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# The Effects of Playing Video Games on Stress, Anxiety, Depression, Loneliness, and Gaming Disorder During the Early Stages of the COVID-19 Pandemic: PRISMA Systematic Review

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## Abstract

During the initial phases of the COVID-19 pandemic, playing video games has been much more than just a pastime. Studies suggested that video games for many individuals have helped to cope with such difficult life experience. However, other research indicates that gaming may have had harmful effects. Within this context, this systematic review aimed to describe the literature on the effects of video games during the early stages of the COVID-19 crisis on stress, anxiety, depression, loneliness, and gaming disorder (GD), examining the study characteristics and outcomes. A systematic search of the literature was made following the Preferred Reporting Items for Systematic Reviews and Meta-Analysis guidelines. It was preregistered in the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY)—INPLASY202180053. The search databases were PsycINFO, Web of Science, and Medline. The search string was: [(“video game\*”) OR (“computer game\*”) OR (“gaming”)] AND [(“COVID-19”)]. Twenty-four studies met the inclusion criteria. Four research explored the effects of playing video games during the COVID-19 pandemic on stress, anxiety, and depression. Four studies investigated loneliness, while 18 research investigated game disorder. Video games, especially augmented reality and online multiplayer ones, mitigated stress, anxiety, depression, and loneliness among adolescents and young adults during stay-at-home restrictions. However, in the case of at-risk individuals (i.e., particularly male youths), playing video games had detrimental effects.

**Keywords:** video games, COVID-19, stress, anxiety, depression, loneliness, gaming disorder

## Introduction

**A**FTER THE FIRST reports at the end of December 2019 of unidentified pneumonia cases in Wuhan, China, on March 11, 2020, the World Health Organization (WHO) declared the novel coronavirus (COVID-19) a global pandemic.<sup>1</sup> During 2020, many countries have seen a two-wave pattern in cases of COVID-19, with a first wave during spring followed by the current second wave in late summer and autumn.<sup>2–4</sup> In these early stages of the COVID-19 pandemic, most governments worldwide adopted prolonged stay-at-

home directions, dramatically changing people’s daily habits and behavior.<sup>5–7</sup> As a result, various home activities such as cooking, gardening, streaming movies, and digital communication technology grew a lot among the population.<sup>5,8–10</sup>

Video game playing also dramatically increased in 2020.<sup>11</sup> The number of gamers worldwide was about 2.6 billion people, and the sales of video games reached record numbers.<sup>12,13</sup> The time spent using video games had grown after the pandemic outbreak, and play had become more equally distributed across days of the week.<sup>14</sup> As far as the type of video games, the most sold were multiplayer games.<sup>15,16</sup>

Interestingly, many individuals reported having increased the time spent playing video games during the early phases of the COVID-19 crisis with the beliefs that gaming helped to cope with such challenging life experience, diminishing their level of anxiety, stress, depression, and mitigating loneliness.<sup>17–20</sup> This fact seems relevant since, during 2020, the fear of contracting the virus, changes in lifestyle behaviors, social isolation, boredom, and uncertainty have exacerbated these conditions in populations globally, with long-lasting psychological and physical consequences.<sup>21–25</sup>

As stated by the compensatory model,<sup>26,27</sup> gaming represents a versatile coping strategy for many individuals, defined as the cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person.<sup>28</sup> This fact was also noted during times of isolation and during difficult life experiences in general.<sup>18,29,30</sup>

There are several ways in which playing video games can be helpful during distressful life situations.<sup>29</sup> In many cases, as is true for other entertainment media, video games provide a temporary diversion from (real-world) adverse events or emotions.<sup>31–36</sup> Second, like other pleasurable activities, video game playing stimulates dopamine release, a neurotransmitter linked to sensations of pleasure and reward,<sup>37</sup> and elicits positive emotions such as joy and surprise,<sup>38,39</sup> with positive effects on the psychological well-being of the individual.<sup>40–42</sup>

Thanks to these characteristics, more and more studies, literature reviews, and meta-analyses have emphasized that playing video games can help to reduce stress,<sup>43–45</sup> anxiety,<sup>43–46</sup> and depression.<sup>43,46–48</sup> Among the most useful genres are the casual video games,<sup>43,44</sup> characterized by low cognitive loads and generally short time demands (e.g., Tetris and Angry Birds), the exergames, defined as a combination of video gaming and physical exercise (e.g., Just Dance and Ring Fit Adventure),<sup>49,50</sup> and augmented reality (AR) games (e.g., Pokémon Go).<sup>46,47</sup>

Besides, playing video games, especially the online multiplayer ones, with friends or with people met online—or social gaming—offers the possibility of establishing social connections and diminishing loneliness.<sup>51,52</sup> This fact is particularly relevant since the COVID-19 pandemic broke out.<sup>30,53</sup> Gaming for social compensation might mitigate the loneliness experienced during pandemic-related self-isolation.<sup>19,54</sup> Notably, the WHO launched in March 2020 the campaign #PlayApartTogether, aimed at promoting social interaction through online gaming activities.<sup>55,56</sup>

Even if video games represent helpful and easily accessible instruments to cope with difficult life experiences,<sup>29,30</sup> including the COVID-19 pandemic,<sup>18,53,57</sup> it is important to emphasize that they are not always beneficial since their effect strictly depends on people's situational circumstances.<sup>27,29,58</sup> Gaming as a non-problematic or even healthy coping strategy when facing a difficult life situation might turn into a maladaptive or problematic one in the case of at-risk individuals (i.e., male children, adolescents, and adults with a problematic gamer profile or with a high level of stress).<sup>26,27,29,58</sup>

Therefore, some scholars argue that significant increases in gaming during 2020 may have had harmful effects on vulnerable individuals, enhancing their level of stress, anxiety, depression, and loneliness.<sup>59–61</sup> Besides, particularly

among male children and adolescents, symptoms of the much debated<sup>62</sup> Internet gaming addiction<sup>63,64</sup> or gaming disorder (GD) may have increased.<sup>59–61</sup>

Within this context and since, to the best of our knowledge, no previous work has investigated the topic, this systematic review aimed to describe the literature on the effects of video games during the early stages of the COVID-19 crisis on stress, anxiety, depression, loneliness, and GD, examining the study characteristics and outcomes. The principal aims were to investigate the following:

- RQ1. Whether and for whom video games have been beneficial versus harmful for mitigating stress, anxiety, and depression.
- RQ2. Whether and for whom playing video games mitigated versus enhanced loneliness.
- RQ3. Whether the prevalence of GD increased and what risk factors emerged.

## Methods

### Databases searched

A systematic search of the literature was performed on January 15, 2022, by two of the authors (F.P. and A.P.) following the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines.<sup>65</sup> It was preregistered (August 14, 2021) in the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY)—INPLASY202180053. The search databases were PsycINFO, Web of Science, Medline, and the preprint servers medRxiv and PsyArxiv.

