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Primary Versus Secondary Disorder in the Context of Internet Gaming Disorder

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Abstract

Purpose of Review We consider the evidence for Internet gaming disorder as a primary or a secondary disorder.

Recent Findings Findings in this area are mixed. Although it is generally acknowledged that IGD is frequently comorbid with other disorders, there is a disagreement as to whether IGD does or does not appear as a primary disease.

Summary The question of IGD as a primary or secondary disorder is founded on a presumption of dichotomy. To declare it as belonging in one category or another implies a presumption that it cannot be both. The literature does not place it clearly in either position. IGD is likely best conceptualized as a disorder that can be comorbid or multimorbid, similar to many other mental health disorders.

Keywords Internet gaming disorder · IGD · Primary disorder · Secondary disorder · Comorbidity · Video game addiction

Introduction

Internet gaming disorder was first officially recognized in Section 3 of the *Diagnostic and Statistical Manual for Mental Disorders* – 5 (*DSM-5*) in 2013. Both online and offline gaming disorders are included within the recent *International Classification of Diseases* (ICD-11). Within the DSM-5, IGD is conceptualized similarly to gambling addiction and substance use disorders; these are characterized by significant damage to normal functioning. This damage can include altered rewards processing, high rates of depressive and impulsive symptoms, and significant distress related to the behavior [1–3]. To be diagnosed with IGD in the *DSM-5*, one must meet five of nine criteria: preoccupation, tolerance, withdrawal, loss of control, escape, persistence despite problems, deception, displacement, and significant conflict.

There is a nomenclature issue within the DSM-5. The DSM-5 states that IGD is "commonly referred to as Internet use disorder, Internet addiction or gaming addiction" [4. pg. 769] which can lead to confusion in the discussion of IGD. This statement implies that IGD is synonymous with terms such as internet addiction, internet use disorder, or pathological gaming. This can lead to issues where people are ostensibly discussing the same thing but are using differing terminologies, or they are discussing different topics but using the same terminology for them [5]. Resolving this nomenclature problem is desirable. Nonetheless, for the purposes of this review, we do not make strong distinctions between these terms but try to examine the widest set of relevant research.

How Would We Know if IGD Were a Primary Disorder?

Winokur et al. [6] give an example of a disorder (alcoholism) as secondary to another (mania). They define secondary as a disorder that is temporally or in severity subordinate to the other. One might also extend the model of causation to the primary-secondary distinction and suggest that a secondary disorder is one that is either directly, through the natural progression of related events, or indirectly, through a weakening of the subject or increase in risk exposure, caused by the primary. Two disorders can exist at the same time, however,

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with no singular causative relation as in the case of comorbidity. The literature's use of primary and secondary as designations is often confused by the term primary being used not to describe a hierarchical relationship, but merely to designate one as the disorder of interest to the researchers. As we examine the question of IGD as a primary or secondary disorder, we assume the intention of the question is to imply hierarchical ordering.

In order to demonstrate that IGD is clearly a primary disorder, all possible comorbidities would need to be ruled out to ensure that the person does not have any other illnesses that could directly or indirectly lead to IGD. Due to the wide prevalence of comorbidities that are present within IGD cases, "pure" cases of IGD are extremely rare. It seems likely, however, that many or most mental health disorders would not be "primary" by this strict definition, due to comorbidity being so common within mental health [7, 8].

Nonetheless, if comorbidities are observed, IGD could still be demonstrated to be primary if clinical histories showed that the gaming problem occurred before any symptoms of other disorders. Unfortunately, the temporal resolution in most clinical histories is rarely so fine-grained as to be able to demonstrate this. Many disorders are not noticed in the early stages, patients do not always seek help until symptoms have existed for some time, and we define many disorders within a broad time window (e.g., "Have you had a given symptom within the past year?"). It seems, therefore, that the data needed to demonstrate IGD as a clear primary disorder are unlikely to exist.

Another difficulty in trying to identify IGD as primary is seen in some of the IGD criteria themselves. Criterion 8 [use of Internet games to escape or relieve a negative mood; 9] explicitly suggests a functional link between IGD and such emotions as anxiety or depression —gaming is used as a coping strategy for emotions that could be related to other problems. Although this is not a mandatory criterion for diagnosis, it demonstrates the difficulty in defining symptoms that are entirely independent of other potential disorders.[1]

What Evidence Exists for IGD Being Primary?

