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# Keep Playing or Restart? Questions about the Evaluation of Video Game Addiction from a Systematic Review in the Context of COVID-19

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**Abstract:** This is a systematic review of the impact of COVID-19 confinement on problematic video game use and addiction. The research questions were: (1) What instruments were used to measure problematic gaming and video game addiction in the context of COVID-19; (2) how many studies made comparisons with analogous samples measured at two timepoints (pre-confinement and confinement); and (3) what were the results of these studies in terms of a possible increase of problematic gaming and video game addiction during confinement. The review followed the PRISMA model and used Web of Science and Scopus. Following an initial identification of 99 articles, inclusion and exclusion criteria were applied leaving 31 articles in response to the first two research questions and 6 articles for the third. The results show that a wide variety of instruments were used, with IGDS9-SF and IGD-20 being the most common. A high number of non-validated ad hoc instruments were used. Only six (22.58%) of the 31 studies examined compared pre-confinement measures with measures during confinement. Those studies were inconclusive about the negative impact of confinement on the variables mentioned, with some studies noting an increase in problematic behaviors (n = 4) and others not confirming that (n = 2). The conclusion is a need for more scientific evidence based on validated instruments, consolidation of the concepts related to problematic gaming, and consideration of other theories such as the active user to produce more robust, transferrable findings.

**Keywords:** COVID-19; gaming disorder; internet gaming disorder; video games; confinement

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## 1. Introduction

In its International Classification of Diseases-11 (ICD-11), the WHO [1] recognizes Gaming Disorder (6C51) in two types, predominantly online and predominantly offline. It is referred to as behavior that includes a loss of control, progressive prioritization over other activities, and increasing time spent without considering the negative consequences. The American Psychiatric Association decided not to include video game addiction in the DSM-5 [2] owing to the lack of evidence over gaming and any kind of disorder. However, the DSM-5 does include "Internet Gaming Disorder" (IGD) in the section on continued research.

Despite this, the term video game addiction is widely used in the scientific literature due to increased use of video games and concern about problematic use and its consequences. Studies examining video games as a medium capable in itself of causing behavioral changes (active medium) [3] have documented various negative effects such as poorer academic performance [4,5], hyperactivity [6,7], deterioration of social behavior [8], and increased aggression [9].

The COVID-19 pandemic beginning in 2020 changed how we live and relate to each other during and after lockdown/confinement. That situation produced studies linked to questions such as a possible reduction in physical exercise [10], the psychological effects of confinement [11,12], changes in patterns of alcohol consumption [13], problematic internet use [12], and changes in the use of technological devices [14].

Some studies reported an increase in demand after the pandemic for professional services to deal with problems linked to video games [15]. Although some studies had examined video game use during the early stages of the pandemic [16], the impact on technology addictions comparing prior to and during confinement has been scarcely addressed. The prevalence of internet gaming disorder (IGD) before the pandemic was 3.05% [17], although Chia et al. [18] reported an increase from 5.4%, before the pandemic, to 15.4% after it. Ismail et al. [19] reported lower levels during the pandemic, around 2.5%, indicating that the use of different instruments and samples may have contributed to this variation.

Along these lines, Lemmens et al. [20] looked at the variety of instruments constructed explaining the traditional dependencies on the different versions of the APA DSM or the WHO ICD and noted that creating instruments based on those indicators did not mean that the instruments would be valid. How then should public policy be approached for prevention and clinical treatment of the issues related to problematic video game use?

The present study explores the research that has examined the impact of COVID-19 confinement on video game addiction and problematic gaming through a systematic review of the literature. The main objective was to determine whether problematic videogaming and video game addiction increased during confinement and whether the findings were consistent over the various studies that have addressed this issue. The research questions to be addressed were: (1) What instruments were used to measure problem gaming and video game addiction in the context of COVID-19; (2) how many studies compared analogous samples at two timepoints (before and during confinement); and (3) what results did these studies report about a possible increase in problematic gaming and video game addiction during confinement.

## 2. Materials and Methods

### *2.1. Search Strategy and Sources of Information*

The systematic review followed the directives from the PRISMA Declaration (Preferred Reporting Items for Reviews and Meta-Analyses) [21,22]. The systematic search strategy was applied between 27 January and 20 March 2022. Two researchers independently identified and selected the titles and abstracts obtained from the digital searches.

