Revisiones

Psychological Treatments for Video Game Adicction in Adolescents and Young Adults: a Systematic Review

Tratamientos psicológicos para la adicción a videojuegos en adolescentes y adultos jóvenes: una revisión sistemática

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Abstract

Video game addiction is a relevant problem, as it is linked to numerous psychosocial disorders. The objective of this work was to know the psychological treatments for the aforementioned addiction and to determine their effectiveness. A bibliographic search was carried out in 7 databases. 2,355 articles were obtained, of which 21 met the inclusion criteria. Participant characteristics, study design, risk of bias and quality of studies, method of diagnosis, type of intervention, and effects of interventions were examined. Cognitive-Behavioral Therapy (CBT) has been widely studied, finding significant decreases in the variables contemplated (reduction of symptoms and/or playing time) in most of the studies analyzed. However, the lack of rigor in the designs used and the associated biases make it impossible to place it in the category of well-established treatments according to the APA standards. However, there is promising experimental evidence that these interventions can achieve the postulated levels of efficacy. The same is true for treatments listed as other treatment approaches, even though these are still in an experimental phase. For this reason, future research needs to overcome the methodological limitations of the studies carried out to date.

Keywords

Video game addiction; treatment; effectiveness; systematic review

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Resumen

La adicción a los videojuegos constituye un problema relevante, pues se encuentra vinculado a numerosas alteraciones psicosociales. El objetivo de este trabajo fue conocer los tratamientos psicológicos para la adicción mencionada y determinar su eficacia. Se realizó una búsqueda bibliográfica en 7 bases de datos. Se obtuvo 2.355 artículos, de los que 21 cumplieron los criterios de inclusión. Se examinaron las características de los participantes, el diseño de los estudios, el riesgo de sesgo y la calidad de los estudios, el método de diagnóstico, el tipo de intervención y los efectos de las intervenciones. La Terapia Cognitivo Conductual (TCC) ha sido ampliamente estudiada, encontrándose disminuciones significativas en las variables contempladas (reducción de la sintomatología y/o tiempo de juego) en la mayoría de los estudios analizados. Sin embargo, la falta de rigurosidad en los diseños empleados y los sesgos asociados, impide ubicarla en la categoría de tratamientos bien establecidos según las normas APA. No obstante, existen indicios experimentales prometedores de que estas intervenciones pueden alcanzar los niveles de eficacia postulados. Esto mismo ocurre con los tratamientos catalogados como otros enfoques de tratamiento, a pesar de que estos todavía se encuentran en una fase experimental. Por esta razón, es necesario que investigaciones futuras superen las limitaciones metodológicas propias de los estudios realizados hasta el momento.

Palabras clave

Adicción a los videojuegos; tratamiento; eficacia; revisión sistemática.

INTRODUCTION

In recent decades, video games have emerged as one of the most popular recreational activities among adolescents and young adults (André et al., 2020). Although their use can generate benefits at a cognitive, motivational, emotional, and social level (Granic et al., 2014), their excessive use can have serious consequences (Stockdale and Coyne, 2018). Therefore, the American Psychiatric Association (APA) included video game addiction (Internet Gaming Disorder, IGD) in Section III of the Diagnostic and Statistical Manual of Mental Disorders-5th edition (DSM-5) to consolidate the proposed criteria while promoting the study and formal research in the area. Years later, the World Health Organization (WHO) incorporated video gaming disorder (GD) into the International Classification of Diseases-11 (ICD-11). Although there are slight differences between the two definitions, both refer to a pattern of continuous and recurring gambling behavior mainly linked to two negative conditions: lack of control of gambling behavior and increased priority given to video games over other aspects of life events, causing clinically significant impairment (Bender et al., 2020). In addition, video game addiction has been associated with other psychosocial disorders, namely: anxiety, depression, social phobia, irritability, social, academic or professional difficulties, low self-esteem, loneliness, sleep disorders, and comorbidity with other behavioral addictions (Bargeron and Hormes, 2017; González-Bueso et al., 2018; Ko, 2014; Yen et al., 2017; Wei et al., 2012), becoming a highly prevalent problem, with estimates ranging between 0.26-38% in ado-

lescents and 0.21 – 55.77% in those over 18 years of age (Daversh et al., 2020).

Adolescence and early adulthood are considered critical periods in the development of IGD, with the highest rates of abuse and addiction to video games in the age range between 15 and 30 years (André et al., 2020). Possible causes include sensation-seeking and the need for immediate reward present in these stages. These aspects, added to the interactivity and diversity of options provided by video games, make them one of the most popular recreational activities (Echeburúa and de Corral, 2010). However, not all adolescents and young people who make use of video games end up developing an addiction, as some risk factors predispose to the development of this pathology: the male sex, attention problems, emotional dysregulation, and problematic family relationships, among others (Bender et al., 2020; Fumero et al., 2020).

However, it is possible to affirm that video game addiction constitutes a relevant problem, requiring its correct approach in clinical practice. Various approaches linked to pharmacology and psychology have been postulated for its treatment. Regarding the latter approach, Cognitive-Behavioral Therapy (CBT) has been widely studied in the treatment of video game addiction. In addition, new lines related to this type of therapy are emerging, including new components that can be very useful in overcoming the aforementioned addiction, such as Cognitive Therapy based on Mindfulness. Likewise, there are other approaches, other than pharmacology and CBT, that appear to be promising in the treatment of video game addiction, ranging from transcranial direct current stimulation (Lee et al., 2018) to brief voluntary abstinence (King et al., 2017).