One of the strongest longitudinal studies to date [12••] measured over 3000 children three times at an annual interval. The researchers discerned four groups across the 2 years: One group was already experiencing clinically significant levels of IGD symptoms at the beginning of the study and continued to experience them, one group started the study at pathological levels but stopped meeting clinical criteria by the end of the study, a third group began without meeting criteria but became addicted by the end of the study, and most (92%) never reached clinically significant levels at any point. These groups allowed for testing of risk factors predicting later IGD symptoms (evidence of IGD being secondary), as well as for testing of whether IGD predicts later disorders (evidence of IGD being primary). Very few risk factors seemed to be good predictors of later IGD. The primary risk factors were higher impulsiveness, lower social competence, and higher amount of gaming. In contrast, IGD symptoms tended to be good predictors of later symptoms of depression, social phobia, and anxiety. This appears to lend more support to the argument that IGD is a primary disorder. As the authors note, however, given that the measurements are a year apart, the temporal resolution is not sufficient to be unequivocal. Nonetheless, some researchers do specifically argue for IGD being primary, such as the I-PACE model by Brand et al. [13].

Other studies have indicated there might be a causal relation between using the internet or games to meet core needs (such as competence) that are not being met offline [14] and the later development of IGD [12••, 15•, 16, 17]. The use of the Internet and games to fulfill emotional needs could become maladaptive, especially when the person is unable or unwilling to develop sources for fulfillment in other areas of their life. It is unclear from these studies, however, whether the lack of needs fulfillment in other areas of life may first cause other disorders, such as depression, which may in turn fuel the disordered gaming. Thus, although there is some evidence for IGD being a primary disorder, the evidence is not very strong.

How Would We Know if IGD Were a Secondary Disorder?

In order to demonstrate that IGD is clearly a secondary disorder, we would need to demonstrate that it is most typically a result of some other primary disorder, that it does not need treatment on its own, and perhaps that it does not interact in any significant way with the primary or other comorbid disorders. For example, given that video games are often used as a coping strategy [18–20], we could easily imagine a case where a person was depressed, played games to cope, experienced no improvement in their depression, and gamed more. In this hypothetical case, treating the gaming would be ineffective because the real (primary) disorder is the depression. Critically, however, if the depression were successfully treated, then the excessive gaming should stop due to the decreased need to cope, as hypothesized for example in the compensatory Internet use model [21].

We might also have more confidence that IGD was purely a secondary disorder if it regularly showed up only with a specific disorder, such as depression. That is, the logic of it being secondary is that it is necessarily and systematically caused by

[1] Although somewhat peripheral to the discussion here, it is worth mentioning that the symptom of escapism/mood reduction has been the topic of serious debate (c.f., Kardefeldt-Winther et al. [10]; Billieux et al. [11]).

some primary issue. If, instead, it co-occurs with multiple different types of disorders, this weakens the case of it being a symptom of some other disorder. As seen below, the literature seems to have found IGD co-occurring with higher rates of symptoms of many different types of disorders.

Finally, we could perhaps demonstrate IGD to be secondary if symptoms clearly and regularly appear after some other disorder, but never first. As noted above, we generally do not have fine enough temporal resolution to know the order of onset. Without clear data demonstrating that IGD symptoms are either symptoms of some other disorder, requires another disorder as a prerequisite, or is always temporally second to another, it seems likely that the best we may be able to say is that it is comorbid with other disorders.

What Evidence Exists for IGD Being Secondary?

There is even less clear evidence of IGD being solely a secondary disorder. The list of possible primary causes that could result in secondary IGD are wide-ranging, including personality factors [e.g., neuroticism, introversion, aggression, sensation seeking, low self-esteem 22], motivational factors [control seeking, friendship seeking, etc.; 23, 24], and other psychiatric illnesses such as depression or anxiety. A number of studies [25–29] have estimated that approximately 2% of people experience problematic video gaming as a primary disorder. It is unclear, however, how they came to that estimation.

The literature does not demonstrate IGD regularly following only one specific disorder, and the disorders that it sometimes seems to follow are varied. Some studies find that IGD follows depression or dysthymic disorders, while others have found that there is little or no association between IGD and depression [30, 31, 32•, 33, 34]. Some authors [35] suggest that IGD is secondary to depression with people using the Internet or gaming as a way to avoid negative emotions or feelings of lack of competence within their everyday lives. When an individual's competence is threatened or stifled, it tends to lead to overall lessened feelings of well-being [36]. Lower well-being may increase internet use or gaming to restore the lost feelings of competence or to cope with the lack of offline competence. When gaming is used to restore feelings of competence, it could be indicative of either primary or secondary IGD.

