INTERNET ADDICTION DISORDER: CURRENT AND FUTURE PERSPECTIVES

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ABSTRACT

Internet Addictive Disorder (IAD) is the new psychiatric disorder, who keeps experts around the world arguing about its validity. Since it was first proposed as a psychiatric disorder in 1999 until present days, a numerous body of research and various scientific approaches (psychological, psychiatric and neuroscientific) have bee made regarding IAD, in the attempt to legitimize this concept. Once with the new DSM V nominalization of "Internet Gaming Disorder - IGD" as a condition that requires further empirical and clinical research, before being considered as a formal disorder, the research community draws attention to the absence of an all-encompassing and widely accepted definition and lack of a gold standard assessment tool which makes it difficult to endorse this affection. Research has been focusing on the negative impact and the potential harm of internet use, but also on the benefits of gaming, thus increasing interest in the medical community for alternative forms of therapeutic interventions for psychiatric disorder (e.g. depression) based on internet/gaming appeal and benefits. The aim of this review is to provide an insight into current perspectives on Internet Addiction Disorder using a holistic approach and a more balanced perspective, taking into consideration the mass appeal of online life, the context of Internet gaming addiction and the consequences and benefits of playing video games, but also considering neuroimaging findings, as well as the current diagnostic framework proposed by the American Psychiatric Association. The future perspectives are based on the accessibility of internet and the potential of using video games in the field of treatment mental health disorders such as depression in teens.

Keywords: Internet Addictive Disorder, Internet Gaming Disorder, neuropsychological model, adolescents development, depression.

The status quo of our contemporary society seems to be the use of internet with more than 40 % of the world population being online as the latest International Telecommunication Union report shows [1]. From this point of view, the growing number of research and the interest of different sciences (psychology, psychiatry and neuroscience) in the effect of “online life” are well intended and helpful in understanding our behaviours.

The increasing popularity and frequency of Internet use among children and young adults was outlined in a 2012 study, where young adults were identified as the most active

Internet users spending approximately three hours online per day (watching TV and/or playing on the Internet and playing video games) [2; 3].

Internet Addiction Disorder (IAD) is a concept first used in 1996 by Goldberg [4] as an analogy to substance dependence, but Young and Griffiths were the ones who reinforced and defined this condition as an impulse-control disorder not involving an intoxicant.

Since then various names have been used for this condition that varies from Compulsive Internet Use, Internet Dependency, Problematic Internet Use, Virtual Addiction, to Internet Addiction Disorder (IAD) [5; 3]. The assessment of potential Internet addiction in the last decade has grown exponentially, but has had its share of critique due to the absence of an all-encompassing and widely accepted
definition, poor standardized studies and lack of a gold standard assessment tool which makes it difficult to compare one study to another. However, as the authors of a 2015 review on the psychology of Internet addiction point out “the most recent empirical evidence shows that IAD can be a serious disorder which can be understood from a behavioural addiction framework despite the methodological and conceptual limitations usually associated with the phenomenon” [5].

Young, in her 1999 article, states that Internet addiction is an umbrella term for a wide variety of behaviours and impulse control problems that include these five specific subtypes:

Cyber sexual addiction: compulsive use of adult websites for cybersex and cyberporn;
Cyber-relationship addiction: Over-involvement in online relationships;
Net compulsions: Obsessive online gambling, shopping or day-trading;
Information overload: Compulsive web surfing or database searches;
Computer addiction: Obsessive computer game playing. However, Griffiths (2000) has argued that many of these excessive behaviours are not Internet addiction, but just excessive Internet use as a medium to fuel other addictions [6].

Recently, the American Psychiatric Association has evaluated and decided to include “Internet Gaming Disorder - IGD” in the appendix of the new DSM-5 as a condition that requires further empirical and clinical research, before it might be considered for inclusion as a formal disorder. Focusing on only a particular online behaviour has been supported by the larger data research for online gaming in particular [7, 8], but as Kuss and Griffith argue “the conflation of Internet use and online gaming in the same diagnostic category creates further diagnostic imprecision as seven out of the nine criteria used to define IAD relate specifically to gaming and so the new research diagnosis appears somewhat vague, further complicating a clinical evaluation” [3].