Numerous investigations suggest that CBT may become established as a first-line treatment, as it appears to be consistent with explanatory models of video game addiction. In this regard, the I-PACE model (Brand et al., 2016) postulates that this addiction is maintained by the decrease in cognitive control, which affects players' needs and perceptions, resulting in maladaptive decision-making. In this sense, CBT can modify the maladaptive cognitions underlying the gambling behaviors that generate discomfort and/or distress. In addition, this addictive behavior is usually accompanied by other pathologies (anxiety, depression, etc.), and CBT has confirmed its efficacy and clinical utility in treating them. However, a recent meta-analysis (Stevens et al., 2019) found that this type of therapy was effective in reducing video game-associated symptoms and comorbid depressive and anxious symptoms, but not playing time. The rest of the intervention approaches have been investigated to a lesser extent, and are still in the experimental phase. However, some have already demonstrated their efficacy in substance addictions or pathological gambling, making it necessary to investigate their usefulness in the pathology at hand, as these addictions share many of the explanatory mechanisms and processes that underlie their onset.

However, despite the breadth of the proposed interventions, the latest systematic review of treatments for video game addiction (Zajac et al., 2019) could not assert the efficacy of any of the proposed approaches, given that the methodological limitations of the reviewed studies prevented reaching

certain conclusions. In this sense, neither CBT nor the studies classified as other treatment approaches could achieve the necessary conditions to be classified as well-established treatments according to the treatment evaluation criteria of the standards of the APA. However, the growing interest in the subject has led to an increase in publications related to treatment approaches for video game addiction, a fact that justifies the need to carry out a new review that summarizes the findings produced in recent years. In addition, this review, unlike the previous one (Zajac et al., 2019), seeks to capture the results from a global approach rather than purely descriptive results and focuses on exclusively psychological treatments.

Hence, this review pursues the objective of examining effective psychological treatments for video game addiction in adolescents and young adults, as they are populations at particular risk. In addition, the aim is to examine the sociodemographic characteristics of the participants, the designs used, the method of diagnosis, the biases (selection bias, performance bias, detection bias, attrition bias, and reporting bias), and the quality of the studies, the type of intervention, and the effects of the applied treatments.

METHOD

First, the scope and limits of the review were specified. The inclusion criteria were that the studies: 1) evaluated the efficacy of a psychological intervention for video game addiction; 2) they should use a randomized controlled trial, a non-randomized controlled trial, or a pretest-posttest study, without a control group; 3) they should incorporate participants between the ages of 12 and 30; 4) they should include at least 10 participants per group, in order to exclude very small pilot feasibility studies or single-case designs; and 5) they should present an outcome measure related to the symptoms of video game addiction or the duration of the game. Studies were excluded if: 1) they focused on prevention; 2) they were theoretical or review papers; or 3) were not available in English or Spanish.

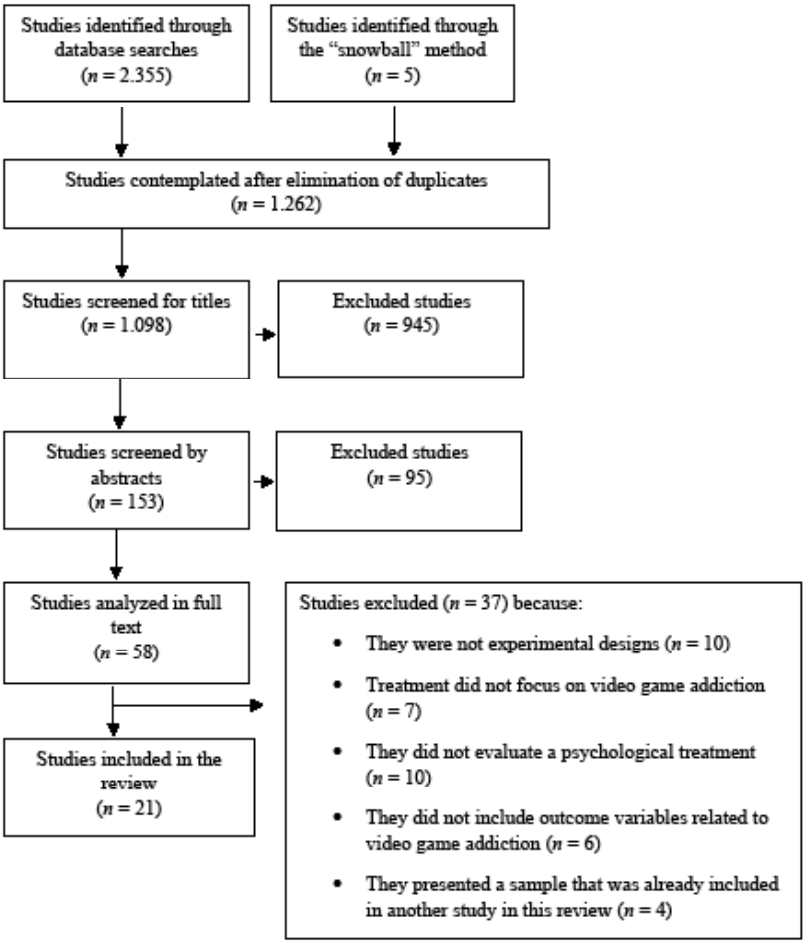
Seven databases were searched for articles published between January 2010 and October 2021, following the PICO strategy (Cochrane Controlled Register of Trials, Web of Science, Scopus, Proquest, PsycINFO, PubMed and Academic Search Complete) and using the following search equation: ("gaming disorder *" OR "internet gaming disorder *" OR "video game addiction *" OR "digital game addiction *" OR "compulsive digital gaming *") AND (therap * OR treatment * OR intervention * OR program *) AND (adolesc * OR teen * OR youth OR young *).

Titles, abstracts, citation information, and descriptive terms of citations were reviewed in a three-step process. First, an initial selection was made by title screening to eliminate irrelevant records. In doubtful cases, the record was kept until the next phase. Next, a screening by abstracts was performed to discard references that did not meet the established inclusion criteria. Finally, a comprehensive full-text screening of the articles was carried out. The entire process was carried out by two members of the research team, who independently examined the records, compared the results, and reached a consensus when discrepancies arose.