Coping strategies can play an important role in IGD development. Loton, Borkoles, Lubman, and Polman [37•] found that an individual's coping strategy can account for the association between IGD and depression. Escape-based coping has been found to be associated with IGD symptoms [38–41]. Li, Wang, and Wang [42] found that the use of avoidance coping strategies are related to increased problematic Internet usage in Chinese students and this was replicated in American students [43]. In two large cross-sectional surveys of American students, those who used video games specifically as a coping strategy demonstrated more IGD symptoms [44]. This specificity was demonstrated especially for students who had greater anxiety and more symptoms of other mental health disorders. This relation held up even after controlling for other negative and escape-based coping strategies that did not concern video games. Because these were cross-sectional, it is unclear whether the IGD was really secondary. In a follow-up longitudinal study [45], we have found that earlier use of games to cope with negative emotions predicts increased IGD symptoms, particularly if they were lonelier initially. Although this seems like clearer evidence of IGD being secondary, it really is not. Studies like this are probably demonstrating some of the risk factors for IGD, but they are not showing that people with one clinical diagnosis gain IGD as a symptom of that diagnosis. These samples are of "normal" populations, and although several of them have measured other mental health symptoms, almost none of the samples reach clinically significant levels of those other disorders. Thus, these studies are not strong evidence for IGD as a purely secondary disorder.

As described above, demonstrating that IGD is clearly a primary or secondary disorder requires clear and stringent evidence. Although there is some limited evidence for both claims, none of it rises to the level needed. Therefore, the evidence suggests a more nuanced answer, or perhaps a more nuanced question. Rather than asking a dichotomous question, what does the existing evidence indicate?

Evidence for Comorbidity/Multimorbidity

Rather than trying to slot IGD into either a primary or secondary category, perhaps it would be more fruitful to examine it as a comorbid or a multimorbid condition. Comorbidity means that there is the presence of at least one distinct disorder or condition, existing simultaneously and somewhat independently of other disorders, although it can interact with other disorders in complex ways [46]. Multimorbidity is when multiple diseases or disorders occur largely simultaneously. Within psychiatry, multimorbidity is more common when two or more disorders occur without any reference to a primary condition and without any explicit ordering [47].

Much of the evidence presented above for IGD being a primary or secondary disorder also is evidence for comorbidity or multimorbidity. Common comorbid or multimorbid conditions for IGD include depression, anxiety, attention-deficit hyperactivity disorder (ADHD), and obsessive-compulsive disorder (OCD) [48]. One study showed that 7% of adult IGD patients had a comorbid dysthymic disorder [49]. Yen et al. [50] found a similar association between depression and dysthymic disorders with IGD in a college sample. A

recent systematic review [51•] reported that IGD showed strong correlations with anxiety, depression, ADHD, and social phobia/anxiety. Because IGD and depression have similar risk factors [e.g., loneliness, lack of social support, and a lack of sense of belonging; 52], it makes sense that they could be commonly comorbid.

Several other risk factors for IGD have been identified. These include personality factors such as neuroticism, introversion, disagreeableness, aggression, hostility, low self-esteem, high sensation seeking and boredom susceptibility, intrinsic motivational factors such as a desire to establish friendships or to feel powerful in games [12••], as well as cognitive factors such as obsessive thoughts about online activities, a preference for online interactions, thinking about or anticipating online interactions, reduced feedback processing, and a preference for immediate rewards [53, 54]. Our interpretation of the literature is that there appears to be somewhat reasonable evidence for IGD being a comorbid or multimorbid condition. Ultimately, however, longitudinal studies that capture information on multiple disorders in a clinical sample will be needed to verify or contradict this claim.

Conclusion

To demonstrate that IGD is a primary disorder requires strict evidence of its temporal primacy and independence from other disorders. The literature to date do not seem to meet this stringent requirement. Demonstrating IGD as a secondary disorder requires similarly strict evidence of its lack of independence, a lack of significant interaction, and its being a systematic symptom of some specific disorder. The existing literature does not seem to meet this set of requirements either. What, then, are we left to conclude?