The criteria for DSM-5 Internet Gaming Disorder includes: (A) preoccupation with Internet games; (B) withdrawal symptoms when Internet gaming is taken away; (C) tolerance, the need to spend increasing amounts of time engaged in Internet gaming; (D) unsuccessful attempts to control participation in Internet gaming; (E) loss of interest in hobbies and entertainment as a result of, and with the exception of, Internet gaming; (F) continued excessive use of Internet games despite knowledge of psychosocial problems; (G) deception of family members, therapists, or others regarding the amount of Internet gaming; (H) use of Internet gaming to escape or relieve a negative mood; and (I) loss of a significant relationship, job, or educational or career opportunity because of participation in Internet games [9]. Five or more symptoms need to be met over a 12-month period for diagnosis, which must cause the individual clinically significant impairment or distress [7, 3].

Assessment Tools for Internet Addiction Disorder and Prevalence

The most frequently used tools for IAD are the self-assessment scale tools developed by Young and called The Internet Addiction Test (IAT) and The Internet Addiction Diagnostic Questionnaire (IADQ). Both of them draw their own critique, but what is frequently found flawed in these tools is precisely their form of administration, based exclusively on self – report, which leaves no room for an objective perspective or a specialized opinion on the behaviour which they assess. While the Internet Addiction Test (IAT) is a 20-item self-report scale that assesses Internet addiction based on criteria for substance dependence and pathological gambling and uses a Likert scale ranging from 1 (“not at all”) to 5 (“always”) for identifying different behaviours analogue to substance dependence, the Internet Addiction Diagnostic Questionnaire (IADQ) is a parsimonious 8-item self-report measure based on the diagnostic symptoms of pathological gambling and uses a binary form of response which is very restrictive in properly evaluating the symptoms related to pathological gambling, from a wider and more thorough perspective. In addition to these issues, both of them lack a temporal dimension of the symptoms evaluated, as Kuss and Griffith notice in their 2014 study “if these disorders were to be treated as a behavioural analogue to substance dependence, a minimum of symptoms need to be present simultaneously over the same 12 month period” [3].
In a 2014 exhaustive review of existing Internet addiction scales, the authors identified more than 45 tools for assessing Internet addiction, most of which required further validation work. The study emphasises on the importance of promoting the use of validated and well-established measures as basis for an accurate evaluation of IAD [10]. From this point of view, the lack of a golden standard assessment tool is also the cause of different prevalence rates from specialised literature [3].

The prevalence rates for adolescents seem to be lower in Europe (0.8% in Italy [11]; 1.4% in Finnish girls [12]) and higher in Asia with numbers ranging between 13.8% in South Korea [13] and 26.7% of adolescents in Hong Kong [14]. As a review of epidemiological research on Internet Addiction from the last decade, the use of different assessment tools and cut-offs of these tools influences the prevalence rates, but also other factors such as socio-demographic factors, comorbid symptoms and disorders, may be the cause of these differences in data [3].

Etiology development models of Internet Addiction Disorder

Different approaches regarding the etiology models of IAD have been proposed, from a cognitive - behavioural approach model of problematic Internet use proposed by Davis (2001) and Caplan (2002) [15; 16] to the ACE (anonymity, convenience; escape) model of Young [17] towards a comprehensive model of the development and maintenance of Internet addiction by Winkler and Dörsing [18], which takes into account socio-cultural factors (i.e. male gender; internet access), biological vulnerabilities (the neuropsychological model of reward circuit proposed by Young [19]; genetic predisposition to addictive behaviours[20]), psychological predispositions (the compensatory model of Tao, in which the excessive use of internet is explained as a means to compensate for or cope with deficits in self-esteem, identity, and relationships [19]) and specific attributes of the Internet (some online behaviours seem to be more problematic then others [21;22]) [19; 20].

Socio-demographic factors.

In adolescents the most common socio-demographic variable associated with Internet addiction is male gender [3], which seem to be intermediated by other variables, such as the male preference to more addictive online behaviours (online gaming; online sex), personality traits such as low self-control, impulsivity and sensation seeking [3], but also the male adolescents' higher risk for developing substance-related disorders compared to adolescent girls [23], which may lead to a vulnerability in addiction in general [3]. Other socio-demographic variables associated with adolescent Internet addiction, which were identified in an epidemiological review of scientific data from 2014, includes higher family income levels, being left behind (abandoned), migrant status and living in rural areas, being in senior high school, social adaptation, stress, low academic achievement, but also siblings who drink alcohol. Furthermore, a variety of family variables were found associated with Internet addiction: family conflict and parental monitoring (little parental communication about Internet use; lack of rules regarding Internet use) and perceived positive attitude to adolescent substance use by parents. The authors draw attention on the discrepancy between these findings that can possibly be explained by different measurements tools, and also, cultural differences which have not been looked into, but also the fact that “associated” does not imply a causal relationship [3].