### Inclusion criteria

In line with the PRISMA guidelines,<sup>65</sup> two authors (F.P., A.P.) established clear inclusion criteria to determine articles' eligibility for inclusion in the review. Only studies meeting the following criteria were considered eligible for inclusion: (a) human participants (clinical and nonclinical populations); (b) the outcome measures were the effects of video games on stress, anxiety, depression, loneliness, and/or GD; (c) the study design was a randomized-controlled trial (RCT) quantitative nonrandomized (e.g., non-RCTs, case-control study), quantitative descriptive (e.g., cross-sectional study, longitudinal study, case report), or mixed methods (i.e., combines qualitative and quantitative methods); and (d) must have been conducted during the early stages of the COVID-19 pandemic (i.e., during the first or the second wave).

Articles published in English in peer-reviewed journals were selected and subjected to the inclusion criteria as outlined above. According to the PRISMA guidelines, the authors (F.P., A.P., and F.M.) established a specific date range. Studies published after December 2019 were selected. This time frame was chosen as COVID-19 first emerged in that month.

### Exclusion criteria

Studies were excluded if they: (a) did not focus specifically on video games (e.g., research more in general on the use of Internet, screen, or digital technologies); (b) did not include specific outcome measures on stress, anxiety,

depression, loneliness, or GD; (c) were not conducted during the COVID-19 pandemic or did not include details on the exact period in which the research was conducted; (d) were qualitative study; and (e) were letters to editors, commentaries, or studies describing protocols.

#### *Search terms and selection of articles for inclusion*

The search string was as follows: The search string will be: [(“video game\*”) OR (“computer game\*”) OR (“gaming”)] AND [(“COVID-19”). Initially, two authors (F.P. and A.P.) checked the titles and abstracts of identified articles to determine their eligibility. Subsequently, they independently reviewed the full text of potentially eligible articles. A consensus between the authors (F.P. and A.P.) resolved any disagreements. When articles provided insufficient data for inclusion in the analysis, the corresponding authors were contacted to provide additional data. Seven additional articles emerged via hand-searching and reviewing the reference lists of relevant articles.

#### *Data extraction*

Two of the authors (F.P. and A.P.) independently extracted the following data: (a) the *populations* included in the study (sample size, gender, mean age or age range, nationality); (b) the *study design* used (i.e., RCT, quantitative nonrandomized, quantitative descriptive, mixed-methods study); (c) the *time period* in which the research was conducted (i.e., during lockdown restrictions or not); (d) the *measures used for the assessment of outcomes* (e.g., self-report questionnaires); and (e) the *study outcomes* (i.e., stress, anxiety, depression, loneliness, GD).

The populations, study design, measures of outcomes, and the study outcomes were considered relevant variables in analogy to what was done in previous reviews<sup>43,66–68</sup> to facilitate easily classified and comparable access studies among the literature. An indication of the mean age or age range identified studies conducted on children (i.e., younger than 12 years), adolescents (12–18 years old), young adults (18–35 years old), middle-aged adults (36–55 years old), and older adults (older than 55 years). The division in these age ranges followed previous studies.<sup>69–71</sup>

#### *Study quality and risk-of-bias assessment*

The Mixed Methods Appraisal Tool (MMAT)<sup>72</sup> was used to assess the methodological quality of studies included in this systematic review. It has high reliability and efficiency as a quality assessment protocol and can concomitantly appraise methodological quality across various empirical research.<sup>73</sup> Two of the authors (F.P. and A.P.) independently assessed study quality. Interrater reliability calculated using Cohen’s kappa<sup>74</sup> using the software package SPSS was 0.874, representing substantial agreement.<sup>75</sup> Disagreements on study quality were resolved by discussion between the two authors.

## **Results**

The search strategy retrieved 1,842 records. One thousand fifty-nine studies remained after deduplication and language examination, and 834 records were excluded after the first screening and title and/or abstract

analysis. Two hundred twenty-five full-text copies of the remaining studies were obtained and subjected to further evaluation.

After reading full-text copies, 201 studies were excluded from this review due to the following reasons: 46 did not focus specifically on video game use; 114 did not include specific outcome measures on stress, anxiety, depression, loneliness, or GD; 2 were not conducted during the COVID-19 pandemic; 5 did not include details on the exact period in which the research was conducted; 3 were qualitative studies; and 31 were letters to editors, commentaries, or studies describing protocols. At the end of the process, 24 studies remained (Fig. 1 and Tables 1–3).

#### *Quality assessment outcomes*

An overall quality score was assigned to each study using the MMAT scoring system.<sup>72</sup> Studies could be awarded 0, 25, 50, 75, or 100 (with 100 being the highest quality). Considering all the study designs, 9 (37.5 percent) scored 100, 13 (54 percent) scored 75, and 2 (8.5 percent) scored 50 (see Table 1 and Multimedia Appendix Table A1).

#### *Study design*

Twenty-two studies used a quantitative descriptive research design, while two studies adopted a mixed-method design (see Table 2 for detail).<sup>18,20</sup>

#### *Populations*

The number of participants ranged from 162<sup>76</sup> to 3,928<sup>77</sup> in quantitative descriptive studies, and from 781<sup>18</sup> to 2,004<sup>20</sup> in mixed-methods studies. All studies involved both male and female healthy individuals. Twenty-one studies included participants from the same country, while three recruited residents from different nations.<sup>78–80</sup> Seven research involved participants of different age ranges (see also Table 2 for details).

#### *Time period*

Sixteen studies have been conducted during stay-at-home restrictions following the outbreak of the COVID-19 crisis, while eight studies in a period in which no lockdown restrictions were in place.