The databases used were the principal collection from Clarivate Analytics Web of Science (WoS) and Scopus. Although WoS is the most important scientific and academic search engine [23], some authors have questioned whether it should be used exclusively, and noted that other databases, such as Scopus, may be more inclusive as they have more sources. We chose to use these more general databases rather than more specialist databases such as PsycINFO and PubMed based on recommendations from authors such as García-Pérez [24], who emphasized their suitability due to providing references focused on the statistical dimension. In addition, the larger number of relevant sources [25,26] gives greater redundancy and increased capacity for inclusion compared to the smaller databases.

The search string and corresponding Boolean operators were the same in both cases, although due to the peculiarities of each system's syntax, in WoS we used the "TD" field (equivalent to title, abstract, and key words) and in Scopus, the equivalent "TITLE-ABS-KEY". The search focused on articles in English which included the terms videogame, videogames, video game and video games together with addiction or gaming disorder/s, all together with the term COVID. The string was:

("videogame*") OR ("video game*")) AND (addiction)) OR ("gaming disorder*")) AND (COVID) (Table 1).

**Table 1.** Classification of DeCS terms in the review articles.

| Descrip. | Op. | Descrip. | Op. | Descrip. |
|---|---|---|---|---|
| videogame* | AND | addiction | AND | COVID |
| videogame* | AND | gaming disorder* | AND | COVID |
| video game* | AND | addiction | AND | COVID |
| video game* | AND | gaming disorder* | AND | COVID |

### *2.2. Eligibility Criteria*

Once the search string was defined, the following inclusion criteria were applied: (a) scientific articles in peer-reviewed journals, (b) open access, (c) evaluating the impact of video game use in the context of COVID, (d) published in English, (e) that were quantitative. The filtering process continued, following a detailed reading of the articles, by excluding various studies for the following reasons: (a) case studies, (b) narrative study designs, (c) practical guides and reports with technical recommendations, (d) studies based on theoretical reflections or solely correlational studies based on variables other than the object of study, (e) studies focusing on particular groups, (f) incomplete texts, or (g) main contributions in languages other than English.

To respond to the last two research questions, one final inclusion criterion was applied, which was that they needed to be studies with measures taken on at least two specific timepoints (pre-confinement and confinement) with the same samples. A protocol based on PICO [27] was applied to the studies meeting this criterion to identify their main contributions.

### *2.3. Selection Process*

Three of the authors independently assessed the titles and abstracts to determine whether they met the inclusion criteria. Discrepancies were resolved through critical discussion with the other authors until full agreement was reached. Subsequently, each author individually evaluated the full text of each article. Studies which did not meet the inclusion criteria were excluded.

### *2.4. Data Extraction*

Three authors independently extracted the data from each study into individual tables including the following data: (a) authors and year; (b) sample used; (c) mean age of the sample; (d) study variables; (e) instruments used to evaluate study variables; (f) methodology; (g) evaluation timepoints; and (h) main results.

### *2.5. Evaluation of Methodological Quality*

The methodological quality of the selected articles was assessed using the Mixed Methods Appraisal Tool (MMAT) [28]. The MMAT is a critical evaluation tool designed for systematic reviews which has five items assessing the sampling strategy, the representativeness of the sample, suitability of measurements, the risk of non-response bias, and the suitability of the statistical analysis.

## 3. Results

### *Selection of Studies*

The process for study selection is outlined in Figure 1. The first step identified 99 articles between WoS (n = 54) and Scopus (n = 45). Applying the first two criteria—scientific articles from peer-reviewed, open-access journals—left 65 articles (WoS = 29; Scopus = 36), from which duplicates (n = 19) were removed. The remaining 46 articles were given a more thorough screening, using a detailed reading to apply the remaining exclusion criteria. This produced a final sample of 31 articles to answer the first research question.