Psychosocial factors associated with IAD in adolescents tend to consolidate the Compensatory model approach of Internet addiction [19], in which excessive use of internet is explained as a means to compensate for or cope with deficits in self-esteem (e.g. low life satisfaction and well-being, low self-esteem and emotional stability), identity (e.g. introversion, novelty seeking, harm avoidance, frustration, intolerance) and relationships (e.g. loneliness; lack of confidants; preference for online social interaction), but also by the use of Internet as a mood regulation method [3].

The neuropsychological model of addictive internet: neurobiology and neuroimaging of IAD

Regarding the construct of Internet addiction from a less theoretical perspective, the next step in explaining and investigating IAD as a more concrete disorder was a logical neuropsychological approach.
Neurobiology in Internet Addictive Disorder

The neurobiology of IAD involves the brain reward circuit [3], which implies an increase in dopamine level in certain brain areas, specialized in reward and motivation, such as the nucleus accumbens, which is also involved in other addictions [20]. Video gaming has been shown to increase striatal dopamine release, activating this reward pathway [24; 25; 26]. Other mechanisms of increased Internet addiction in youth imply higher reward dependency rates based on increased prevalence of specific polymorphisms of the dopamine receptor gene involved in alcoholism and pathologic gambling, when compared to normal controls [27]. There also appears to be a genetic predisposition to addictive behaviour [28], which translates in these individuals as an inadequate number of dopamine receptors and transporters [29; 30] or an insufficient amount of serotonin/dopamine [31], meaning that they can hardly experience normal levels of pleasure in activities which most people would find rewarding [20]. The reward experience seem to be intensified when combined with mood enhancing/stimulating content such as sexual stimulation - in pornography, various social rewards, identification with a hero, immersive graphics – in video gaming, romantic fantasy - in dating sites, financial reward - in online poker [19; 20]. Besides dopamine being released during gaming, studies show that craving / urges for gaming produces brain changes that are similar to drug cravings [32; 27].

Neuroimaging in Internet addiction Disorder

In the recent years, research in IAD has followed the path towards discerning similarities in brain activity and structural abnormalities involved in Internet addiction in the hope of having a better and a global understanding of the mechanisms involved in IAD addiction [33; 3]. These studies provide compelling evidence for the similarities between different types of addictions, especially substance-related addictions and Internet and gaming addiction, on a variety of levels [33; 34], but as Van Rooij et al. states: “differences in the activity of brain areas are not direct evidence of any pathology, but neuroimaging might be used to model relationships between Internet use and brain function” [8]. In a nutshell, the main changes in brain activity and structures associated with IAD are gray matter atrophy, reduced functional connectivity due to loss of white matter integrity, reduced cortical thickness and impaired cognitive functioning.

Gray matter atrophy: Multiple studies have found gray matter atrophy regions linked to Internet/Gaming addiction [35; 36; 37; 38]. Zhou et al. report, in their 2011 voxel-based morphometry (VBM) study, on adolescents with IAD, that the areas affected by decreased gray matter density are: the left anterior cingulate cortex, posterior cingulate cortex, insula and lingual gyrus [35]. The areas affected are involved in executive functions, such as planning, prioritizing, organizing, and impulse control, or in our capacity to develop empathy and compassion for others, as insula region is. The striatum, which is involved in reward pathways and the suppression of socially unacceptable impulses, was another brain region identified with volume loss in IAD individuals [38]. In a 2015 study which compared brain connectivity of amateur vs. professionals AVG (action video games) players (through functional MRIs) , the authors found that professional gamers had enhanced functional connectivity and increased gray matter volume in the insula [39].