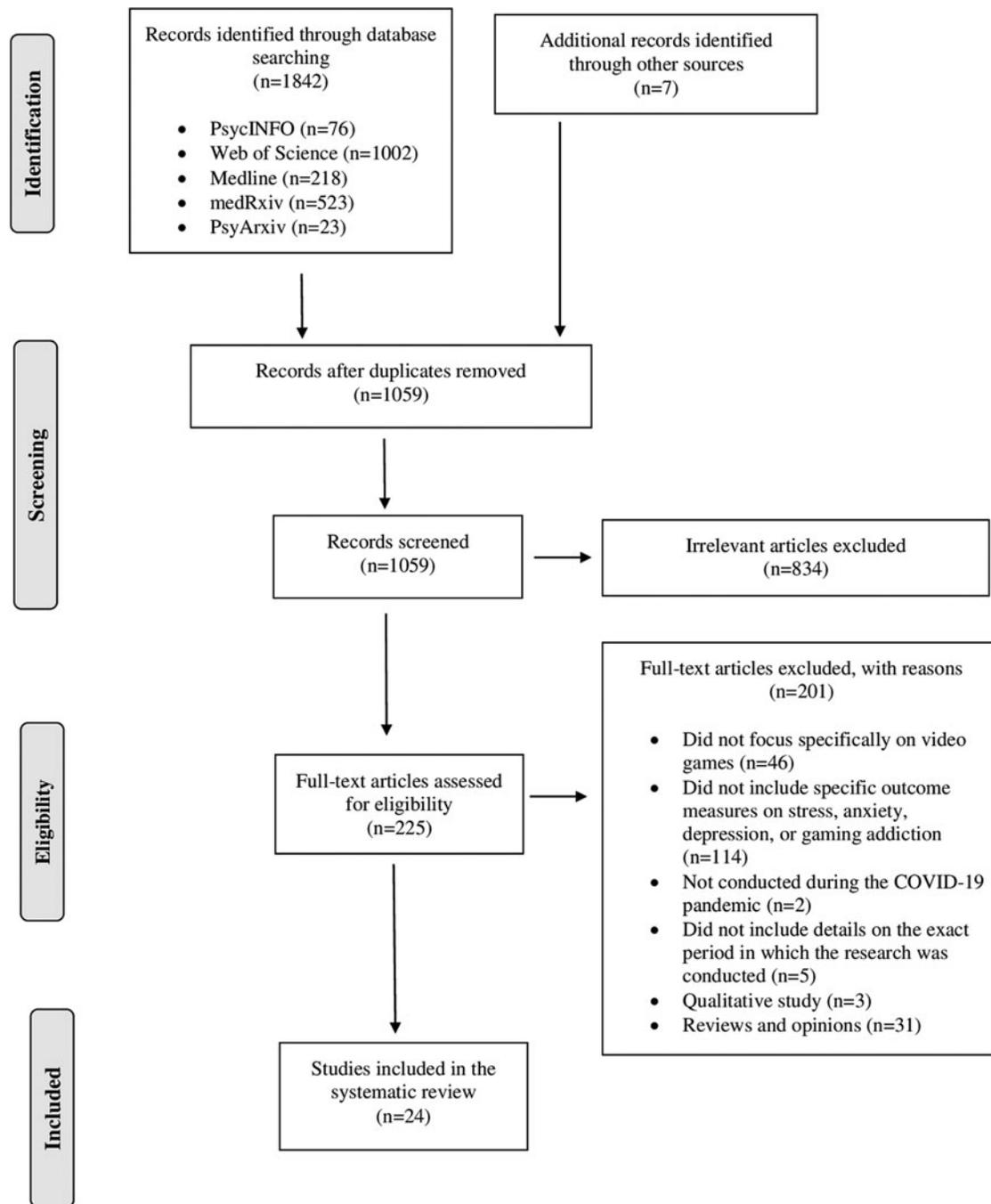
#### *Outcome measures*

Twenty-two research used self-reported quantitative measures, while two adopted quantitative and qualitative measures (i.e., open-ended questions).

#### *Study outcomes*

Two studies investigated more than one study outcome,<sup>18,20</sup> while 22 focused only on one. Four research explored the effects of playing video games during the COVID-19 pandemic on stress, anxiety, and depression, 4 studies investigated loneliness, and 18 research investigated GD.

Stress, anxiety, and depression. Two research conducted during the lockdown following the first wave of the COVID-19 pandemic in English-speaking countries, especially the United Kingdom and the United States, showed



**FIG. 1.** PRISMA flowchart of the systematic review. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analysis.

that college students and adults who played AR games (i.e., Pokémon GO or Harry Potter: Wizards Unite) had increased the time spent playing video games, with a beneficial effect in lowering stress.<sup>18,20</sup> In another research conducted in the same period and countries, middle-aged adults with high levels of avoidant coping spent more time playing online video games than individuals with approach coping. The increase in the time of playing was related to higher subsequent levels of depression.<sup>80</sup>

Another study showed that playing online multiplayer games during the first lockdown in Italy mitigated the ex-

perienced depression, anxiety, and stress in young adults with no previous history of problematic gaming. Differently, in individuals with previous maladaptive gaming patterns, the increase in hours of play had short-term relaxing effects, but resulted in long-term higher stress, depression, and anxiety symptoms.<sup>54</sup>

Loneliness. Two studies reported that video games provided an enjoyable means of maintaining social contact and promoted the perception of social ort for U.K. and U.S. college students<sup>18</sup> and adults who play AR games<sup>20</sup> during

TABLE 1. STUDY DESIGN AND MIXED METHODS APPRAISAL TOOL SCORE DISTRIBUTION

<i>MMAT score distribution</i>	<i>References</i>	<i>n</i>	<i>Percentage</i>
Quantitative descriptive			
0		0	0
25		0	0
50	92	1	4
75	17,54,76,82–84,86,87,89–91,93,94	13	54
100	53,77–81,85,88	8	33
Mixed methods			
0			
25			
50	18	1	4
75			
100	20	1	4

MMAT, Mixed Methods Appraisal Tool.

lockdown restrictions following the first wave of the COVID-19 pandemic. On the contrary, one research conducted in the United States in the same period on middle-aged adults reported that playing online multiplayer video games was negatively related to social connectedness.<sup>17</sup>

Finally, another study made during the stay-at-home period following the first wave of the COVID-19 pandemic in German-speaking countries (i.e., Germany, Austria, and

Switzerland) showed that among middle-aged adults, the effect of online multiplayer video games on the sense of loneliness depended on the reasons that spurred people to play. Specifically, gamers with a more social motive for gaming perceived less loneliness, but gamers with a dominant escape motive demonstrated a positive link to perceived loneliness.<sup>53</sup>

**Gaming disorder.** Nine studies reported the prevalence of GD during the early stages of the COVID-19 pandemic as follows: 11 percent among Vietnamese adolescents,<sup>81</sup> 19 percent among Italian children and adolescents,<sup>82</sup> 5.3 percent among Chinese children and adolescents,<sup>83</sup> 16.6 percent among Spanish university students,<sup>84</sup> 2.5 percent among medical students in Malaysia,<sup>85</sup> 4.1 percent among Japanese middle-aged adults (8.5 percent among younger than 30),<sup>77</sup> 15 percent among Chinese adolescents,<sup>86</sup> 8.5 percent in college students from Nepal,<sup>87</sup> and 4.5 percent among Malaysian university students.<sup>88</sup>

The 11 studies conducted on children and adolescent GD were associated with: age (i.e., being adolescent),<sup>79,82,89</sup> gender (i.e., being male),<sup>82–84,86,89–92</sup> maladaptive coping regulatory styles,<sup>86</sup> poor social support,<sup>83,86,89</sup> depressive and anxiety symptoms before the COVID-19 pandemic,<sup>76,92</sup> poor mental health,<sup>83</sup> academic stress,<sup>86</sup> unhealthy parental care styles,<sup>81–83</sup> addictive gamer profile,<sup>90,91</sup> and excessive use of social networks.<sup>84</sup>

With regard to adults, eight studies showed an increased risk of developing GD symptoms in association with age