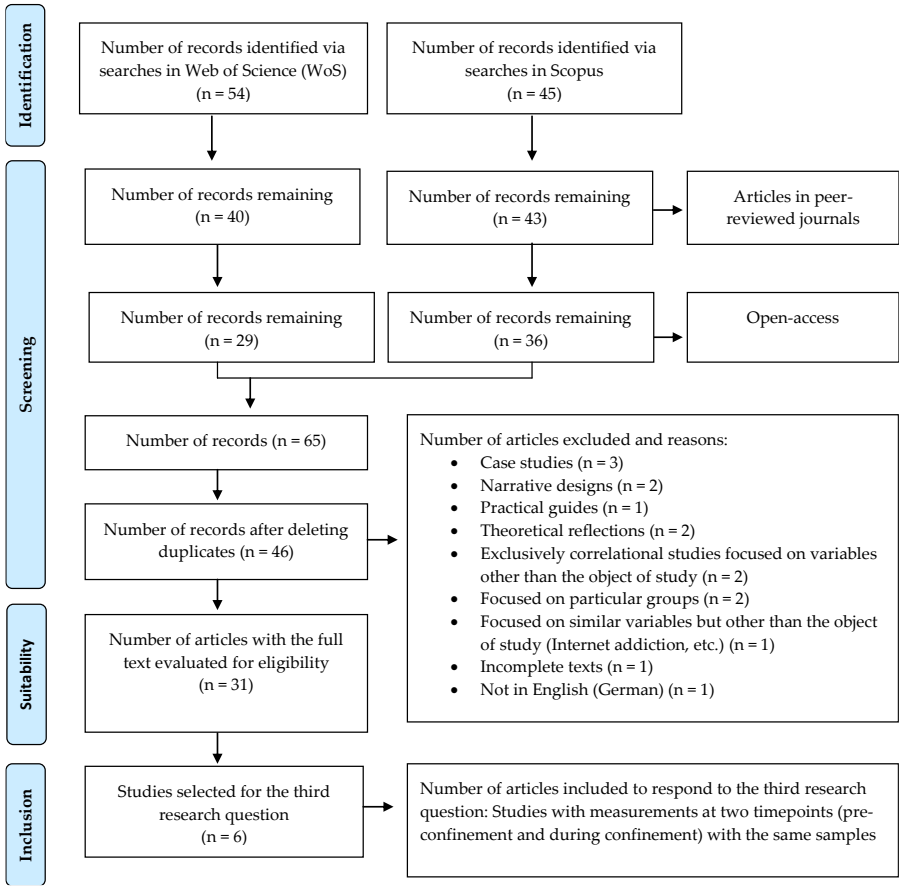


**Figure 1.** Diagram of the process followed based on the PRISMA model. Authors own work based on Moher et al. [21].

To answer the second research question, we identified the instrument used in each article (Table 2; Figure 2).