We argue, in line with Gentile et al. [12••], that the question of IGD being a primary or secondary disorder is a false dichotomy. It is widely recognized that comorbidity or multimorbidity among mental health disorders is more often the rule than the exception [55]. This is true also for substance addictions [e.g., 56, 57] and has been specifically noted in the debate over gaming disorder [e.g., 58]. It is typical that once a person has one mental health issue, they often gain others and they each interact with the others in complicated ways, often making each other worse.

From a clinical perspective, the primary/secondary question is not only a false dichotomy; it is largely irrelevant. When a patient presents with symptoms of anxiety, depression, and gaming disorder, the clinician does not only treat that first disorder. It is likely that the patient would not get better easily because the other untreated disorders continue to interact and influence the "primary" disorder. Instead, to be maximally effective, the clinician must take a broad view and treat the whole patient by looking at the disorders as a multimorbid concern. It does not matter very much which disorder was first, as all of the disorders are manifest at this time and need to be considered and treated in combination.

As scientists, we are certainly willing to be convinced by new data that demonstrate clearly the primary or secondary nature of IGD. From this review, however, it seems unlikely that such data are likely to be forthcoming. Therefore, we recommend putting this question aside for now, as it seems to distract from the more important issues that need additional research (such as defining etiological pathways, patterns of comorbidities, and treatment efficacy). These issues are of increasing importance, given that the World Health Organization has included gaming disorder in the International Classification of Diseases-11 [59]. This recommendation has spurred a great deal of new debate, and it will benefit the field more if we are not distracted by further debating the false dichotomy of IGD (or GD) being a primary or secondary disorder.

Compliance with Ethical Standards

Conflict of Interest The authors declare they have no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

References

Papers of particular interest, published recently, have been highlighted as:
- • Of importance
- •• Of major importance

1. Lehenbauer-Baum M, Klaps A, Kovacovsky Z, Witzmann K, Zahlbruckner R, Stetina BU. Addiction and engagement: an explorative study toward classification criteria for internet gaming disorder. Cyberpsychol Behav Soc Netw. 2015;18(6):343–9. https://doi.org/10.1089/cyber.2015.0063.
2. Petry NM, Rehbein F, Ko CH, O'Brien CP. Internet gaming disorder in the DSM-5. Curr Psychiatry Rep. 2015;17(9):72. https://doi.org/10.1007/s11920-015-0610-0.
3. Yao YW, Wang LJ, Yip SW, Chen PR, Li S, Xu J, et al. Impaired decision-making under risk is associated with gaming-specific inhibition deficits among college students with Internet gaming disorder. Psychiatry Res. 2015;229(1):302–9. https://doi.org/10.1016/j.psychres.2015.07.004.
4. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®). American Psychiatric Pub; 2013 May 22.
5. Pontes HM, Griffiths MD. Internet addiction disorder and internet gaming disorder are not the same. J Addict Res Ther. 2014;5(4)
6. Winokur G, Coryell W, Akiskal HS, Maser JD. Alcoholism in manic-depressive (bipolar) illness: familial illness, course of illness, and the primary-secondary distinction. Am J Psychiatry. 1995;152(3):365–72.