TABLE 2. STUDIES' CHARACTERISTICS

<i>Characteristics</i>	<i>References</i>	<i>n</i>	<i>Percentage</i>
Study design			
RCT		0	0
Quantitative nonrandomized		0	0
Quantitative descriptive		22	92
Cross-sectional/correlational study	53,76,78–90,94	16	67
Longitudinal study	17,54,77,91–93	6	25
Mixed methods	18,20	2	8
Age ranges			
Children (younger than 12 years)	76,82,83,89,92	5	16
Adolescents (12–18 years old)	18,81–83,86,89–92,94	10	32
Young adults (18–35 years old)	18,20,54,78,79,84,85,87,88,93,94	11	35
Middle-aged adults (36–55 years old)	17,53,77,80,93	5	16
Older adults		0	0
Nationality			
Europe	18,53,54,76,79,80,82,84,89,93,94	12	43
North America	20,17,78–80	5	18
South America		0	0
Asia	77,81,83,85–88,90–92	10	36
Africa		0	0
Oceania	78	1	6
Time period			
Stay-at-home restriction period	17,18,20,53,54,79–82,84,85,87,90–93	16	67
No stay-at-home restriction period	76–78,83,86,88,89,94	8	33
Study outcome			
Stress, anxiety, depression	18,20,54,80	4	15
Loneliness	17,18,20,53	4	15
GD	76–79,81–94	18	69

GD, gaming disorder; RCT, randomized-controlled trial.

TABLE 3. DESCRIPTION OF THE STUDIES INCLUDED IN THE REVIEW

<i>Study</i>	<i>Aim</i>	<i>Time and place</i>	<i>Sample</i>	<i>Study design</i>	<i>Outcome measures</i>	<i>Main outcomes</i>
Barr and Copeland-Stewart <sup>18</sup>	To understand how games are being used during the lockdown following COVID-19 and how they impacted players' mental health	During June 2020 in the United Kingdom, during lockdown restrictions	781 respondents (32.9% female; $N = 258$ ; most aged between 16 and 24) recruited through social networks and gaming-related groups	Mixed-methods research design	Online self-reported survey: <ul style="list-style-type: none"> <li>• Demographic information</li> <li>• Questions related to game play habits</li> <li>• Two open-ended questions on: the type of games played during the COVID-10 pandemic; how playing video games impacted well-being during the COVID-19 outbreak</li> </ul>	Playing video games during the COVID-19 pandemic has provided an enjoyable means of maintaining social contact and stress-relieving
Cheng et al. <sup>80</sup>	To test different mechanisms related to online gaming for handling stress	From March to May 2020 in the United Kingdom and the United States, during lockdown restrictions	1,047 participants (53.8% female, $N = 563$ ; mean age = 44.1, $SD = 12.59$ )	Cross-sectional/correlational research design	Online self-reported survey: <ul style="list-style-type: none"> <li>• Demographic information</li> <li>• Coping Strategies Inventory-Short Form</li> <li>• Cyber-Aggression and Cyber-Victimization Scale</li> <li>• Multidimensional Scale of Perceived Social Support</li> <li>• CES-D</li> <li>• Custom questions on time allocated to social networking and Internet gaming during the COVID-19 pandemic</li> </ul>	Mediated analyses showed that individuals who reported higher levels of avoidant coping to manage stress tend to spend more time playing online video games, which was related to higher levels of depression

(continued)

TABLE 3. (CONTINUED)

Study	Aim	Time and place	Sample	Study design	Outcome measures	Main outcomes
Claesdotter-Knutsson et al. <sup>94</sup>	To study changes in gaming among youths during the COVID-19 crisis, and to look at potential risk factors behind problematic gaming	During March 2021 in Sweden, when secondary schools had started to reopen, but the national COVID-19 strategies regarding leisure activities were still in effect	932 participants (48.5% female, $N=452$ ; age range 16–39) recruited from individuals who play video games	Cross-sectional/correlational research design	Online self-reported survey: <ul style="list-style-type: none"> <li>• Demographic information</li> <li>• <i>Ad hoc</i> questions about changes in the respondent's personal behavior during the COVID-19 pandemic</li> <li>• <i>Ad hoc</i> questions regarding schooling situation</li> <li>• <i>Ad hoc</i> questions on gaming habits</li> <li>• GASA</li> <li>• Psychological Distress scale (K6)</li> <li>• PGSI</li> </ul>	The group that reported increased gaming during the COVID-19 pandemic was more likely aged 16–39 years old. In the age group 25–39 years old, the increase was associated with psychological distress, reporting less exercise, and being unemployed
Cuong et al. <sup>81</sup>	To evaluate the associations between GD and parenting practice and discipline practice among adolescents	Between March and August 2020 in Vietnam, during the study-at home period	2,084 participants (50.2% female, $N=1,046$ ; mean age = 14.5, $SD=0.04$ ) recruited from secondary and high school students	Cross-sectional/correlational research design	Online self-reported survey: <ul style="list-style-type: none"> <li>• Demographic and socioeconomic information</li> <li>• IGD-20 test</li> <li>• Parent-family connectedness scale</li> <li>• Child Discipline Module</li> <li>• <i>Ad hoc</i> question on parental supervision and discipline styles</li> </ul>	The prevalence of GD among the respondents was 11.6%. There was an association between GD and parent-child relationship, parental supervision, and parental discipline
De Pasquale et al. <sup>76</sup>	To assess the prevalence of video games use and addiction in children during the COVID-19 pandemic and their association with anxiety symptoms	During November 2020 in Italy, when children were attending school in presence	162 participants (51.8% female, $N=84$ ; mean age = 9.4, $SD=0.7$ ) recruited from primary schools' students	Cross-sectional/correlational research design	Online self-reported survey: <ul style="list-style-type: none"> <li>• Demographic information</li> <li>• Data on the access to electronic tools and game preferences</li> <li>• VASC</li> <li>• TAD</li> <li>• CAM-S</li> </ul>	Students reported a low risk of video game addiction. Males reported to spend more time on video games, to perceive higher self-control and to be more influenced by reinforcement mechanisms. State anxiety was a predictor of video game use and addiction

(continued)

TABLE 3. (CONTINUED)