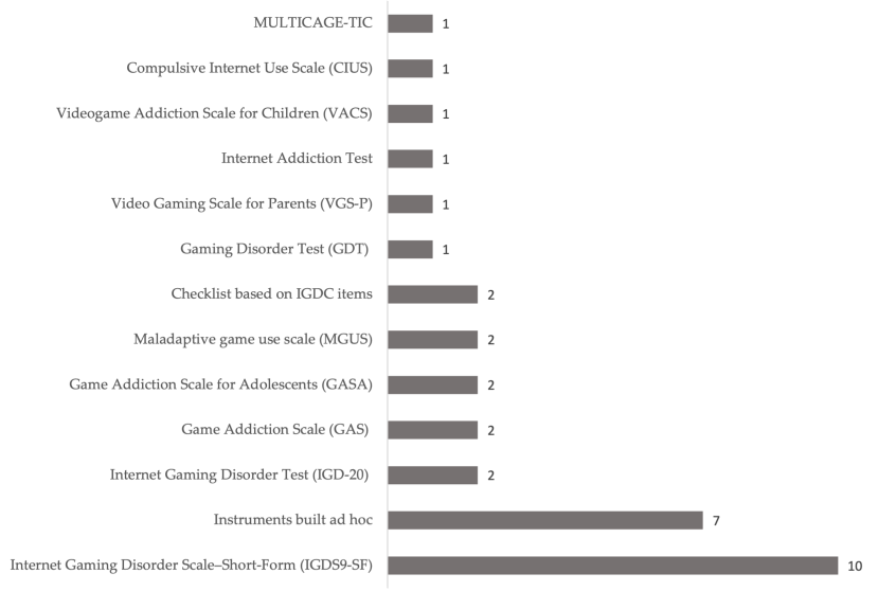


**Figure 2.** Instruments used in the studies examined.

**Table 2.** Characteristics of the instruments appearing in the studies.

| Instrument | Characteristics |
| --- | --- |
| Internet Gaming Disorder Scale—Short-Form (IGDS9-SF) (Pontes & Griffiths, 2015) [29] | Short nine-item instrument for measuring IGD in accordance with the nine APA criteria in the DSM-5. Many studies of validity and reliability. Translated and validated in various languages. |
| Internet Gaming Disorder Test (IGD-20) (Pontes et al., 2014) [30] | Long version of the above instrument, with a shared process of construction and many reviews of validity and reliability. |
| Gaming Disorder Test (GDT) (Pontes et al., 2021) [31] | An instrument with four items for measuring GD in accordance with WHO diagnostic criteria based on the beta-version of the 11th edition of the International Classification of Diseases (ICD-11). Many studies of validity and reliability. Translated and validated in various languages. |
| Game Addiction Scale (GAS) (Lemmens et al., 2009) [20] | Version for adults. Containing 21 items in the long version and 7 in the short version. Developed around the seven criteria of "pathological gambling" under the DSM-IV-TR. Use of various criteria to assess whether someone is an addict. Many studies of validity and reliability. Translated and validated in various languages. |
| Game Addiction Scale for Adolescents (GASA) (Lemmens et al., 2009) [20] | Version for adoldescents focusing questions on homework and relations with parents. Many studies of validity and reliability. Translated and validated in various languages. |
| Maladaptive game use scale (MGUS) (Korea Creative Content Agency, 2010) [32] | A seven-factor instrument based on Internet Gaming Disorder according to the DSM-V and Gaming Disorder in the ICD-11. Scores above nine points in three or four factors would indicate addiction. The scale has been validated in a study but not translated or used in other languages. |
| Video Gaming Scale for Parents (VGS-P) (Donati et al., 2021) [33] | A hetero-evaluation instrument to be completed by parents. Derived from the Video Gaming Scale for Adolescents (VGS-A) and the Video Gaming Scale for Children (VGS-C). Validated by the authors of the scale but not translated or used in other languages. |
| Internet Addiction Test (Young, 2016) [34] | A widely used test of internet addiction. Developed from the DSM-IV criteria for pathological gaming. Although designed as a unidimensional instrument, a different number of dimensions has been found although there is no consensus about it. It focuses on internet addiciton in a broad sense and not just gaming. Many studies of validity and reliability. Translated and validated in various languages. |
| Videogame Addiction Scale for Children (VASC) (Yılmaz et al., 2017) [35] | Specific to children. It has 21 items giving an overall score and sub-scores related to self-control, reinforcement, lifestyle, and problems of time management and involvement with the games. It was validated by the authors of the scale but has not been translated, adapted, or used in other languages. |
| Compulsive Internet Use Scale (CIUS) (Meerkerk et al., 2009) [36] | A 14-item questionnaire around criteria set according to the scientific literature in combination with indicators from the DSM-IV for dependency, pathological gaming, behavioral addiciton, and compulsive internet use. It focuses on compulsive internet use in a broad sense, not just the use of games. The scale was validated by its authors but has not been translated, adapted, or used in other languages. |
| MULTICAGE-TIC (Pedrero-Pérez et al., 2007) [37] | A questionnaire based on MULTICAGE-CAD-4 (general) for the detection of addictive bahaviors. It has 20 items in 5 scales: internet, mobile phones, video games (the relevant part for the present study), instant messaging, and social networks. Reliability and valididy have been tested in two studies in the Spanish context, but it has not been adapted or used in other languages. |

The most-used instrument was the Internet Gaming Disorder Scale—Short-Form (IGDS9-SF) (n = 10). It appears in Figure 2 next to two related instruments, the Internet Gaming Disorder Test (IGD-20) (n = 2), and the Gaming Disorder Test (GDT) (n = 1). Another instrument that was used on multiple occasions was the Game Addiction Scale (GAS) (n = 4) developed by Lemmens et al. [20].