7. Brown TA, Campbell LA, Lehman CL, Grisham JR, Mancill RB. Current and lifetime comorbidity of the DSM-IV anxiety and mood disorders in a large clinical sample. J Abnorm Psychol. 2001;110(4):585–99. https://doi.org/10.1037/0021-843X.110.4.585.
8. Widiger TA, Samuel DB. Diagnostic categories or dimensions? A question for the diagnostic and statistical manual of mental disorders–. J Abnorm Psychol 2005;114(4):494. doi:https://doi.org/10.1037/0021-843X.114.4.494, 504.
9. Petry NM, Rehbein F, Gentile DA, Lemmens JS, Rumpf HJ, Mößle T, et al. An international consensus for assessing internet gaming disorder using the new DSM-5 approach. Addiction. 2014;109(9):1399–406. https://doi.org/10.1111/add.12457.
10. Kardefelt-Winther D, Heeren A, Schimmenti A, Rooij A, Maurage P, Carras M, et al. How can we conceptualize behavioural addiction without pathologizing common behaviours? Addiction. 2017;112(10):1709–15. https://doi.org/10.1111/add.13763.
11. Billieux J, King DL, Higuchi S, Achab S, Bowden-Jones H, Hao W, et al. Functional impairment matters in the screening and diagnosis of gaming disorder: Commentary on: scholars' open debate paper on the World Health Organization ICD-11 Gaming Disorder proposal (Aarseth et al.). J Behav Addict. 2017;6(3):285–9. https://doi.org/10.1556/2006.6.2017.036.
12.•• Gentile DA, Choo H, Liau A, Sim T, Li D, Fung D, et al. Pathological video game use among youths: a two-year longitudinal study. Pediatrics. 2011;127(2):e319–29. **This paper is one of the most important longitudinal studies of IGD providing information on risk factors, how long pathological gaming lasts, the outcomes, and whether it is primary or comorbid.**
13. Brand M, Young KS, Laier C, Wölfling K, Potenza MN. Integrating psychological and neurobiological considerations regarding the development and maintenance of specific internet-use disorders: an Interaction of Person-Affect-Cognition-Execution (I-PACE) model. Neurosci Biobehav Rev. 2016;71:252–66. https://doi.org/10.1016/j.neubiorev.2016.08.033.
14. Przybylski AK, Weinstein N, Ryan RM, Rigby CS. Having to versus wanting to play: background and consequences of harmonious versus obsessive engagement in video games. Cyberpsychol Behav. 2009;12(5):485–92. https://doi.org/10.1089/cpb.2009.0083.
15.• Allen JJ, Anderson CA. Satisfaction and frustration of basic psychological needs in the real world and in video games predict internet gaming disorder scores and well-being. Comput Hum Behav. 2018;84:220–9. **This study found that people who are unable to meet their needs online or offline have higher IGD scores than those that can meet their needs in either place.** https://doi.org/10.1016/j.chb.2018.02.034.
16. Choo H, Sim T, Liau AK, Gentile DA, Khoo A. Parental influences on pathological symptoms of video-gaming among children and adolescents: a prospective study. J Child Fam Stud. 2015;24(5):1429–41. https://doi.org/10.1007/s10826-014-9949-9.
17. Wu A, Lei LL, Ku L. Psychological needs, purpose in life, and problem video game playing among Chinese young adults. Int J Psychol. 2013;48(4):583–90. https://doi.org/10.1080/00207594.2012.658057.
18. Hughes CM. Three measures of coping in video games (CIV-III): the development, construct validation, and profile analysis of the CIV-III. Richmond: Virginia Commonwealth University; 2018.
19. Gervasi AM, La Marca L, Costanzo A, Pace U, Guglielmucci F, Schimmenti A. Personality and Internet gaming disorder: a systematic review of recent literature. Curr Addict Reports. 2017;4(3):293–307. https://doi.org/10.1007/s40429-017-0159-6.
20. Kuss DJ, Griffiths MD. Internet gaming addiction: a systematic review of empirical research. Int J Ment Heal Addict. 2012;10(2):278–96. https://doi.org/10.1007/s11469-011-9318-5.
21. Kardefelt-Winther D. Conceptualizing Internet use disorders: addiction or coping process? Psychiatry Clin Neurosci. 2017;71(7):459–66. https://doi.org/10.1111/pcn.12413.
22. Hussain Z, Griffiths MD. Excessive use of massively multi-player online role-playing games: a pilot study. Int J Ment Heal Addict. 2009;7(4):563–71. https://doi.org/10.1007/s11469-009-9202-8.
23. Griffiths MD, Van Rooij AJ, Kardefelt-Winther D, Starcevic V, Király O, Pallesen S, et al. Working towards an international consensus on criteria for assessing internet gaming disorder: a critical commentary on Petry et al. (2014). Addiction. 2016;111(1):167. https://doi.org/10.1111/add.13057.
24. Bowditch L, Chapman J, Naweed A. Do coping strategies moderate the relationship between escapism and negative gaming outcomes in World of Warcraft (MMORPG) players? Comput Hum Behav. 2018;86:69–76. https://doi.org/10.1016/j.chb.2018.04.030.
25. Aboujaoude E, Koran LM, Gamel N, Large MD, Serpe RT. Potential markers for problematic internet use: a telephone survey of 2,513 adults. CNS Spectr. 2006;11(10):750–5. https://doi.org/10.1017/S1092852900014875.
26. Durkee T, Kaess M, Carli V, Parzer P, Wasserman C, Floderus B, et al. Prevalence of pathological internet use among adolescents in Europe: demographic and social factors. Addiction. 2012;107(12):2210–22. https://doi.org/10.1111/j.1360-0443.2012.03946.x.
27. Müller KW, Glaesmer H, Brähler E, Woelfling K, Beutel ME. Prevalence of internet addiction in the general population: results from a German population-based survey. Behav Inform Technol. 2014;33(7):757–66. https://doi.org/10.1080/0144929X.2013.810778.
28. Müller KW, Janikian M, Dreier M, Wölfling K, Beutel ME, Tzavara C, et al. Regular gaming behavior and internet gaming disorder in European adolescents: results from a cross-national representative survey of prevalence, predictors, and psychopathological correlates. Eur Child Adolesc Psychiatry. 2015;24(5):565–74. https://doi.org/10.1007/s00787-014-0611-2.
29. Rumpf HJ, Meyer C, Kreuzer A, John U. Prevalence of internet addictive behavior (PINTA). Final report for the German Federal Ministry of Health. Lübeck: University of Lübeck, Klinik für Psychiatrie und Psychotherapie; 2011.
30. Young KS, Rogers RC. The relationship between depression and Internet addiction. Cyberpsychol Behav. 1998;1(1):25–8. https://doi.org/10.1089/cpb.1998.1.25.
31. Bahrainian SA, Alizadeh KH, Raeisoon MR, Gorji OH, Khazaee A. Relationship of internet addiction with self-esteem and depression in university students. J Prev Med Hyg. 2014;55(3):86–9.
32.• Dieris-Hirche J, Bottel L, Bielefeld M, Steinbüchel T, Kehyayan A, Dieris B, et al. Media use and Internet addiction in adult depression: a case-control study. Comput Hum Behav. 2017;68:96–103. **This paper indicates that the co-occurrence of depression and IGD is higher than in healthy patients and should be considered when conducting psychiatric treatment.** https://doi.org/10.1016/j.chb.2016.11.016.
33. Jang KS, Hwang SY, Choi JY. Internet addiction and psychiatric symptoms among Korean adolescents. J Sch Health. 2008;78(3):165–71. https://doi.org/10.1111/j.1746-1561.2007.00279.x.
34. Shapira NA, Goldsmith TD, Keck PE, Khosla UM, McElroy SL. Psychiatric features of individuals with problematic internet use. J Affect Disord. 2000;57(1):267–72. https://doi.org/10.1016/S0165-0327(99)00107-X.
35. Ha JH, Yoo HJ, Cho IH, Chin B, Shin D, Kim JH. Psychiatric comorbidity assessed in Korean children and adolescents who screen positive for Internet addiction. J Clin Psychiatry. 2006;67(5):821–6. https://doi.org/10.4088/JCP.v67n0517.
36. Ryan RM, Deci EL. Intrinsic and extrinsic motivations: classic definitions and new directions. Contemp Educ Psychol. 2000;25(1):54–67. https://doi.org/10.1006/ceps.1999.1020.

