such as League of Legends, Dota 2 and Counter-Strike: Global Offensive presented a high prevalence of IGD in this sample. eSport is a relatively new phenomenon and there is almost no research on the subject, and even less so on the potential link to IGD (Hutchins, 2008). The growing popularity of gaming as entertainment has not only given rise to professional gaming as a career path, but also professional streaming (Gandolfi, 2016). No conclusions on the subject can be drawn from this study, but future research is recommended to examine the way eSport and streaming might contribute to beliefs about fame, and the possible connection to IGD.

Gaming has enormous potential in satisfying basic human needs such as deep

relationships, validation, social identity belonging, being recognized as competent and achieving goals (Billieux et al., 2013; Kaye et al., 2017; King et al., 2018a; Lee et al., 2017; Schneider et al., 2017). It is not difficult to understand why the hobby for some individuals can become exaggerated and outmaneuver other important aspects of living. Gaming is not inherently bad, and for the healthy majority of gamers it is an essential and enriching part of life (Aarseth et al., 2017). The clinical priority must be on helping individuals finding a balance that aids them in living the life they want for themselves.

Limitations

Sample. There are several limitations to this study. Firstly, the sample is not representative of the general population, or even the population of gamers. The sample was recruited by convenience from internet forums and gamers without forum presence were not sought out. In addition, some of the forums of popular game titles declined the request of using their platforms as recruitment for the survey, and in yet other forums the recruitment post gained no attention as the rate of submitted new posts in popular forums occasionally is so high that most of them end up being ignored. An example of a very popular game title not represented in this sample is StarCraft. However, gamers were encouraged to share the survey with other gamer friends which might have compensated the skewness slightly.

No action was taken to prevent respondents from taking the survey multiple times. This was hopefully compensated for by sorting out the survey responses with an unrealistically short response time and the responses with unreliable answers to the open ended questions. It is difficult however to estimate the potential amount of non-unique survey responses.

Validation and survey. There is yet no gold standard for evaluating problematic gaming. Many different scales have been used during the last decades and the debate on which criteria to use is active. The survey questions are based on a scale with good psychometric properties for evaluating IGD, however given the varying opinions among researchers on the necessary criteria, the true prevalence of gamers that ought to be diagnosed might differ from the results of the study. It could even be argued that it is not possible to determine the actual prevalence until such gold standard exists.

Another limitation is the data regarding the motivations for playing. All questions are derived from theory, however they are not validated. It is customary to use scales for variables such as achievement, escapism and flow. In the present study, there was only one question based on each variable. This was motivated by the length of the survey, as a considerably longer survey was assumed to deter gamers from finishing the survey.

The first part of the survey consisted of general demographic questions. According to proper survey design, this is not ideal (Dumitrescu & Martinsson, 2016). It is possible that these questions activated different schemata within the respondents that affected the way they answered the remainder of the survey. An example of this could be a question on relationship status followed by a question on whether the respondent wants to play less or not. Cognitions on being in a relationship, such as social obligations, might interfere with attitudes towards gaming thus skewing the sample. Therefore, these demographic questions would ideally have been placed in the last part of the survey.

Game titles. In order to facilitate data preparation and statistical analysis, each respondent in the sample was only represented by one game title: the game played the most within the last month. Unfortunately this does not fully capture the gaming behavior of many gamers, as it is not uncommon to switch between several games for the duration of a month, week or even a single day. However, in order to categorize players in this study it was a necessity to define them as belonging to the group of their most played game as this was

considered to be a better fit than any alternatives.

A few out of the 54 games used in the statistical analysis are actually several different games classified as one. For most titles, such as Madden NFL and The Legend of Zelda, this is not a cause for concern as the different titles in these series are quite similar to each other and it can be assumed that the gamers are similar in their behavior regardless of the title. However, for some game series it can be speculated that the player base differs even between specific titles. Final Fantasy is an example of this as a majority of the titles are offline solo adventures but there also is an MMORPG within the series. Another example of uncertainty related to the player base is Fire Emblem since it has titles on both console, portable device and mobile phone. The results of these game titles in the study should be interpreted with care.

Conflict of interest. The author has personal experience from gaming which might have affected the way gaming is viewed throughout the study. It is possible a positive bias towards gaming in general is present and in an effort minimize the influence of such bias, this has been carefully reflected upon during the process.