Looking at 31 articles and finding 33 instruments is because two of the studies used two tests: Teng et al. (2021) [38] used the IGDS9-SF along with an ad hoc instrument and Çakıroğlu et al. (2021) [39] used the IGD-20 along with another ad hoc instrument.

The number of studies using tools constructed ad hoc (n = 7) is worth noting. Most of the time, these instruments were not validated and comprised items created specifically for each study.

The Maladaptive Game Use Scale (MGUS) (not validated) was used in two studies (n = 2), as were the (unvalidated) checklists created directly from the characteristics defining Internet Gaming Disorder according to the DSM (n = 2). Although these instruments could be included in the "ad hoc created instrument" category, we felt that this peculiarity merited them being considered as an entity on their own.

Other instruments used only in single studies were the Video Gaming Scale for Parents (VGS-P) (not validated), the Internet Addiction Test (including some questions about games), the Videogame Addiction Scale for Children (VAC), the Compulsive Internet Use Scale (CIUS) (again with questions related to games), and the MULTICAGE-TIC.

The objective of the second research question was to determine how many of those studies compared analogous samples with measurements at two timepoints (pre-confinement and during confinement). Figure 1 shows that only 6 of the 31 studies selected (22.58%) reported comparisons between those two timepoints.

To answer the third research question, we analyzed the results of those studies in terms of possible increases in video game addiction or problematic gaming during the COVID-19 confinement compared to pre-confinement. Six articles were examined. Figure 1 summarizes the procedure followed, and the inclusion and exclusion criteria used in each case. The quality of these six studies was assessed using the MMAT scale (Table 3). All of the studies met at least 60% of the criteria, with the mean percentage being 90%.

Table 4 summarizes the most important information for these six articles: their samples, the variables measured, and the instruments used, along with a summary of the results. Video game addiction and/or problematic gaming increased during confinement in four of the studies [38–41] and did not increase in the other two [42,43].

**Table 3.** Evaluation of methodological quality.

| Estudio | P1 | P2 | P3 | P4 | P5 | % Compliance |
|---|---|---|---|---|---|---|
| Kim and Lee (2021) [42] | Yes | Yes | Yes | Yes | Yes | 100% |
| Teng et al. (2021) [38] | Yes | Yes | Yes | Yes | Yes | 100% |
| Oka et al. (2021) [40] | Yes | Yes | Yes | Yes | Yes | 100% |
| Chen et al. (2021) [43] | Yes | Yes | Yes | Yes | Yes | 100% |
| Magaña et al. (2021) [41] | Yes | Yes | No | No | Yes | 60% |
| Çakıroğlu et al. (2021) [39] | Yes | Yes | No | Yes | Yes | 80% |

Note. P1: Is the sampling strategy relevant to the research question?; P2: Is the sample representative of the target population?; P3: Are the measurements appropriate? P4: Is the risk of non-response bias low?; P5: Is the statistical analysis suitable for answering the research question?

**Table 4.** Summary of the information from the studies which made comparisons between pre-confinement and confinement.

| Author and Year | Sample | Mean Age | Variables | Instruments | Methodology | Assessment Timepoints | Results |
|---|---|---|---|---|---|---|---|
| Kim and Lee (2021) [42] | (n = 2096) | Primary and middle school students in Korea (M = 13) | Addiction to viedogames via the internet | Maladaptive game use scale (MGUS) | Latent profile analysis (LPA) Y ANCOVA | Pre: 2018 Post: 2020 | Increased gaming addiction depended on the profile (gamers who already displayed problematic use). The time spent playing video games increased in those with the "addicted profile" on PCs but not on mobile phones. The difference between the 2018 and 2020 groups of between 1.2% and 4.9% suggests very small clinical significance and none of the profiles demonstrated valid statistical indications of increased addiction to games through the internet. |