Reduced functional connectivity due to loss of white matter integrity

Neuroimaging research in IAD demonstrates loss of integrity of the brain white matter, which translates into loss of communication within the brain, including connections to and from various lobes of the same hemisphere, links between the right and left hemispheres, and paths between higher (cognitive) and lower (emotional and survival) brain centres. Hong et al. (2013) showed that adolescents diagnosed with IAD have reduced functional connectivity, which involved cortico-subcortical circuits (~24% with prefrontal and ~27% with parietal cortex). A subcortical brain region frequently involved in IAD altered connectivity is the putamen, which is known to modulate several neurotransmitters including dopamine [40]. This finding is consistent with recent evidence of striatal dopamine transporter and D2 receptor involvement in people with...
IAD, which may explain the disturbances observed in functional connectivity of the putamen [30; 29]. These brain regions are described as being involved in the current theoretical models of addiction disorders, incorporating not only substance addiction but also behavioural addiction (e.g., pathological gambling), which in turn highlights the pathology of fronto-striatal circuitry [41] in IAD [40].

**Modified cortical thickness and impaired cognitive functioning**

Hong (2013), Yuan (2011) reported that adolescents with IAD have reduced cortical thickness [36; 40] and in online gaming addicts (late adolescent males and females) this is correlated with impairment of a cognitive task [36]. Regardless of whether IAD is best conceptualized as a behavioural addiction or an impulse control disorder, IAD has also been speculated to be related to impaired inhibitory control [42], which means less efficient information processing and reduced impulse inhibition [42]. In their 2013 study, Dong et al., who examined the neural correlates of response inhibition in males with and without IAD using an event-related functional magnetic resonance imaging (fMRI) Stroop task, found that males with IAD have increased sensitivity to rewards and insensitivity to loss [42].

These findings “taken together show that Internet addiction disorder is associated with structural and functional changes in brain regions involving emotional processing, executive attention, decision making, and cognitive control” as Lin and Zhou summarize in their 2012 study [38].

Based on these findings, Tao and Ying (2007), propose a chain model to better explain the neuropsychology of Internet-addictive behaviour [43]. This includes what Young explains as “**Primitive drive** (The instinct of an individual to pursue pleasure and avoid pain; this includes various reasons and impulses to use the internet), **Euphoric experience** (Internet activities stimulate the central nervous system of the individuals, who will feel happy and satisfied, which will drive them to continuously use the Internet and extend euphoria. Once addiction is formed, the euphoric experience will soon be transformed into a habit and numbness state), **Tolerance** (Because of repeated use of the Internet, the sensory threshold of the individual increases; in order to achieve the same happy experience, the user must increase the amount of time and passion) **Abstinence reaction** (Physical and psychological syndromes happen once the individual stops using the Internet, or after decreased Internet use, mainly including dysphoria, insomnia, emotional instability, irritability, and so on), **Passive coping** (Passive behaviours influenced by the environment occur once the individual is confronted with frustration or receives outside harmful effects, which includes adverse event imputation, cognition falsification, and the formed suppression, escape, and aggression), **Avalanche effect** (The avalanche effect includes passive experience consisting of tolerance and abstinence reaction, and combined drive consisting of individual passive coping styles on the basis of the primitive drive of the individual)” [19].

**Symptoms of IAD**

Using Young’s IAT scale, based on her definition of Internet addiction as a failure of personal impulse control that does not involve external substances, the following set of criteria are used while assessing IAD: (a) a preoccupation with the Internet, (b) the need to use the Internet for increasing amounts of time, (c) unsuccessful efforts to stop using the Internet, (d) mood change when attempting to stop or cut down Internet usage, (e) staying online longer than intended, (f) jeopardizing significant relationships or opportunities due to excessive Internet usage, (g) lying about Internet use, (h) using the Internet as an escape from problems or seeking to relieve bad mood states [8]. Griffith and his “component model” for IAD states that: “all addictions consist of six distinct and common components (salience, mood modification, tolerance, withdrawal, conflict, and relapse)” [8]. Tao et al. (2010) [43] developed their diagnostic criteria for IAD, based on clinical characteristics of a large population considered at risk for IAD, from which they excluded patients with bipolar disorder and/or psychotic disorders. Using a clinical evolution of IAD they proposed the following set of criteria for IAD: (a) **symptom criteria** (both must be present): preoccupation and withdrawal symptoms; (b) **one or more of**
these criteria: (1) tolerance, (2) persistent desire and/or unsuccessful efforts to control use, (3) continued use despite problems, (4) loss of other interests, (5) use of the Internet to escape or relieve dysphoric mood; (c) clinically significant impairment criterion: functional impairments (reduced social, academic, working ability), including loss of a significant relationship, job, educational or career opportunities; (d) a course criterion: an excess use of three months, with at least six hours of Internet usage (non-business/non-academic) per day [8].