Study	Aim	Time and place	Sample	Study design	Outcome measures	Main outcomes
Donati et al. <sup>82</sup>	To analyze video gaming habits and GD symptoms in children and adolescents during the lockdown due to COVID-19 pandemic	From April to June 2020 in Italy, during lockdown restrictions	554 parents of 306 children (31% female, $N=95$ ; mean age = 8.6, $SD=1.9$ ) and 248 adolescents (23% female, $N=57$ ; mean age = 14.1, $SD=1.9$ )	Cross-sectional/correlational research design	Online self-reported survey: <ul style="list-style-type: none"> <li>Demographic information</li> <li>VGS-P</li> <li>VGS-A or the VGS-C</li> <li>Parents' Video Gaming Behavior (<i>ad hoc</i>)</li> <li>Parental Knowledge subscale of the Parental Monitoring Scale</li> <li>Parental monitoring in relation to video game behavior custom questions</li> </ul>	Parents reported that children and adolescents were involved in video games. Mediation analyses revealed high rates of GD symptoms particularly in boys and adolescents
Ekinci et al. <sup>89</sup>	To investigate the impact of the pandemic period on students' loneliness and digital game addiction levels	In March 2020 before the pandemic and in September 2020 in Turkey, when students have returned attending school in presence	398 participants (51% female, $N=203$ ; range 6–13) recruited from primary and secondary schools students	Cross-sectional/correlational research design	Online self-reported survey: <ul style="list-style-type: none"> <li>Demographic information</li> <li>DGAS-7</li> <li>UCLA Loneliness Scale</li> </ul>	There was a statistically low positive correlation between digital game addiction and loneliness. The game addiction and loneliness level of students increased during the COVID-19 pandemic. As the age of students increases, their level of addiction also increases
Ellis et al. <sup>20</sup>	To examine the impact of COVID-19-related social restrictions on the use of video games and motivations for their use, and to explore the potential role of video games in supporting mental health during the pandemic	In May 2020 in English-speaking countries (especially United States), during a period in which many countries were under social restrictions	2,004 participants (42.2% female, $N=845$ ; mean age = 30.5) who had played for at least a week the English versions of Pokémon GO or Harry Potter: Wizards Unite	Mixed-methods research design	Online self-reported survey: <ul style="list-style-type: none"> <li>Demographic information</li> <li>Video game use</li> <li>Physical activity</li> <li>WHO-5 Well-Being Index</li> <li>Open-ended questions on motivations to play and the impact of video games on mental health during the COVID-19</li> </ul>	Participants reported a significant increase in video game playtime. Individuals reported that they used video games to lower stress and to maintain social connection

(continued)

TABLE 3. (CONTINUED)

Study	Aim	Time and place	Sample	Study design	Outcome measures	Main outcomes
Giardina et al. <sup>54</sup>	To test the protective effect of online gaming during the lockdown due to the COVID-19 crisis, and to investigate the differences between highly involved gamers and problematic gamers in this regard	From February 28 to March 10 2020, before the COVID-19 outbreak in Italy (Time 1), and between March 11 and March 28 2020, after the start of the national lockdown (Time 2)	664 participants (91.3% male, $N=606$ ; 8.7% female, $N=58$ ; mean age = 23.59, $SD=6.27$ )	Longitudinal research design	Online self-reported survey: <ul style="list-style-type: none"> <li>• Demographic information</li> <li>• DASS-21</li> <li>• IGD-10</li> <li>• VIS</li> <li>• Custom items on gaming compensation</li> </ul>	Gaming for social compensation mitigated the experienced depression, anxiety, and stress during the COVID-19 pandemic-related self-isolation, whereas maladaptive gaming patterns constituted a vulnerability factor deserving clinical attention
Galán et al. <sup>84</sup>	To analyze the use of video games during the COVID-19 and whether it may have contributed to the increase in the risk factors in video game addiction among students	In June 2020 in Spain, during lockdown restrictions	310 participants (69.9% female, $N=217$ ; mean age = 23.7) recruited from university students	Cross-sectional/correlational research design	Online self-reported survey: <ul style="list-style-type: none"> <li>• Demographic information</li> <li>• GASA (short version)</li> <li>• WHO ASSIST questionnaire</li> <li>• Social Network Addiction Scale (ARS)</li> </ul>	Video game addiction was observed in 16.6% of Spanish university students, and it was determined by gender (i.e., being male) and social network addiction
Hall et al. <sup>78</sup>	To examine the effects of self-isolation and quarantine on depression and anxiety, and excessive video gaming	In April 2020 in English-speaking countries (especially United States), during a period when the United States had not enacted a federal lockdown response (although individual states had enacted different lockdown restrictions)	1,144 participants (44% female, $N=499$ ; mean age = 31.4, $SD=10.5$ )	Cross-sectional/correlational research design	Online self-reported survey: <ul style="list-style-type: none"> <li>• Demographic information</li> <li>• Kessler-10</li> <li>• Psychological Distress Scale (K-10)</li> <li>• PGSI</li> <li>• IGD checklist</li> <li>• RLI</li> <li>• Revised Padua-Inventory 10-item contamination subscale</li> <li>• Spending on loot boxes in the past month</li> </ul>	Self-isolation did not result in greater excessive game play. Compared with those not self-isolated or quarantined, participants in self-isolation or quarantine showed negligibly lower levels of depression and anxiety, but no differences in excessive gaming

(continued)

TABLE 3. (CONTINUED)

Study	Aim	Time and place	Sample	Study design	Outcome measures	Main outcomes
Ismail et al. <sup>85</sup>	To determine the prevalence of GD and Internet addiction, and their associations with anxiety among medical students during the COVID-19 pandemic	From November to December 2020 in Malaysia, during lockdown restrictions	237 participants (69.6% female, $N=164$ ; mean age=21, $SD=3$ ) recruited from medical students	Cross-sectional/correlational research design	Online self-reported survey: <ul style="list-style-type: none"> <li>• Demographic information</li> <li>• The MVIAT</li> <li>• The Malay version of the IGD9-SF</li> <li>• The Malay version of the DASS-21</li> </ul>	GD prevalence was only 2.5%, which is the lowest among other countries. The study did not find a high prevalence of GD nor any significant association with anxiety among the medical students during the pandemic
Kim and Lee <sup>91</sup>	To explore the different profiles of addictive Internet gaming behavior among adolescents before and after the outbreak of the COVID-19 pandemic	From November to December in 2018 (Time 1) and from November to December 2020 in South Korea, during lockdown restrictions (Time 2)	2018: 3,040 participants (48.3% female, $N=1,468$ ; mean age=13.46, $SD=1.71$ ) 2020: 2,906 participants (48.5% female, $N=1,409$ ; mean age=13.62, $SD=1.71$ ) All respondents were recruited from primary and secondary schools' students	Longitudinal research design	Online self-reported survey: <ul style="list-style-type: none"> <li>• Demographic information</li> <li>• MGUS</li> <li>• Time spent playing Internet games on a PC and mobile phones</li> </ul>	Latent profile analyses showed that the increase of addictive Internet gaming usage and game play time differed by profile. While adolescents of the four profiles (i.e., casual gamer, moderate gamer, potential risk gamer, addictive gamer) showed no significant signs of increased addictive Internet gaming usage, the addictive gamer profile demonstrated a significant increase in game time after COVID-19
Kim et al. <sup>90</sup>	To investigate the latent profiles of the Internet game usage among adolescents	From November 2020 to December 2020 in South Korea, during lockdown restrictions	2,984 participants (48.1% female, $N=1,435$ ; mean age=13.6) recruited from primary and secondary schools' students	Cross-sectional/correlational research design	Online self-reported survey: <ul style="list-style-type: none"> <li>• Demographic information</li> <li>• MGUS</li> <li>• Time spent on Internet and Internet game</li> <li>• <i>Ad hoc</i> questions on neuroticism</li> </ul>	Latent profile analyses showed that profiles with higher game usage time scored higher in problematic game use than other profiles. Males were more likely to be in the profiles with high gaming time, and females were more likely to be in Internet and Smartphone User profiles