**Table 4.** *Cont.*

| Author and Year | Sample | Mean Age | Variables | Instruments | Methodology | Assessment Timepoints | Results |
|---|---|---|---|---|---|---|---|
| Teng et al. (2021) [38] | (n = 1778) | Children and adolescents in schools in China. 875 children and 903 adolescents. Mean age not reported. | Level of video game use and severity of IGD | Authors' own instrument for the level of use, the IGDS9-SF for IGD. | *t*-test and structural equations | Pre: October to November 2019 Post: April to May 2020 | The use of video games increased during confinement [t (df) = −6.96 (1.522), $p < 0.001$] as did IGD [t (df) = −2.25 (1.777), $p = 0.025$]. Severity of IGD only increased in adolescents. Depressive symptoms and anxiety at the first timepoint were predictors of use and IGD, particularly for boys. |
| Oka et al. (2021) [40] | (n = 3938) | Adults (over 18 years old) in Japan | Prevalence of IGD and problematic internet use | Validated Japanese version of the Internet Gaming Disorder Scale (IGDS) with one item for each of the DSM-5 criteria. PIU for problematic internet use. | Comparison of descriptive analysis at two timepoints. Chi-squared test, Cramer's coefficient, and Bonferroni's correction for comparison fit. | Pre: December 2019 Post: July 2020 | Prevalence of IGD was 1.6 times higher and problematic internet use was 1.5 times higher (IGD: $\chi^2 = 619.9$, $p < 0.001$, PIU: $\chi^2 = 594.2$, $p < 0.001$). Particular impact on infected people (5.67 times more risk). All of the DSM-5 symptoms increased. Under-30s had 2.1 times the risk of those aged 40–49. Variables such as depression and levels of anxiety had no direct influence. Others, such as mobile phone use did not influence the increase but did influence the initial levels of both variables. |
| Chen et al. (2021) [43] | (n = 535) | Primary school students in mainland China (M = 10.42) | Levels of video game use and IGD | IGDS9-SF | *t*-test and structural equations | Pre: November 2019 Post: March 2020 | There was increased use of mobile phones (an increase of 1.02 h per day; $p < 0.001$) and social networks (an increase of 0.73 h per day; $p < 0.001$), but there was no significant increase in the use of games (increase of 0.14 h per day; $p < 0.001$). Time spent gaming was similar at pre (Mean = 0.60 h per day; SD = 1.23; $p = 0.07$) and post (Mean = 0.74 h per day; SD = 1.27; $p = 0.07$). Problematic gaming fell between pre (Mean = 1.42; SD = 0.55) and post (Mean = 1.41; SD = 0.62). |
| Magaña et al. (2021) [41] | (n = 147) | Student-teachers at the University of Málaga (M = 20.52) | Problematic use ICTS, level of video game use | MULTICAGE-TIC (based on MULTICAGE-CAD-4) | Leven and Kolmogorov–Smirnov tests. Cohen's D to measure effect size. | Pre: February 2020 Post: April 2020 | Pre-confinement: higher risk in all ICT dimensions except use of video games. During confinement there was the opposite picture except for the use of mobile phones. Problematic use of ICTS and video games increased in confinement. Pre (M = 0.46) and post: (M = 2.11). (F = 62.527, $p < 0.001$). |
| Çakıroğlu et al. (2021) [39] | (n = 424) | Children aged 10–18 in 5th to 12th grade in Istambul, Turkey. | Time spent gaming and IGD | IGD-20 and authors' own instrument to determine attitudes to gaming. | Comparative analysis of descriptive statistics and *t*-test | Pre: May 2018 Post: June 2020 | 54% of the participants played more. Although the difference in percentages of IGD was small between the two timepoints (41.72% vs. 43.99%), according to the authors it was significant both overall and in the different subdimensions. In some groups (those gaming for more than 8 h or those gaming for more than 40) the increase was more apparent. Boys had greater increases than girls in both time spent gaming and IGD ($p < 0.001$). |

## 4. Discussion

The main objective of this study was to determine whether problematic gaming and video game addiction increased during the COVID-19 confinement, and whether the findings were consistent across various studies addressing this question. The research questions were: (1) What instruments were used to measure problem gaming and video game addiction in the context of COVID-19; (2) how many studies compared analogous samples at two timepoints (before and during confinement); and (3) what results did these studies report about a possible increase in problematic gaming and video game addiction during confinement.

In answering the first question, the variety of instruments used was notable. Some were validated and used on multiple occasions, such as the IGDS9-SF [29], the IGD-20 [30], the GAS [20], and the GDT [31]. However, a third of the studies used instruments created ad hoc, non-validated instruments, or instruments produced from the diagnostic criteria of the DSM [2]. This raises questions about the findings they present, or the interpretations around possible video game addiction.