Comorbid Symptoms and Disorders associated with Internet Addiction Disorder

A series of studies have been done in an attempt to support the case for IAD, by demonstrating it co-occurs with other Axis-I psychopathology, but as Van Rooij points out in his 2014 critical review of Internet addiction “comorbidity alone with other psychopathology does not provide evidence of a unique and separate psychopathology” [8]. In their 2010 review of correlations between pathological internet use and comorbid psychopathology, Carli et al, found that the most common comorbid symptoms/disorders related to IAD are depression and ADHD symptoms, followed by anxiety, obsessive-compulsive symptoms and hostility/aggression [44]. In adolescent population, comorbid psychiatric symptoms includes: alcohol and substance use, susceptibility for problem behaviours, depression, suicidal ideation, ADHD, social phobia and phobic anxiety, obsessive-compulsive disorder and antisocial/aggressive behaviours [3]. Other psychosomatic symptoms were also linked to problematic Internet use, from poor health condition to excessive daytime sleepiness and physiological dysfunction [3]. In a prospective study on 2000 adolescents who were followed over a period of 2 years to determine whether the presence of psychiatric symptoms would predict later development of IAD, the study found that ADHD is the most significant predictor for IAD development, followed by hostility, who was a stronger predictor in boys as ADHD was in girls [25]. Researchers draw attention on the need for focusing on IAD role in problems with basic functions (e.g., learning) that might be more fruitful from a psychiatric point of view [8], but also on the biopsychosocial processes that contribute to the development of addictive behaviours on the Internet [3].

Adolescents, emotions and video games

The adolescent brain

Recent research in the field of neuroscience on the subject of adolescent brain development has outlined the fact that the adolescent brain is far from being fully completed and that many important stages of development occur during the second decade of life. The cortex goes through a major period of change and growth, to contribute to the transition into adulthood. The prefrontal cortex, for instance, is one of the last areas to mature. After the growth spurt specific to age 9 or 10, the prefrontal cortex goes through a process that continues into early adulthood, during which new experiences stimulate new brain connections and neural pathways. Another region of the brain that is influenced by experience and environment and develops during adolescence is the cerebellum, which, alongside coordinating movement and balance, acts as a support system for cognitive functions such as recognizing social cues. The growth of the neurological pathways in the cerebellum continues into the early twenties and it seems that this is the last area of the brain that matures. Other than this, it is important to keep in mind that, compared to adults, who usually use their frontal lobe to respond to different situations, teens tend to rely more on the amygdala. This means that they are more likely to respond emotionally to a new stress agent, quicker and without considering the consequences their actions might have. Adolescence can be viewed as a window of opportunity for developing a more efficient, faster brain, with advanced skills. Brain connections that are stimulated and used repeatedly grow stronger, while unused connections wither away [45].

The abnormal development and loss of neurons in areas such as the hippocampus, the centre for both memory and mood, have been linked to disorders such as depression [46]. Recent meta-analyses of neuroimaging studies reported that smaller volumes of the thalamus, hippocampus and frontal lobe (including the orbitofrontal cortex and gyrus rectus), can be
observed in depressed patients, compared to control groups [47]. Similar relations have been observed between depression and an area of the anterior cingulate cortex involved in the modulation of emotional behaviour [48].

**Adolescents and depression**

Depression is the leading cause of nonfatal disability worldwide [49]. The onset of depression is common in adolescence and young adulthood [50], and thus, it coincides with a pivotal period of physical and psychological development and can lead to poorer psychosocial functioning, lower life and career satisfaction, difficulty in developing interpersonal relationships, greater need for social support and increased risk of suicide [51].

Since major depressive disorder (MDD) is one of the most prevalent psychiatric disorders among adolescents, with rates of approximately 5.9% among females and 4.6% among males, [52] it is important to investigate not only the efficiency of adolescent MDD treatments, but also the aspects of teenagers' lives that reduce the risk of developing this condition.

The development of depression in adolescence may be understood as a biopsychosocial, multifactorial process influenced by risk and protective factors including temperament, genetic heritability, parenting style, cognitive vulnerability, stressors (e.g. trauma exposure or poverty), and interpersonal relationships.

Recently, it has been implied that one of the factors that influence the progress of depression in adolescents' life might be the exposure to electronic media and video games.