37.• Loton D, Borkoles E, Lubman D, Polman R. Video game addiction, engagement and symptoms of stress, depression and anxiety: the mediating role of coping. Int J Ment Heal Addict. 2016;14(4):565–78. **This paper is one of the first to examine the mediating variables between IGD and poor mental health.** https://doi.org/10.1007/s11469-015-9578-6.

38. Allison SE, von Wahlde L, Shockley T, Gabbard GO. The development of the self in the era of the internet and role-playing fantasy games. Am J Psychiatr. 2006;163(3):381–5. https://doi.org/10.1176/appi.ajp.163.3.381.

39. Beranuy M, Carbonell X, Griffiths MD. A qualitative analysis of online gaming addicts in treatment. Int J Ment Heal Addict. 2013;11(2):149–61. https://doi.org/10.1007/s11469-012-9405-2.

40. Wan CS, Chiou WB. Psychological motives and online games addiction: a test of flow theory and humanistic needs theory for Taiwanese adolescents. Cyberpsychol Behav. 2006;9(3):317–24. https://doi.org/10.1089/cpb.2006.9.317.

41. Wood RT, Griffiths MD, Parke A. Experiences of time loss among videogame players: an empirical study. Cyberpsychol Behav. 2007;10(1):38–44. https://doi.org/10.1089/cpb.2006.9994.

42. Li H, Wang J, Wang L. A survey on the generalized problematic Internet use in Chinese college students and its relations to stressful life events and coping style. Int J Ment Heal Addict. 2009;7(2):333–46. https://doi.org/10.1007/s11469-008-9162-4.