(continued)

TABLE 3. (CONTINUED)

Study	Aim	Time and place	Sample	Study design	Outcome measures	Main outcomes
Nebel and Ninaus <sup>53</sup>	To explore social gaming during the pandemic and its association with perceived loneliness within a German-speaking sample	Between April and May 2020 in German-speaking countries (Germany, Austria, Switzerland), during lockdown restrictions	741 individuals (11.9% female, $N=88$ ; mean age = 31.7, $SD=9$ ) recruited from adults social networks and gaming forums	Cross-sectional/correlational research design	Online self-reported survey: <ul style="list-style-type: none"> <li>• Demographic information</li> <li>• COVID-19-related information</li> <li>• Video game habit questions</li> <li>• UCLA loneliness scale</li> </ul>	Individuals with a more social motive for gaming diminished loneliness, but gamers with a dominant escape motive demonstrated a positive link to perceived loneliness
Nguyen et al. <sup>17</sup>	To investigate how various digital media uses (i.e., online video games, e-mail, social media, and others) relate to social connectedness during the COVID-19 crisis	In April 2020 (Time 1) and in May 2020 (Time 2) in the United States, during a period when the United States had not enacted a federal lockdown response (although individual states had enacted different lockdown restrictions	2,925 participants (54.7% female, $N=1,599$ ; mean age = 46, $SD=16.5$ ) recruited from adults	Longitudinal research design	Online self-reported survey: <ul style="list-style-type: none"> <li>• Demographic information</li> <li>• GASA (short version)</li> <li>• WHO ASSIST questionnaire</li> </ul>	In line with notions from social presence theory, especially digital media lower in social presence (i.e., online video games, e-mail, social media, and to some extent text messaging) related negatively to social connectedness, while this was not the case for higher social presence media (e.g., voice and video calls)
Oka et al. <sup>77</sup>	To study changes in IGD and problematic Internet use during the COVID-19 pandemic and risk factors for them	In December 2018 before the onset of the pandemic (Time 1), and in August 2020 in Japan, when no lockdown restrictions were in effect (Time 2)	3,938 respondents (50.1% female, $N=1,972$ ; mean age = 46.6, $SD=11.8$ )	Longitudinal research design	Online self-reported survey: <ul style="list-style-type: none"> <li>• Demographic information</li> <li>• IGDS</li> <li>• CIUS</li> </ul>	Comparisons before and during the pandemic revealed that probable GD prevalence had increased 1.6 times. Youth (age <30) and COVID-19 infection were strongly associated with GD exacerbation
Rogier et al. <sup>93</sup>	To test the hypotheses that the use of gaming and social networks after the COVID-19 outbreak may not be pathological <i>per se</i> but that the increase in levels of loneliness induced by this condition may account for an increase in the pathological use	In March 2020 immediately after a national lockdown in Italy because of COVID-19 pandemic (Time 1) and 3 days before the end of the early 60 days after Stage 1) (Time 2)	308 participants (81.3% female, $N=250$ ; mean age = 35.5, $SD=13.9$ )	Longitudinal research design	Online self-reported survey (Time 1): <ul style="list-style-type: none"> <li>• Demographic information</li> <li>• UCLA Loneliness Scale</li> <li>• Social Media Use Questionnaire</li> </ul> Online self-reported survey (Time 2): <ul style="list-style-type: none"> <li>• IGDS9-SF</li> <li>• Bergen Social Media Addiction Scale</li> </ul>	Loneliness levels longitudinally predicted both gaming and social media addiction during forced social isolation

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TABLE 3. (CONTINUED)

Study	Aim	Time and place	Sample	Study design	Outcome measures	Main outcomes
Sallie et al. <sup>79</sup>	To investigate how COVID-19 social isolation affected online gaming and pornography viewing in the general population	In May 2020, with 80 countries participating; a majority residing in the United States and the United Kingdom, during lockdown restrictions	1,344 participants (24% female, $N = 325$ ; mean age = 28.9, $SD = 12.5$ )	Cross-sectional/correlational research design	Online self-reported survey: <ul style="list-style-type: none"> <li>Demographic information</li> <li>IGDS9-SF</li> <li>CYPAT</li> <li>Amount of overall Internet use before and during quarantine</li> <li>10 factors that may impact COVID-19-related stress</li> <li>TUPI</li> <li>HADS</li> <li>SUPPS-P</li> </ul>	Results showed a significant increase in online gaming and a minor increase in pornography viewing. Those who increased online gaming during quarantine were younger individuals, males, those who left the quarantine household infrequently, those who reported low frequency or poor-quality social interactions, and those with higher depression, anxiety, and urgency impulsivity
She et al. <sup>86</sup>	To test the roles of stress related to schooling during COVID-19 in GD	From September to November 2020 in Hong Kong (China), when the schools were reopened	3,136 participants (51.9% female, $N = 1,627$ ; mean age = 13.6)	Cross-sectional/correlational research design	Online self-reported survey: <ul style="list-style-type: none"> <li>Demographic information</li> <li>IGD 9-item DSM-5 IGD symptoms checklist</li> <li>CES-D</li> <li><i>Ad hoc</i> question on COVID-19 stress</li> <li><i>Ad hoc</i> questions on perceived social support</li> </ul>	Findings from a structural equation model highlight the roles of academic stress, poor social support, maladaptive emotion regulation, and gender to understand how disruption and stress caused by COVID-19 increase adolescent depression and GD
Shrestha et al. <sup>87</sup>	To assess the gaming behavior of medical college students during the lockdown due to the COVID-19 pandemic	Between July and August 2020 in Nepal, during lockdown restrictions	412 participants (52.3% female, $N = 215$ ; mean age = 20.8) recruited from college students	Cross-sectional/correlational research design	Online self-reported survey: <ul style="list-style-type: none"> <li>Demographic information</li> <li>PHQ</li> <li>GAD</li> <li>IGDSF</li> </ul>	During the lockdown period due to the COVID-19 pandemic, the gaming behavior of medical college students increased. Gender and spending more time online per day showed significant associations with greater scores on the GD

(continued)

TABLE 3. (CONTINUED)