The initial search returned a total of 2,355 results. Likewise, 5 additional references were identified through the "snowball" method. After eliminating duplicates, 1,098 records were subjected to an initial evaluation. 153 articles were preserved, which were subjected to abstract screening. Of these, 58 were analyzed in full text. Finally, 21 studies were included in the review (Figure 1).

One trained coder extracted data from studies that met the inclusion criteria, and a second coder cross-checked them. The following data were collected from each study: type of treatment, sample size, mean sample age and standard deviation (or range when the mean was not available), study design, method of diagnosis of video game addiction. (specific measure and type of measure), primary outcome variables related to

Figure 1. Modified version of the PRISMA diagram with the studies included in the systematic review



video game addiction or gambling behavior (severity of symptoms and time spent gambling), study findings, and follow-up evaluations (when present). These were collected in Tables 1 and 2 included in Annex I.

RESULTS

Participant Characteristics

Twelve studies (57.14%) evaluated treatments with adolescents between 12 and 18 years old and 9 (42.86%) with young adults between 19 and 30 years old. These were predominantly male; more than half of the studies (52.38%) used an exclusively male sample. Most of the studies that included women in their samples did so unevenly, for example: the study by Han et al. (2012) had 20 men and 4 women. Only the studies by Lee et al. (2018) and Li and Wang (2013) included an equitable sample by gender. The sample size ranged from 10 to 101 participants. The studies were conducted in South Korea (33.33%), China (19.04%), Spain (9.52%), Germany (4.76%), Thailand (4.76%), Japan (4.76%), Norway (4.76%), United States (4.76%), Australia (4.76%), Switzerland (4.76%), and Finland (4.76%).

Study design

Twelve studies (57.14%) evaluated CBT-based therapies and 9 (42.86%) evaluated other treatment approaches. Five CBT studies (23.8%) (Han et al., 2020; Kim et al., 2012; Li et al., 2017; Li and Wang, 2013; Park et al., 2016) and 1 (4.76%) of other treatment approaches (Kim et al., 2013) used randomized controlled trials. The remaining studies were mostly non-randomized controlled trials and pretest-posttest studies without a control group. There was great variability in the types of control groups used in the different psychosocial treatments, ranging from no treatment to active treatments.

The number of sessions differed according to the study, covering a range of 4 to 22 sessions (M = 11; Mo = 6, 8). The average duration of the sessions was 98 minutes. Several treatments were carried out internally: the 7-day residential camp of Pornoppadol et al. (2018), the 9-day self-discovery camp by Sakuma et al. (2017), and the 84 hours of brief voluntary abstinence in the study by King et al. (2017). The study by Nielsen et al. (2021) did not specify the total sessions of the intervention.

9.52% of the studies provided short-term follow-up evaluations: 1 study at 28 days (King et al., 2017) and another at 4 weeks (Kim et al., 2012). Five studies (23.81%) carried out mid-term evaluations, specifically at 3 (Sakuma et al., 2017; Torres-Rodríguez et al., 2018) and at 6 months (Deng et al., 2017; Männikkö et al., 2021; Pornnoppadol et al., 2018). Two studies (9.52%) carried out long-term evaluations at 12 months (Nielsen et al., 2021; Szász-Janocha et al., 2020). The remaining 12 studies (57.14%) only included post-treatment evaluations.

Risk of Bias and Quality of the Studies

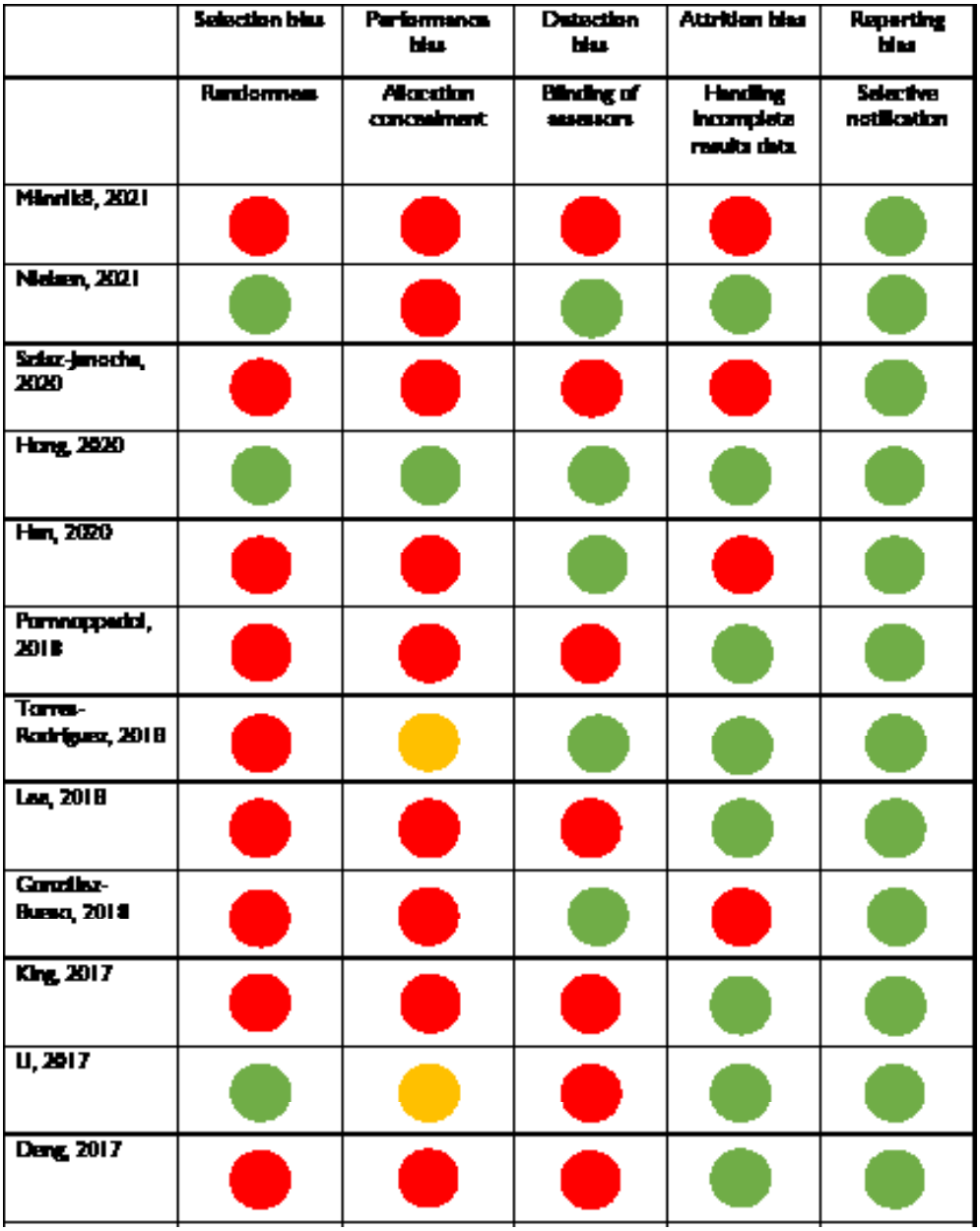
The risk of bias and the quality of the studies were assessed using the Cochrane Handbook of Systematic Reviews of Interventions (Higgins and Green, 2011). The biases are concentrated in the first four columns of Figure 2, concerning selection