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Attachments

Attachment 1

During the last year…	Criterion
… have there been periods when all you could think of was the moment that you could play a game?	Preoccupation
… have you felt unsatisfied because you wanted to play more?	Tolerance
… have you been feeling miserable when you were unable to play a game?	Withdrawal
… were you unable to reduce your time playing games, after others had repeatedly told you to play less?	Persistence
… have you played games so that you would not have to think about annoying things?	Escape
… have you had arguments with others about the consequences of your gaming behavior?	Problems
… have you hidden the time you spend on games from others?	Deception
… have you lost interest in hobbies or other activities because gaming is all you wanted to do?	Displacement
… have you experienced serious conflicts with family, friends or partner because of gaming?	Conflict

Attachment 2

AK-47, Apache Attack Helicopter, Attack Helicopter, Boeing AH-64 Apache, F-14 Tomcat, Helicopter, I am a meat popsicle, I identify as a waffle, im a Pleyadian, Manatee, Oh god why add this option, Submarine, SWEDEDUCKS, There is no "other", Transformer (Autobot), Uruk-hai.

Attachment 3

Dear r/[game],

My name is Theo Toresson and I am a student of Science in Psychology at the University of Gothenburg, Sweden - currently writing my master's thesis. The survey aims to gain understanding of the different aspects of gaming that affects psychological well-being. The survey will take about 10 minutes to complete. At the moment of writing, the survey has around [amount] replies, but I am lacking your community. I hope that as many of you (from the [game]-community) as possible want to help me by doing this survey, because in order to make something out of this I hope to get data from a broad variety of gamers. That means that even if you have a different game that you currently play more, I am interested in you anyway. Also, you should feel free to post this survey anywhere there might be gamers - to friends or on forums, Twitch, Twitter, Facebook etc. So if you have a few minutes to spare in between games, use it for this survey - it's for (actual) science. Thank you for your time!

LINK TO SURVEY: https://samgu.eu.qualtrics.com/jfe/form/SV_2rvhBqqSVrTycC1

All the best,
Theo Toresson,
Master's student of Science in Psychology at the University of Gothenburg, Sweden.

Attachment 4

FAQ:

I have received a few questions and comments on the survey. I can't change anything in the survey due to the fact that it would corrupt the data. Please refer to the FAQ below should any confusion occur during or after the survey.

What counts as "my most played game" in the survey?

It's the game you chose on the first question, your most played game in the last month.

I live in Ireland, Northern Ireland, Hong Kong, Faroe Islands or United Kingdom – where is my country?

The list is lacking a few countries. You can choose any country on the list as long as you make sure to specify the correct country in the very last question of the survey. If you live in England, Scotland or Wales, please select Great Britain.

What kind of device is Nintendo Switch? And what if I play my most played game on both console and computer?

Choose the way you play the game the most. Switch can count as either portable device or console, answer according to your most frequent type of usage.

You ask for streaming, but what about Youtube and other sites for non-streaming video content related to gaming?

Use the "other"-alternative on the question about gaming related activities and fill in your preferred alternative in the corresponding box. For the content to count as "streaming" in the other questions of the survey however it has to be live (e.g. live on Twitch, Mixer or Youtube LIVE).

Some genres are unrepresented, for example fighting games, what can I do?

Use the "other"-alternative and fill in your favorite genre in the corresponding box if it's missing.

You ask for money spent on games each week, but I only buy one game each month, is my spending 0?

No. Calculate your weekly expenditure by dividing your monthly by four, for example.

How can you know that my mental and physical health is related in any way to my gaming?

I can't. Your hand injury might be because of an accident you had yesterday. You should still fill in the box, because even if I can't see the underlying causes of your health (as an individual), I can analyze it on a group level and look for patterns among thousands of replies. If there is no connection between a particular way of gaming and a particular mental or physical state, I won't find any connection. There is no need to worry that you're messing up the data! So try to be as honest as possible in the survey, even if you know that your state is not related to your gaming.

The questions in the end seem focused on the negative side of gaming. What is your motive?

I am a gamer myself, and have been for all my life. I have had several amazing experiences with games, and also a few bad ones. Gaming has many positive effects, there is research to support that. For a minority of people, gaming can have negative effects (just like alcohol, work, sex, candy, exercise, therapy, TV, horseback riding or really anything that can be enjoyable). This particular study is done to explore correlations (not causality) between different kinds of gaming, social and mental health problems (I myself work as a therapist, therefore my focus). Neither I (the author) nor the institution is biased towards gaming in general in an either positive or negative way.

Will I get to see the results?

Yes. The thesis will be in Swedish, but I will post a summary of the results in all groups and forums that have been participating in the study, most likely sometime in June 2018.

What is your favorite game?

No one has actually asked me this, but for the record it's Super Smash Bros. Melee!

I have more questions!

Feel free to send an email to gustoreth@student.gu.se and I will get back to you as soon as possible.