Study	Aim	Time and place	Sample	Study design	Outcome measures	Main outcomes
Teng et al. <sup>92</sup>	To examine gaming in the context of the COVID-19 pandemic and its association with depressive and anxiety symptoms	From October to November 2019, before COVID-19 outbreak (Time 1), and from April to May 2020 in China, during lockdown restrictions (Time 2)	1,778 participants (49.3% female, $N = 877$ ; range 6–13) recruited from primary and secondary schools' students	Longitudinal research design	Online self-reported survey: <ul style="list-style-type: none"> <li>• Demographic information</li> <li>• Video game habit questions (number of hours spent on gaming before and during quarantine, type of video games participants engaged in during their gaming experience before and during quarantine)</li> <li>• IGDS9-SF</li> <li>• Perceived COVID-19 impacts</li> <li>• Chinese version of the CES-D</li> <li>• Chinese version of the STAI</li> </ul>	Children and adolescents both increased video game use during the COVID-19 pandemic, but only adolescents significantly increased the severity of GD symptoms. Mediation analyses showed that depressive and anxiety symptoms before the pandemic positively predicted IGD and video game use during the COVID-19 (especially for boys), but not inversely
Ting and Essau <sup>88</sup>	To study the frequency of three addictive-like behaviors (i.e., online gaming, eating, social media) among university students, and their associations with mental health and self-regulation during the COVID-19 crisis	Between September 2020 and October 2020 in Malaysia, when the schools were reopened	178 participants (82% female, $N = 146$ ; mean age = 22.5, $SD = 2.9$ ) recruited from university students (undergraduate or postgraduate) from a public university	Cross-sectional/correlational research design	Online self-reported survey: <ul style="list-style-type: none"> <li>• Demographic information</li> <li>• Time spent on games and social media <i>ad hoc</i></li> <li>• GAS</li> <li>• SMAS-SF</li> <li>• Frequency of food and beverages consumption</li> <li>• mYFAS 2.0</li> <li>• Substance Use Scale adapted from the Malaysia-GSHS</li> <li>• SSRQ</li> <li>• FCV-19S</li> <li>• Kessler Distress Scale (K6)</li> </ul>	There was a significant increment in the duration of time spent on online gaming and social media during the COVID-19 pandemic. Significant positive correlations were found between the three addictive-like behaviors (food, gaming, and social media addiction) and psychological distress. Significant negative correlations were found between self-regulation and the three addictive-like behaviors as well as psychological distress

(continued)

TABLE 3. (CONTINUED)

Study	Aim	Time and place	Sample	Study design	Outcome measures	Main outcomes
Zhu et al. <sup>83</sup>	To study the associations between loneliness and GD behaviors among young people in China during the COVID-19 crisis, and to investigate how familial factors, psychological distress, and gender differences moderate these relationships	In June 2020 in Hong Kong (China), when schools reopened after 6 months of school closures due to the first wave of COVID-19	2,863 participants (52.5% female, $N = 1,502$ ; mean age = 12.6, $SD = 1.3$ ) recruited from primary and secondary school students	Cross-sectional/correlational research design	Online self-reported survey: <ul style="list-style-type: none"> <li>• Demographic information</li> <li>• Chinese children's version of the 7-item GAS</li> <li>• Gaming Time and Mode</li> <li>• <i>Ad hoc</i> question on loneliness</li> <li>• MSPSS</li> </ul>	The prevalence of excessive and pathological game addiction behaviors was 20.9% and 5.3%, respectively. More male students had GD symptoms than female students. Low socioeconomic status, less parental support and less supervision, and poor mental health were risk factors for problematic gaming, especially among primary school students

CAM-5, Children's Anxiety Meter-State; CES-D, Center for Epidemiologic Studies Depression Scale; CIUS, Compulsive Internet Use Scale; CYPAT, Cyber Pornography Addiction Test; DASS-21, Depression, Anxiety and Stress Scale 21-Item Version; DGAS-7, Digital Game Addiction Scale; FCV-19S, Fear of COVID-19 Scale; GAD, Generalized Anxiety Disorder; GAS, Gaming Addiction Scale; GASA, Game Addiction Scale for Adolescents; GSHS, Global School-based Student Health Survey; HADS, Hospital Anxiety and Depression Scale; IGD, Internet gaming disorder; IGDS, Internet Gaming Disorder Scale; IGDS9-SF, Internet Gaming Disorder Scale-Short Form; IGDT-10, Internet Gaming Disorder Test, 10-Item Version; MGUS, Maladaptive Game Use Scale; MSPSS, Multidimensional Scale of Perceived Social Support; MVIAT, Malay version of the Internet addiction test; mYFAS 2.0, Modified Yale Food Addiction Scale Version 2.0; PGSI, Problem Gambling Severity Index; PHQ, Patient Health Questionnaire; RLI, Risky Loot Box Index; *SD*, standard deviation; SMAS-SF, Social Media Addiction Scale Student Form; SSRQ, Short Self-Regulation Questionnaire; STAI, State-Trait Anxiety Inventory; SUPPS-P, Short UPPS-P Impulsive-Behavior Scale; TAD, Test of Anxiety and Depression; TIPI, Ten-Item Personality Inventory; VASC, Videogame Addiction Scale for Children; VGS-A, Video Gaming Scale for Adolescents; VGS-C, Video Gaming Scale for Children; VGS-P, Video Gaming Scale for Parents; VIS, Videogame Involvement Scale; WHO, World Health Organization.

(i.e., being younger than 30 years),<sup>77,79</sup> gender (i.e., being male),<sup>79,87</sup> loneliness,<sup>79,93</sup> maladaptive self-regulation style,<sup>79,88</sup> high impulsivity,<sup>79</sup> depressive and anxiety symptoms before the COVID-19 pandemic,<sup>79</sup> psychological distress,<sup>88,94</sup> low physical activity,<sup>79,94</sup> being unemployed,<sup>94</sup> and being affected by COVID-19.<sup>77</sup> Another two studies reported no significant association between the prevalence of GD and anxiety<sup>85</sup> or being self-isolated or quarantined.<sup>78</sup>

## Discussion

### Principal findings

The present systematic review examined studies conducted to investigate the effects of playing video games during the early stages of the COVID-19 pandemic on stress, depression, anxiety, loneliness, and GD. After applying the inclusion criteria, 24 articles were included and analyzed. Twenty-two studies (92 percent) met the MMAT quality assessment score of 75 percent or above. This suggests that much of the research in this area is of high quality, despite the tight deadlines and limitations forced by the COVID-19 pandemic.

First, regarding the *study design*, this systematic review showed that studies used a quantitative descriptive design in 22 cases (92 percent). In particular, 16 were cross-sectional/correlational studies and 6 longitudinal studies. Two studies (8 percent) adopted instead a mixed-methods design.<sup>18,20</sup>

Second, regarding the *population*, regarding the *gender*, all the studies that emerged from this systematic review involved both males and females, even if in percentage very different from each other. Concerning the nationality, the majority of the studies recruited participants who were residents on the European continent, especially Italy<sup>54,82,95</sup> and the United Kingdom,<sup>18,79,80</sup> North America (i.e., the United States),<sup>17,20,78–80</sup> and Asia.<sup>15,83,85,86,90–92</sup> Most of the studies ( $n=11$ ) recruited young adults (i.e., 18–35 years), 5 studies children (i.e., younger than 12 years old), 10 studies adolescents (i.e., 12–18 years old), 5 studies middle-aged adults (i.e., 36–55 years old), while no studies recruited older adults (i.e., up to 55 years old).