bias, performance bias, detection bias, and attrition bias. The first of them is related to the lack of randomness in the allocation of participants, present in 14 (66.66%) of the studies. Performance bias refers to allocation concealment, being low when the double-blind method is applied. In this sense, only 2 studies (Hong et al., 2020; Li and Wang, 2013) included it. In some studies (Kim et al., 2012; Kim et al., 2013; Li et al., 2017; Park et al., 2016; Torres-Rodríguez et al., 2018), the participants and/or their families were unfamiliar with the group to which they had been assigned but it was not stated whether the evaluators knew this. The rest of the studies did not include this method; in fact, in some studies, it was the participants themselves who chose the group, as in the case of Pornnoppadol et al. (2018). On another hand, selection bias is present in all studies that used self-reports, parental reports, and/or playing time as a diagnostic method, without having a diagnostic interview or a diagnosis confirmed by a professional to endorse it. This was the case of 13 (61.90%) studies. Likewise, attrition bias was present in 5 studies (23.81%). The study by González-Bueso et al. (2021) reported a higher dropout in one of the groups, and the study by Han et al. (2020) suffered the loss of 99 (32.6%) participants during treatment. For the pretest-posttest studies without a control group, Item 9 of the Quality Scale was used to assess the threats of bias in the ET estimates (Botella-Ausina and Sánchez-Meca, 2015) related to mortality in the post-test, and was considered high if it was higher than 10%, as in the studies by Männikö, et al. (2021), Pallesen et al. (2015), and Szász-Janocha et al. (2020). Reporting bias was not present in any of the studies.

Diagnostic Method

Regarding the evaluation instruments, 8 (38.1%) of the 21 studies conducted a diagnostic interview to confirm participants' addiction to video games (González-Bueso et al., 2018; Han et al., 2020; Hong et al., 2020; Nielsen et al., 2021; Sakuma et al., 2017; Torres-Rodríguez et al., 2018; Yao et al., 2017), as well as other complementary measures. The remaining 13 studies (61.9%) used only self-reports, parental reports, playing time, distress, and/or maladaptive behavior to determine subject inclusion. Of these, 3 studies (Han et al., 2012; Kim et al., 2012; Park et al., 2016) used the *Young Internet Addiction Scale*, 2 studies (Deng et al., 2017; Zhang et al., 2016) used the *Chen Internet Addiction Scale* and 1 study (Li and Wang, 2013) used the *Online Game Cognitive Addiction Scale* and the *Internet Addiction Scale*. However, in this last study, a psychiatrist confirmed the participants' diagnosis. On another hand, 2 studies used a checklist as a self-reported measure, 1 of them based on the criteria postulated by the DSM-5 (Li et al., 2017), and the other based on the symptoms of video game addiction (King et al., 2017). Likewise, the study by Szász-Janocha et al. (2020) used two scales as self-reports, specifically the *Compulsive Internet Use Scale* and the self-reported adaptation of the *German Video Game Dependency Scale,* as well as the parental adaptation of the latter. The study by Pallesen et al. (2015) also included two self-reports: *The Game Addiction Scale for Adolescents* and *The Problem Video Game Playing Scale*, in addition to the version reported by the parents of the latter one. The study by Pornnoppadol et al. (2018) used exclusively the *Game Addiction Screening Test (GAST) -Parent version*. Männikkö et al. (2021) did not specify the self-report they used to determine the participants' diagno-

Figure 2. Risk of bias according to the authors' judgment on each study. Note. Green circle = low risk of bias; Yellow circle = unclear risk of bias; Red circle = high risk of bias