43. Hetzel-Riggin MD, Pritchard JR. Predicting problematic Internet use in men and women: the contributions of psychological distress, coping style, and body esteem. Cyberpsychol Behav Soc Netw. 2011;14(9):519–25. https://doi.org/10.1089/cyber.2010.0314.

44. Plante CN, Gentile DA, Groves CL, Modlin A, Blanco-Herrera J. Video games as coping mechanisms in the etiology of video game addiction. Psychology of Popular Media Culture. 2018; https://doi.org/10.1037/ppm0000186.

45. Gentile, D. A., Verheijen, G. P., Plante, C. N. (in preparation). Video games as coping mechanisms in the etiology of gaming disorder: a two-year longitudinal study.

46. Valderas JM, Starfield B, Sibbald B, Salisbury C, Roland M. Defining comorbidity: implications for understanding health and health services. Ann Fam Med. 2009;7(4):357–63. https://doi.org/10.1370/afm.983.

47. Van den Akker M, Buntinx F, Metsemakers JF, Roos S, Knottnerus JA. Multimorbidity in general practice: prevalence, incidence, and determinants of co-occurring chronic and recurrent diseases. J Clin Epidemiol. 1998;51(5):367–75. https://doi.org/10.1016/S0895-4356(97)00306-5.

48. Pearcy BT, McEvoy PM, Roberts LD. Internet gaming disorder explains unique variance in psychological distress and disability after controlling for comorbid depression, OCD, ADHD, and anxiety. Cyberpsychol Behav Soc Netw. 2017;20(2):126–32. https://doi.org/10.1089/cyber.2016.0304.

49. Bernardi S, Pallanti S. Internet addiction: a descriptive clinical study focusing on comorbidities and dissociative symptoms. Compr Psychiatry. 2009;50(6):510–6. https://doi.org/10.1016/j.comppsych.2008.11.011.

50. Yen JY, Ko CH, Yen CF, Chen SH, Chung WL, Chen CC. Psychiatric symptoms in adolescents with Internet addiction: comparison with substance use. Psychiatry Clin Neurosci. 2008;62(1):9–16. https://doi.org/10.1111/j.1440-1819.2007.01770.x.

51.• González-Bueso V, Santamaría JJ, Fernández D, Merino L, Montero E, Ribas J. Association between internet gaming disorder or pathological video-game use and comorbid psychopathology: a comprehensive review. Int J Environ Res Public Health. 2018;15(4):668. **This paper is the most recent systematic review on IGD and its comorbid psychopathology.** https://doi.org/10.3390/ijerph15040668.

52. Ryu H, Lee JY, Choi A, Park S, Kim DJ, Choi JS. The relationship between impulsivity and internet gaming disorder in young adults: mediating effects of interpersonal relationships and depression. Int J Environ Res Public Health. 2018;15(3):458. https://doi.org/10.3390/ijerph15030458.

53. Schiebener J, Brand M. Decision-making and related processes in Internet gaming disorder and other types of Internet-use disorders. Curr Addict Rep. 2017;4(3):262–71. https://doi.org/10.1007/s40429-017-0156-9.

54. Marino C, Spada MM. Dysfunctional cognitions in online gaming and Internet gaming disorder: a narrative review and new classification. Curr Addict Rep. 2017;4(3):308–16. https://doi.org/10.1007/s40429-017-0160-0.

55. Kessler RC, Chiu WT, Demler O, Walters EE. Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. Arch Gen Psychiatry. 2005;62(6):617–27. https://doi.org/10.1001/archpsyc.62.6.617.

56. Hall W, Farrell M. Comorbidity of mental disorders with substance misuse. Br J Psychiatry. 1997;171(1):4–5. https://doi.org/10.1192/bjp.171.1.4.

57. Regier DA, Farmer ME, Rae DS, Locke BZ, Keith SJ, Judd LL, et al. Comorbidity of mental disorders with alcohol and other drug abuse. JAMA. 1990;264(19):2511–8. https://doi.org/10.1001/jama.1990.03450190043026.

58. Müller KW, Wölfling K. Both sides of the story: addiction is not a pastime activity. J Behav Addict. 2017;6(2):118–20. https://doi.org/10.1556/2006.6.2017.038.

59. World Health Organization. (2017, Jan 21 2018). 6C71 Gaming disorder. Retrieved from https://icd.who.int/dev11/l-m/en#/http%3a%2f%2fid.who.int%2ficd%2fentity%2f1448597234.