In this regard, a valuable meta-analysis by King et al. (2013) [44] explored the most common problems in instruments and studies aimed at measuring these variables. It indicated, among other issues, an inconsistent approach to the key indicators of addiction, biases in the treatment of data to produce diagnostic categories, problems related to the time variables, untested or inconsistent dimensionality, and inadequate data about predictive validity and inter-rater reliability. All of this indicates a need for a more unified approach to the pathological evaluation of video game use. In their systematic review of instruments measuring internet gaming disorder in young people and adolescents according to the DSM-5, Bernaldo-de-Quirós et al. (2020) [45] concluded that the IGDS9-SF was the most widely used and had the most validations, although they warned that it did not identify types of gamers and that there was a need to look more deeply at its psychometric qualities. In contrast, the IGD20 analyzes different gamer profiles, although it is rather long and there are few validations in other countries.

With regard to the second research question, only 6 of the 31 studies compared video game addiction or problematic video game use in analogous samples prior to the pandemic and during confinement. This, together with the fact that only four of those studies [38–40,43] used validated instruments, is a significant limitation when it comes to answering the third research question.

With regard to this third question, whether some studies with measures taken pre-pandemic and during confinement reported an increase in video game addiction, the results were not conclusive. Four of the six studies reviewed [38–41] reported increases in the rates of video game addiction during confinement. In contrast, two remaining studies [42,43] reported no increases in those rates. If we only look at the studies which used validated instruments, Oka et al. (2021) [40] and Çakiroğlu et al., (2021) [39]—using the IGD-20—and Teng et al. (2021) [38]—using the IGDS9-SF—reported increases, whereas the study by Chen et al. (2021) [43]—using the IGDS9-SF—indicated that rates of vide game addiction during confinement were similar to pre-pandemic levels. This lack of conclusive evidence cannot be explained by the use of samples with different age ranges. Three of the studies used samples of children and adolescents, two of those [42,43] found no increase in rates of video game addiction whereas one did [38]. The remaining study Oka et al. [40] looked at a sample of adults, and reported an increase.

### *4.1. Limitations of the Study*

As any piece of work, this revision has some limitations. Even though the selection of databases has been justified, future studies might consider including other sources such as PsycINFO and PubMed. Additionally, the small amount studies (6) found when answering the third research question, together with the fact that only four studies used valid instruments, could be considered a limitation. However, more than a drawback, we consider this a consequence of the rigorous approach used and an evidence of the lack

of solid research in this area. Future research should analyze to what extent return to "normality" after lock downs has affected levels of gaming and problematic uses. Although COVID-19 has generated an enormous amount of research, it would be important to keep observing the evolution of players and the role of video games once the pandemic is over. While this follow up is being done, for instance, within the game market [46] there is still a lack of studies focusing on the problematic use of video games after COVID-19.

In the same line, it would be interesting to analyze the extent to which publication bias can affect the study of video game use and its consequences. During the COVID-19 pandemic period, there may have been a tendency to publish works with little scientific rigor, but whose results may have generated a perception bias in part of the scientific community, society, and the media. Approaches such as the active media perspective may have also drawn attention to studies that highlight the risks associated with video games to the detriment of other studies whose findings do not corroborate this relationship.

### *4.2. Research Implications*

The findings presented in response to the research questions are interesting. They contribute to the open debate in the scientific community about the lack of conceptual consensus about problems related to the use of video games, and by extension, about the complexity of reaching clear conclusions from the scientific evidence given the many instruments used to evaluate different parameters around problematic video game use.

The variety of terminology used by different institutions (gaming disorder, internet gaming disorder, problematic gaming, problematic internet use, internet gambling, etc.) shows a lack of consensus when it comes to conceptually and operationally delimiting video games as a product and as an activity. Putting different genres and types of games in the same category, or associating gaming exclusively with internet gaming, may call into question the validity of some of these constructs and how they are evaluated. In this regard, the consistency of "Internet Gaming Disorder" is debatable given that, although it includes the word internet, it refers to gaming experiences that may occur offline (as may happen with most video games). There is also confusion as it may refer to other types of experiences, such as online gambling. A thoughtful analysis of this question may be found in Carbonell (2014) [47]. There is, therefore, a need for greater specificity in this regard, with subclassifications, where appropriate, based on whether one is playing online or not, and whether one is playing video games or games of chance, as noted in the ICD-11. This would allow for a more rigorous evaluation, and at the same time would provide more robust evidence.