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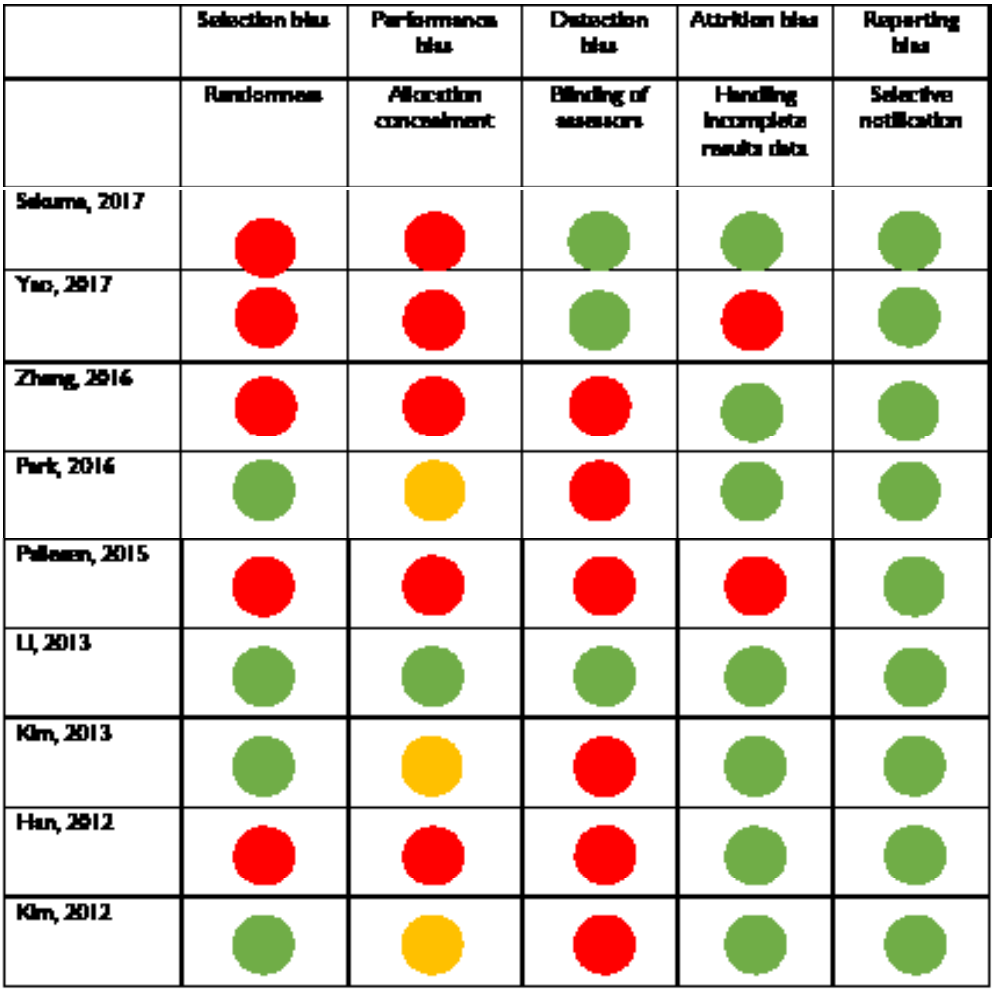

sis. Finally, most of the studies included playing time as a complementary measure, with the exception of the study by Kim et al. (2013), who used it as the only inclusion criterion, as well as the feeling of distress or maladaptive behavior (Deng et al., 2017; Han et al., 2012; Kim et al., 2012; Lee et al., 2018; Li and Wang, 2013; Park et al., 2016; Yao et al., 2017; Zhang et al., 2016).

Type of Intervention

Cognitive-Behavioral Therapy

Regarding interventions based on standard CBT (González-Bueso et al., 2018; Han et al., 2020; Hong et al., 2020; Kim et al., 2012; Li and Wang, 2013; Park et al., 2016; Szász-Janocha et al., 2020; Torres Rodríguez

et al., 2018), most included the following components: psychoeducation about the disorder —definition, course, phases, etc. (75%) — identification of the reasons for playing and the modification of dysfunctional and irrational beliefs associated with excessive use of video games through cognitive restructuring (87.5%), learning adaptive coping skills and problem-solving (100%), training in intrapersonal—identity, self-esteem, self-control, emotional intelligence, anxiety control, etc. (87.5%)— and interpersonal skills —adaptive communication skills, assertiveness, social skills, etc. (75%)—, improvement of the family relationship and cohesion (62.5%), planning for the future and prevention of relapses (75%). In addition, some studies had several active treatment groups. The studies with active treatment as a control group used physical exercise (Hong et al., 2020), parent training (González-Bueso et al., 2020), Virtual Reality (Park et al., 2016), and administration of drugs such as bupropion (Kim et al., 2012).

On another hand, interventions related to Cognitive Therapy based on Mindfulness (Li et al., 2017), Group Reality (Yao et al., 2017), or Craving Management (Deng et al., 2017; Zhang et al., 2016) shared many components, namely: increased awareness of craving (100%), recognition of negative affective states that it arouses and coping with them (100%), stress reduction through conscious relaxation and meditation (100%), and establishment of adaptive and positive plans for life (75%).

Other Treatment Approaches

The interventions listed as other treatment approaches are varied. This makes it impossible to extract common components, proceeding to define them briefly. Residential camps prevented participants from using electronic devices, encouraging outdoor activities and face-to-face communication, in addition to learning basic skills such as cooperation, problem-solving, and social skills (Pornnoppadol et al., 2018; Sakuma et al., 2017). The eclectic therapy of Pallesen et al. (2015) combined techniques of CBT, family therapy, solution-focused brief therapy, and motivational interviewing. The study by Kim et al. (2013) incorporated the writing and presentation of stories, the use of metacognition and feedback. Family therapy, present in the studies of Han et al. (2012) and Nielsen et al. (2021), pursued the objective of reducing problem behaviors and improving the cohesion of its members. Männikkö et al. (2021) carried out a brief intervention that covered the improvement of personal well-being and social skills, time management, and awareness of gambling behaviors, among others. Finally, the study by Lee et al. (2018) focused on transcranial direct current stimulation, and the study by King et al. (2017) on brief voluntary abstinence.