Although certain media exposures have been linked to the presence of psychiatric conditions such as depression, it should also be noted that exposure to certain media content might reduce the likelihood of developing depression [53].

**The gaming world**

For decades, important research has been conducted to study the negative effects of gaming, including addiction and aggression, but, to understand the impact of video games on children's and adolescents' development, a more balanced perspective is needed. It is essential to specify that the most distinguished feature of video games is that they are interactive: “players cannot passively surrender to a game’s storyline; instead, video games are designed for players to actively engage with their systems and for these systems to, in turn, react to players’ behaviours” [54].

The benefits of playing video games specifically have not been thoroughly researched, but the functions and benefits of play in general have been studied for years. Evolutionary psychology has emphasized the adaptive functions of play [55], and in developmental psychology, the positive function of play has been a running theme for some of the most respected scholars in the field (Erikson, Piaget, Vygotsky). Erikson [56] proposed that play contexts allow children to experiment with social experiences and simulate alternative emotional consequences, which can then bring about feelings of resolution outside the play context. Similarly, Piaget [57] suggested that make-believe play provides the necessary opportunities for children to re-enact real-life conflicts, to work out the ideal resolutions for their own pleasure, and to ameliorate negative feelings. Both Piaget and Vygotsky [58] exposed strong theoretical links between play and different elements that foster the development of social cognition. Other than this, developmentalists have emphasized on the role of playing, as an emotionally significant context through which themes of power and dominance, aggression, nurture, anxiety, pain, loss, growth, and joy can be experienced and enacted productively [59].

In his qualitative research on children's conversations during their play, Gottman [59] showed how they use play for mastering real life emotions. While adults often use self-disclosure and direct discussion with their friends and acquaintances to resolve emotional issues, children use play to work them out through pretend-based narratives, which are enacted either alone or with others [54].

In a world where more and more adolescents are forced to face changes in their everyday lives, such as their parents’ divorce or moving into different cities, with a different school and different friends, their computers become their peace oases, places of stability to which they can always return, without the fear of being deserted; safe places that protect and isolate them from the rest of the world, from the
adults that disappointed them, from the colleagues at school that do not accept them. The feeling of belonging to a certain group is highly important during one’s adolescent years and the rejection some teenagers have to face in their real lives, from their peers, can have major consequences in their emotional development. When they find other people their age in the virtual world, who play the same video games and have the same preferences, it is easier to develop friendship relations, based on the exchange of gaming techniques and strategies. Behind these “technical” opinions teenagers express, lies a part of their true, intimate self, which they are afraid to expose in the real life. Thus, the game becomes more than just a common interest – it is a mediator that allows the teenager to be integrated within a group and express some of his personality traits, without the risk of revealing too much of one’s self and, in the end, discovering the true nature of self [60].

Another aspect that can affect the mood and emotional state of the teenagers is the level of encouragement and appreciation they receive from their parents or their educators. More often than not, adolescents are accused of being lazy, incapable of concentrating or not being interested in what they are taught in school and, at home, their parents are more critical than appreciative of their actions and behaviour. These teenagers find refuge and comfort in their video games, in which immediate rewards are granted for their efforts. They are focused on playing and being better at the game, in order to reach the next level, to get the next, bigger reward and the needed gratification for their strive. Moreover, in a video game, they do not perceive failure as brutal or capital. They perceive it as an opportunity to analyze the strategies they used and to imagine and develop new and better ones; so that they can avoid future failures and get the reward they need [60]. Coping with failure and disappointment is also easier in the gaming world when teenagers use avatars. An avatar is a virtual character chosen and designed by the player, to represent them in different actions performed inside the game. (the word “avatar” comes from the Sanskrit “avatara”, which was used to refer to the numerous earthly incarnations of the Vishnu God). This avatar is a handy device used to experience new situations, to try new strategies and ways of acting, without actually having to act in such ways and suffer the real consequences. In this way, in case of failure, the impact is only moderate, but, if the player’s actions are successful through the avatar, they can be learned and applied similarly in the real world [60]. It has further been suggested that some of the most intense positive emotional experiences are triggered in the context of playing video games [61]. For instance, fiero, the Italian word that describes intense pride after succeeding against great adversity, is a feeling which gamers often report seeking and experiencing [54].