At what point can we consider there to be a disorder or addiction to video games? Until the publication of the ICD-11, the lack of consensus around the conceptual description of the disorder, and hence the variety of terminology and criteria making it up, was clear. There was a vacuum that the scientific community attempted to fill with various constructs and different evaluation instruments adapted to those constructs to explain the phenomenon. However, now the ICD-11 [1] outlines it more clearly, establishing criteria for predominantly online video game use disorder and predominantly offline video game use disorder. This should allow the scientific community to move towards validating instruments which fit those diagnostic criteria, leaving those which do not allow rigorous, convergent evaluation behind. There are, therefore, various aspects to consider in the conceptual development and improvement of the evaluation instruments.

In any case, the debate does not end here. Traditionally, people were only considered gamers if they played certain types of games (shooters, sports games, etc.), and other manifestations and forms of expression were excluded. We believe that the study of video games should consider all of the existing types. This leads us to recognize the value, for example, of indie games, and the boom in casual games (simple games often designed to be played on mobile phones). The recognition of these and other products outside of commercial channels will lead us to understanding video games as artistic creations which produce an artificial system accepted by gamers, who interact with it in a

complex experience which essentially depends on the emotions that are established [48]. Consequently, it is important to promote research linked to the perspective of the active user, in which the player is a conscious agent and responsible for an experience. This is in contrast [49,50] to research framed by the active medium [3], which considers video games as products which are in themselves capable of affecting users' behavior, producing addiction [51] or increasing levels of aggression and violence [52]. As various authors have noted [53,54], children and adolescents must not only be considered helpless victims exposed to a medium like video games. Their studies have shown that adolescents are able to articulate their preferences and develop a critical sense about playing video games, including the risks.

In this regard, playing video games may be beneficial for individuals' development, in addition to offering notable educational possibilities. Over the last twenty years, various meta-analyses have demonstrated the medium's possibilities for both development of cognitive abilities and improved performance in school subjects. In terms of the former, the classic studies by Sitzman (2011) [55] showed that playing video games improved self-efficacy and the acquisition of procedural and conceptual content, rates of data retention were higher, and the ability to transfer learning to other contexts increased. Along similar lines, other authors have indicated benefits linked to skills such as spatial abilities [56] and problem-solving [57]. If we look at academic disciplines, there are also meta-analyses that show the benefits games can provide generally [58] and in specific subjects such as mathematics [59], language and literature [60], geography and history [61], and foreign languages [62].

Although using specifically educational games offers possibilities along these lines, as with products such as DragonBox [63] and the series Global Conflict [64], using commercial video games with a dialogical approach is very promising [65]. Recent projects such as *Playing Emotions* [66]—for the development of socio-emotional skills using independent video games like Gris and Braid—and the work Hanghøjh and Møller (2017) have done with Limbo [67] are in this direction.

### *4.3. Conclusions*

In summary, while the abusive use of some best-selling video games may contribute to confirm potentially addictive or harmful effects, future studies should try to differentiate between types of video games, types of players, and socio-cultural contexts associated with video games. Additionally, it would be interesting to analyze the peculiarities of different phenomena frequently placed under the same category in order to establish relationships between those elements in later stages. For instance, we often see how mass media frame manifestations of ludic culture such as esports, streaming, or social gaming under the same umbrella. While some works in this review are aware of those differences [37,43], analyzing separately video games-related issues and social networks problematic use), many studies continue to mix those terms labelling all of them as game-related phenomena.

Perhaps these considerations will help resolve some of the diagnostic dilemmas related to video games and help articulate preventive or clinical policies that minimize their harm and reinforce their benefits [68,69].

Finally, we believe that adolescents, teachers, families, and also the scientific community achieving critical literacy of video games is a particularly interesting line of study that would contribute to the development of more active and pedagogical approaches to using video games.

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