Effects of Interventions

Regarding the efficacy of the interventions, an in-depth study of outcome variables related to video game addiction and gambling behavior, specifically the severity of symptoms and time spent gambling, was present in 19 (90.48%) and 9 (42.86%) studies, respectively. In this sense, more than half of the studies (52.30%) reported significant decreases in both variables as the post-test and at the follow-up evaluations (when they were included), as well as greater reductions in the experimental group compared

to the control group. However, in the study of Kim et al. (2013), although there was a decrease in weekly playing time in both groups, no statistically significant differences were found between the experimental group (speaking and writing course) and the control group (general education). Furthermore, despite reporting decreases in the severity of symptoms, 2 studies (González-Bueso et al., 2018; Park, 2016) found no statistically significant differences between the two active groups studied. Likewise, some studies found significant differences in some of the variables, but not in others, for example: Sakuma et al. (2017) found reductions in daily and weekly game time, but not in the days per week. Another study (Pallesen et al., 2015) found decreases in the severity of symptoms reported by parents, but not in those reported by the participants themselves; and 4 studies (King et al., 2017; Männikkö et al., 2021; Nielsen et al., 2021; Szász-Janocha et al., 2020) did not show decreases in playing time, although they did so in the severity of the symptom. Finally, the study by Li and Wang (2013) was the only one that did not find statistically significant differences in the outcome variable studied: severity of symptoms.

47.62% of the studies reported information on the magnitude of the differences, with effect sizes between medium and large (González-Bueso et al., 2018; Kim et al., 2013; Li et al., 2017; Nielsen et al. ., 2021; Pallesen et al., 2015; Pornnoppadol et al., 2018; Sakuma et al., 2017; Szász-Janocha et al., 2020; Torres-Rodríguez et al., 2018; Zhang et al., 2016) . However, some research indicates that studies that do not include a control group present effect sizes that are higher than those that do, this being the case of most of the studies analyzed that provide this data.

DISCUSSION

The objective of this systematic review was to know the efficacy of psychological treatments for video game addiction in adolescents and young adults, as well as to offer an updated synthesis of the scientific literature in this area of knowledge. However, if we consider the treatment evaluation criteria according to the APA standards, we cannot affirm the efficacy of any of the approaches studied, as they do not meet the necessary conditions to be classified in the higher categories.

In this sense, we note that CBT has been widely studied, covering 57.14% of the studies reviewed herein. Most of the studies related to this type of therapy have reported significant decreases in the variables contemplated (symptoms and playing time), both in the adolescent population and in young adults. These changes have also been observed in studies of Cognitive Therapy based on Mindfulness and Craving Management, although these lines have only been studied in young adults. However, the lack of rigor in the designs used (e.g., absence of a control group, lack of randomization of participants to the different conditions, etc.), with the biases that this entails, makes it impossible to place it in the well-established treatment categories or in probably effective treatments, coinciding with the findings of previous reviews (Zajac et al., 2017; Zajac et al., 2019). This is because the lack of randomized controlled trials prevents us from demonstrating that CBT is superior to drug treatment, placebo, other

active treatments, or a waiting-list control group. However, there is promising experimental evidence that CBT can achieve the efficacy levels established by the APA.

The rest of the interventions, classified as other approaches: residential camp and/or parental management (Pornnoppadol et al., 2018), self-discovery camp (Sakuma et al., 2017), eclectic therapy (Pallesen et al., 2015), speech and writing course (Kim et al., 2013), family therapy (Han et al., 2012; Nielsen et al., 2021), brief therapy (Männikko et al., 2021), transcranial direct current stimulation (Lee et al., 2018), and brief voluntary abstinence (King et al., 2017), although they represent efforts to innovate in the treatment of this addiction, are still in an initial phase, making it necessary to invest efforts in further research in these lines, as pointed out in the review by Zajac et al. (2019).

Therefore, it is vitally important for future research to overcome the methodological limitations of the studies carried out so far, among which are: not using randomized controlled trials, as this design allows demonstrating the efficacy of a treatment, and studies using non-randomized controlled trials and pretest-posttest (without a control group) increase selection bias, which may compromise the results. Likewise, sample size should be increased and more women should participate, as most of the studies carried out have relatively small samples and exclusive collaboration of men. Likewise, it is necessary for future studies to include follow-up evaluations, as more than half of the studies included in this review only presented a pretest-posttest evaluation, without exploring mid- and long-term changes. For this purpose, we recommend that future studies: a) include a control group; b) randomly assign the participants to the different experimental conditions; c) use larger and more representative samples; and d) include follow-up evaluations that allow demonstrating the maintenance of the changes in the mid and long term, coinciding with the recommendations of Zajac et al. (2017).

In addition, another common problem in studies is the lack of consensus in the evaluation of video game addiction. Most of them did not include a diagnostic interview that confirmed the participants' addiction to video games, increasing the selection bias. In addition, the self-reports used were quite varied, and some instruments, such as the YIAS, were created to assess excessive use of the Internet in general and not addiction to video games in particular. It is therefore necessary for video game addiction to be included in diagnostic manuals, to specify the criteria that define it. Thus, specific assessment instruments can be developed, so that they can be used commonly in future studies. Likewise, more than half of the interventions were carried out in South Korea, limiting the generalizability of the results obtained. Therefore, it is necessary to develop studies in different countries to examine the efficacy of treatments in other populations, as well as to analyze intercultural differences.

Moreover, it is necessary to consider some limitations inherent to the review. First, the heterogeneity of the data and the indicators present in the different studies constitute a limitation. Furthermore, it should be mentioned that only published studies were included, without gray literature, which introduces the possibility of publication bias. Likewise, a postulated exclusion criterion was related to language, ruling out

all those studies that were not available in English or Spanish, some of which could be relevant in the review. Finally, the diversity of the studies classified as other treatment approaches has prevented the extraction of common components of the different interventions.