In her broaden-and-build theory of positive emotions, Fredrickson’s [61] has described the importance of experiencing positive emotions on a daily basis. And although she does not refer specifically to game playing, she demonstrates that experiencing positive emotions may help broaden the number of behaviours perceived as both possible and motivating and may build social relationships that provide support for goal pursuit and coping with failure. Furthermore, Fredrickson and her collaborators argue that positive emotions help undo the detrimental and de-motivating results of negative emotions. Positive emotions are thus crucial not only as end states, but as sources of inspiration and connectivity. And, in the end, if playing video games simply makes people happier, this seems to be a fundamental emotional benefit to consider [54]. Although correlational studies suggest that individuals consciously turn to these games to regulate their emotions [63], it may simply be that positive moods and game playing co-occur, and players report retrospectively that experiencing positive emotions was a conscious motivation that preceded play [54].

Up to this point, a diverse set of potential benefits of gaming relevant to children’s cognitive, motivational, social, and emotional development was reviewed. The medical field has picked up on these positive effects and become increasingly interested in “gamifying” medical interventions [54; 64].

Video games can have a particularly large impact in the area of developmental psychopathology, where the typical cognitive-behavioural therapy (CBT) proved its effectiveness, but also demonstrated its
Engaging children and youth is one of the most challenging tasks faced by clinicians. Children and adolescents, especially those who do not recognize that they have a mental health problem or are not motivated to change, often find these CBT sessions boring. A video game that can impart this same knowledge but use elements of play and game mechanics that have proven immensely engaging may help to address this barrier.

This idea was put in practice through SPARX, a fantasy role-playing game, which is based on CBT for depression, was recently developed to explicitly increase engagement, and a randomized controlled trial showed it to be as effective in treating depression as a therapist-administered CBT program. SPARX (an acronym for Smart, Positive, Active, Realistic, X-factor thoughts) is a free role-playing game developed by researchers at the University of Auckland in New Zealand. It’s designed to treat mild to moderate depression in young people. The game is a 3D role-playing romp set in a Maori-culture fantasy world. SPARX guides the player through a comprehensive CBT treatment. Players are initially asked questions that allow the computer to make an assessment of the player’s initial state, which is then used to decide an appropriate course of treatment. The game also walks the player through strategies for dealing with depression, anger and frustration, with the aim of building coping skills.

In the game, the players’ aim is to kill creatures that represent these kinds of negative thoughts. The players move through seven levels of a fantasy world, starting in the Cave Province, which teaches basic information about depression and offers hope for recovery. Next comes the Ice Province, which promotes activity and teaches relaxation techniques. The Volcano Province provides lessons on coping with intense emotions like anger, while the subsequent Mountain, Swamp and Bridgelan regions focus on addressing specific problems and recognizing and diffusing unhelpful thoughts.

The study included 168 teens who had sought help for depression from youth health clinics, school guidance counsellors or primary care doctors. Nearly two thirds were girls, reflecting the greater prevalence of the disorder in women. Their average age was about 15.

Half of the group was randomly assigned to play SPARX, while the others were assigned to receive “treatment as usual,” which typically consisted of one-on-one counselling over five sessions. About 44% of those who played SPARX recovered completely from depression, compared with 26% of those in regular treatment, a significant difference. About 66% in the gaming group showed at least a 30% reduction in symptoms, compared with 58% in usual treatment, but this difference did not reach statistical significance. Among those playing SPARX, 86% completed at least four of the “provinces” and 60% completed all seven. Interestingly, however, while 81% of the videogame players said they would recommend it to their friends, traditional therapy got a greater endorsement, with 96% recommending it to others. The study follows up two smaller trials of the game by the same group, which found that it was superior to placebo and to being on a waiting list for treatment.

The authors concluded that SPARX is a potential alternative to usual care for adolescents presenting with depressive symptoms in primary care settings and could be used to address some of the unmet demand for treatment.

All this considered, and added how enthralled most children and adolescents are with video games, it can be concluded that, when dealing with depression, a multidisciplinary classic team of psychiatrists and psychologists, could be upgraded with the participation of game designers. Thus, they can all work together to develop innovative approaches to the intervention for depression in children and adolescents.

The immense potential to teach new forms of thought and behaviour that video games have resides in the fact that these games can be found across almost all countries, in almost all households and there are few other forms of therapeutic interventions that have this high rate of accessibility. This is why, considering this learning potential as a starting point, using video games in the field of treatment of mental health disorders holds a great deal of promise for a radical new approach to intervention.
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