However, this review also has several strengths. This, unlike the previous one (Zajac et al., 2019), it was intended to offer a global approach to the studies, jointly analyzing the characteristics of the participants, the design of the studies, the diagnostic method, the type of interventions and their effects, rather than describing them individually. In addition, the risk of bias and the quality of the studies were explored to determine the limitations of the studies carried out so that future studies can overcome them.

In summary, it is evident that the treatments for video game addiction are still in an incipient phase. However, it is necessary for researchers and clinicians linked to behavioral addictions and impulse control to invest efforts in developing and testing treatments for this pathology, as it has been confirmed as a health problem of great magnitude that is expected to increase.

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ANNEX I

Table 1. Studies included in the review (adolescents)

First author, year	Country	Treatments	N	Treatment duration	Age *M* (*DT*) or range	Study design	Diagnostic method of IGD	Primary outcome variable (s)	Significant results (follow-up)
		CBT							
Szász-Janocha, 2020	Germany	CBT	54	4 sessions	13.48 ± 1.72	Pretest-post-test (without control group)	Psychological discomfort due to excessive use of video games or abusive use of the Internet; self-report or parental report	Symptom severity (CIUS, CSAS-SR, and CSAS-PR); weekly playing time	Decrease in severity of symptoms, but not in playing time (12 months post-treatment)
Hong, 2020	South Korea	CBT + PE CBT	25 25	8 (CBT) + 6 (PE) sessions 8 (CBT) + 6 (support) sessions	15.44 ± 2.92 15.96 ± 2.51	Randomized trial (no control group)	DSM-5 criteria (unspecified measure); diagnostic interview	Symptom severity (YIAS)	Greater reductions in the severity of symptoms in the CBT + PE group (post-treatment)
Torres-Rodríguez, 2018	Spain	Specialized CBT Standard TCC	17 17	22 sessions 22 sessions	15.1 ± 1.9 14.7 ± 1.6	Non-randomized controlled trial	5 or more criteria DSM-5 + IGD-20 >71; diagnostic interview and self-report	Symptom severity (IGD-20); weekly playing time (hours)	Greater reductions in symptom severity and playing time in the specialized CBT group (post-tr eatment). The differences were maintained, but no comparison between the groups was presented (3 months post-treatment)
González-Bueso, 2018	Spain	Individual CBT Individual CBT + Psychoeducation (parents)	14 14	12 sessions 12 sessions (CBT) + 6 (Psychoed)	15.5 ± 2.3 16.1 ± 2.2	Non-randomized controlled trial	DSM-5 criteria (measured according to SCID-I) and DQVMIA; diagnostic interview and self-report	Symptom severity (DQVMIA)	Decrease in the severity of symptoms in both groups. There were no significant differences between the two groups (post-treatment)
Li, 2013	China	CBT Basic advice	14 14	12 sessions 12 sessions	12-19 years	Randomized controlled trial	OGCAS >35 + IAS >3 + play >30 hours/week + distress or maladaptive behavior; self-report and diagnosis confirmed by a psychiatrist	Symptom severity (SAI)	Both interventions showed lower scores on the IAS scale, but the differences were not significant (post-treatment).
Kim, 2012	South Korea	CBT + bupropion Bupropion	32 32	8 sessions + 8 weeks 8 weeks	16.2 ± 1.4 15.9 ± 1.6	Randomized controlled trial	YIAS >50 + play >30 hours/week + distress or maladaptive behavior; self-report	Symptom severity (YIAS); weekly playing time (hours)	Greater reductions in symptom severity and playing time in the CBT + Bupropion group (post-treatment). The differences between groups were maintained at follow-up (4 weeks later)
		Other interventions							

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First author, year	Country	Treatments	N	Treatment duration	Age *M* (*DT*) or range	Study design	Diagnostic method of IGD	Primary outcome variable (s)	Significant results (follow-up)
Nielsen, 2021	Switzerland	Multidimensional family therapy Family therapy (usual)	12 30	2 sessions per week for 6 months (Does not specify the total number of sessions) 1 session per week for 6 months (Does not specify the total number of sessions)	14.9 ± 2.7 14.9 ± 1.8	Randomized uncontrolled trial	At least 5 criteria DSM-5 + Petry's DSM-5-based IGD scale; diagnostic interview and self-report	Symptom severity (Petry's IGD Scale); weekly playing time (hours and days)	Greater reductions in the severity of symptoms in the multidimensional family therapy group. The frequency of play did not decrease. The differences between groups were maintained at follow-up (12 months post-treatment)
Pornnoppadol, 2018	Thailand	Residential Camp (CR) Parent management (MP) CR + MP Psychoeducation	24 24 26 30	7 days 8 sessions 7 days + 8 sessions 1 session	14.6 ± 1.4 14.5 ± 1.1 14.0 ± 1.4 14.3 ± 1.2	Non-randomized controlled trial	Comply with the standards of the GAST-Parent version; parent report	Symptom severity (GAST-Parent version)	Greater reductions in the severity of symptoms in the active groups (post-treatment). The differences between groups were maintained at follow-up (6 months post-treatment)
Sakuma, 2017	Japan	Self-discovery camp	10	9 days	16.2 ± 2.2	Pretest-post-test (without control group)	Criteria DSM-5 + Griffith's 6 components of addiction; diagnostic interview	Daily playing time (hours) and weekly playing time (hours and days)	Decrease in daily (hours) and weekly (hours) playing time, but not in days per week (3 months post-treatment)
Pallesen, 2015	Norway	Eclectic therapy (CBT, family therapy, motivational interviewing, solution-focused therapy)	12	13 sessions	15.7 ± 1.3	Pretest-post-test (without control group)	GASA ≥3 in all items and/or a score of 4 or 5 in all PVP items; self-report (GASA AND PVP) and parental report (PVP)	Symptom severity (GASA and PVP self-report and PVP parent- report)	Decrease in the severity of symptoms reported by parents, but not in those reported by the participants themselves (post-treatment)
Kim, 2013	South Korea	MMORPG Speech and Writing Course General education	27 32	21 sessions 21 sessions	17.4 ± 0.6 17.5 ± 0.6	Randomized controlled trial	Play DF ≥4 hours/day	Average daily playing time in the last month (minutes)	Decrease in playing time in both groups. There were no significant group differences (post-treatment)
Han, 2012	South Korea	Family therapy	15	5 sessions	14.2 ± 1.5	Pretest-posttest (without control group)	YIAS >50 + play >4 hours/day and >30 hours/week + distress or maladaptive behavior; self-report	Symptom severity (YIAS); weekly playing time (hours)	Decrease in severity of symptoms and playing time (post-treatment)

Note. *CBT* = Cognitive-Behavioral Therapy; CIUS = Compulsive Internet Use Scale ; CSAS = German Video Game Dependency Scale ; DF = Dungeon & Fighter; DQVMIA = Diagnostic Questionnaire for Video Games, Mobile Phone or Internet Addiction; GASA = Gaming Addiction Scale for Adolescents; GAST = Gaming Addiction Screening Test; IAS = Internet Addiction Scale; MMORPG = Massively Multiplayer Online Role-Playing Video Game; OGCAS = Online Game Cognitive Addiction Scale; PVP = Problem Video Game Playing Scale; SCID-I = Structured Clinical Interview for DSM-IV; YIAS = Young Internet Addiction Scale.

Table 2. Studies included in the review (young people)

First author, year	Country	Treatments	N	Treatment duration	Age M (DT) or range	Study design	Diagnostic method of IGD	Primary outcome variable (s)	Significant results
		CBT							
Han, 2020	South Korea	CBT Support group	101 104	14 sessions 14 sessions	25.9 ± 5.1 26.5 ± 5.5	Non-randomized controlled trial	DSM-5 criteria (measured according to SCID-5); diagnostic interview	Symptom severity (YIAS)	Greater reductions in the severity of symptoms in the CBT group (post-treatment)
Li, 2017	USA	Mindfulness-based Cognitive Therapy Support group	15 15	8 sessions 8 sessions	22.2 ± 3.8 27.8 ± 5.5	Randomized controlled trial	≥3 DSM-5 symptoms (yes/no questions); self-report	Symptom severity (checklist based on DSM-5 criteria [yes/no questions])	Greater reductions in the severity of symptoms in the Mindfulness-based Cognitive Therapy group (3 months post-treatment)
Deng, 2017	China	Intervention group based on craving management, Group on waiting list	44 19	6 sessions	21.86 ± 1.9 22.05 ± 1.81	Non-randomized controlled trial	CIAS ≥67 + play >20 hours/week for ≥1 year + use of video games as main Internet-related activity; self-report	Symptom severity (POGUS)	Greater reductions in the severity of symptoms in the intervention group based on craving management (post-treatment). The group differences were maintained at follow-up (6 months post-treatment)
Yao, 2017	China	Group Reality and Cognitive Therapy based on Mindfulness	25	6 sessions	22.2 ± 1.6	Pretest-post-test (without control group)	At least 5 DSM-5 criteria + play ≥14 hours/week + use of video games as main Internet-related activity; diagnostic interview	Symptom severity (CIAS)	Decrease in severity of symptoms (post-treatment)
Zhang, 2016	China	Intervention group based on craving management Control group	23 17	6 sessions Not specified	21.9 ± 1.8 22.0 ± 1.9	Non-randomized controlled trial	CIAS ≥67 + play >14 hours/week for ≥1 year; plays 1 of the 4 most popular video games; self-report	Symptom severity (CIAS); weekly playing time (hours)	Greater reductions in the severity of symptoms in the intervention group based on craving management. Playing time only decreased significantly in the intervention group (post-treatment).
Park, 2016	South Korea	CBT Virtual reality	12 12	8 sessions 8 sessions	24.2 ± 3.2 23.6 ± 2.7	Randomized controlled trial	YIAS >50 + play >30 hours/week + life disturbance + distress or maladaptive behavior; self-report	Symptom severity (YIAS)	Decrease in the severity of symptoms in both groups. There were no significant group differences (post-treatment)
		Other interventions							
Männikkö, 2021	Finland	Brief intervention	37	10 sessions	23.8 ± 2.84	Pretest-post-test (without control group)	Excessive gaming; self-report (unspecified measure)	Symptom severity (POQG); playing time (min/day)	Decrease in the severity of symptoms. Playing time did not decrease significantly (6-month follow-up)

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First author, year	Country	Treatments	N	Treatment duration	Age M (DT) or range	Study design	Diagnostic method of IGD	Primary outcome variable (s)	Significant results
Lee, 2018	South Korea	Direct current transcranial stimulation	15	12 sessions	21.3 ± 1.4	Pretest-post-test (without control group)	2 or more DSM-5 criteria (specific measure not mentioned) or play >1 hour/day; self-report	Symptom severity (YIAS); weekly playing time (hours)	Decreased severity of symptoms and playing time (post-treatment)
King, 2017	Australia	Brief voluntary abstinence	24	84 hours	24.6 ± 5.1	Pretest-post-test (without control group)	Current MMO Player; only *n* = 9 met the DSM-5 criteria (measure based on the video game addiction checklist); self-report	Symptom severity (video game addiction checklist); weekly playing time (hours)	Decrease in the score on the video game addiction checklist between the baseline and the 28-day follow-up (the 9 participants who met the video game addiction criteria had greater decreases in symptoms). There was no decrease in playing time for the whole group (28-day follow-up), but meeting the criteria for video game addiction predicted greater decreases in playing time.

Note. CBT = Cognitive-behavioral therapy; CIAS = Chen Internet Addiction Scale; MMO = Massively Multiplayer Online Video Games; SCID-5 = Structured Clinical Interview for DSM-V; YIAS = Young Internet Addiction Scale.