Third, with regard to the *time period*, most of the studies (72 percent) have been conducted during lockdown restrictions following the COVID-19 pandemic, while the remaining eight studies in a period in which no specific stay-at-home restrictions were in effect.

Fourth, regarding the *outcome measures*, all the studies included in this systematic review adopted self-administered questionnaires, and two studies<sup>18,20</sup> also used qualitative measures. All the research adopted online surveys that represented the only way to collect data due to the social contact limitations during the first two waves of the COVID-19 pandemic. Even if self-reported data may be considered reliable,<sup>96</sup> it is essential to underline that such measures may have been subject to bias due to their subjective nature.<sup>97</sup>

Finally, about the *study outcomes*, below are the main results that emerged from this systematic review.

Video games have been helpful in mitigating stress, anxiety, and depression, but not for everyone. From the results of this review, empirical evidence emerged concerning video games' efficacy during the early stay-at-home period following the COVID-19 outbreak for diminishing stress,<sup>18,20,54</sup>

anxiety, and depression<sup>18,20,54</sup> among college students and young adults from the United Kingdom, the United States, and Italy. In particular, in line with previous literature,<sup>45,46,98</sup> AR<sup>20</sup> and online multiplayer games<sup>54</sup> had a beneficial effect in diminishing stress and anxiety.

Besides, studies that emerged from this review reported that the increase in the time spent using online multiplayer games during lockdown restrictions following the COVID-19 crisis had short-term relaxing effects,<sup>54</sup> but resulted in long-term higher stress, anxiety,<sup>54</sup> and depression symptoms<sup>54,80</sup> in problematic gamers,<sup>54</sup> and in individuals with avoidant coping style (i.e., who experienced playing mainly as a way of escaping from unpleasant and stressful circumstances).<sup>80</sup>

Such results appear in line with the compensatory model.<sup>26,27,29</sup> While in general gaming represents a nonproblematic or even healthy coping strategy to alleviate stress, anxiety, and depression,<sup>43,45,68,99–101</sup> it might turn into a maladaptive or problematic one when facing a difficult life situation in individuals more at risk (i.e., problematic gamers and individuals with maladaptive coping styles).<sup>26,27,29,58,102</sup>

Contextually, when facing an overwhelming life experience such as the COVID-19 pandemic, gaming-related relaxation might even be counterproductive and lead to more distress in such types of players.<sup>57,61,103</sup> According to the escaping-the-self theory,<sup>104</sup> it can be speculated that problematic gamers and individuals with avoidant coping styles, by engaging in gaming behaviors to divert their attention from existing problems, may experience greater distress in the long run because the real-life problems remain intact.<sup>80,105</sup>

The dualistic effect of playing video games on loneliness. Two studies that emerged from this review showed that the use of video games during the lockdown restrictions following the first wave of the COVID-19 pandemic reduced loneliness and permitted to maintain social contact among the U.K. and U.S. college students<sup>18</sup> and adults who play AR games.<sup>20</sup> Differently, in another study, the increased time spent playing online multiplayer games during the first lockdown due to the COVID-19 pandemic resulted in enhanced loneliness among middle-aged adults.<sup>17</sup>

These results can be explained based on previous research, reporting that playing video games have a dualistic effect since it can both expand and restrict meaningful social contact.<sup>106</sup> Individuals who feel lonely tend to use online video games to distract from or reduce this feeling.<sup>58,107</sup> Playing video games, particularly online multiplayer ones, may mitigate loneliness when the players engage in gaming freely, authentically, and in balance with other activities or goals in their lives.<sup>108–112</sup> However, it can also lead individuals into a vicious circle with increasing problematic video game use.<sup>108,113</sup>

This possible adverse effect of playing video games on loneliness may be explained on the basis of the time-displacement hypothesis,<sup>114</sup> which underlines that the total time spent on daily activities is constant. Hence, spending more time on a particular online activity results in less time on another.<sup>115</sup> In line with this hypothesis, more leisure time in gaming may reduce the time spent for other life activities, including socializing, and thus, the opportunities of fostering social support.<sup>116,117</sup>

Notably, another study made during the stay-at-home period following the first wave of the COVID-19 pandemic

in German-speaking countries (i.e., Germany, Austria, and Switzerland) showed the crucial role of the motivations to play online multiplayer video games on the perceived sense of loneliness: individuals who play for social interaction experienced less loneliness, while people who play for diversion felt more lonely.<sup>53</sup> This result appears in line with a previous study that underlined how individuals use games, and their dominant motives for gaming might determine factors that can be used to identify beneficial or adverse effects of gaming.<sup>118</sup>

GD has risen among the individuals (especially adolescents) most at risk. From the studies of this review, important differences in the prevalence of GD emerged depending on demographic and cultural factors. The GD prevalence pre-COVID-19 varies according to the screening tool,<sup>119–121</sup> but its global prevalence was estimated at 3.05 percent.<sup>119</sup> In the studies included in this review, higher values were reported, both for children and adolescents and young and middle-aged adults. More in detail, the prevalence of GD symptoms ranged from a minimum of 4.1 percent among middle-aged Japanese adults<sup>77</sup> to a maximum of 19 percent among Italian children and adolescents.<sup>82</sup>

It could be hypothesized that during the early stages of the COVID-19 pandemic, the prevalence of GD increased compared with before, probably, as indicated by some studies, in relation to protracted periods of isolation, technology-based activity, and limited face-to-face interaction.<sup>59,61,119</sup> However, it is important to underline that studies of this review adopted different methods to assess GD. Therefore, such result need a careful interpretation.

In line with what was observed in previous studies,<sup>122–124</sup> in the present systematic review, gender and age differences with regard to GD emerged: potentially problematic gaming symptoms were found to be more likely among males than females<sup>79,87</sup> and among younger gamers.<sup>77,79,82,89</sup> Furthermore, high levels of loneliness and poor social support,<sup>79,83,86,89,93</sup> maladaptive coping regulatory styles,<sup>86,88</sup> and depressive and anxiety symptoms<sup>76,79,83,88,92,94</sup> resulted in risk factors for GD in both young people and adults. Such results support what was reported by previous studies, in which these factors were indicated as risk elements for problematic gaming.<sup>125–127</sup>

With regard specifically to children and adolescents, in support of previous literature,<sup>128–130</sup> GD was associated with unhealthy parental care styles (i.e., nonsupervision, non-discipline, violent discipline).<sup>81–83</sup> Instead, familial support and supervision for video games protected young people from developing problematic gaming behaviors.<sup>81–83</sup> Other risk factors among youth were found to be the addictive gamer profile,<sup>91</sup> academic stress,<sup>86</sup> and excessive use of social networks.<sup>84</sup> Finally, regarding young and middle-aged adults, a greater risk of developing GD symptoms has been observed in individuals reporting low physical activity,<sup>79,94</sup> unemployed,<sup>94</sup> and had been affected by COVID-19.<sup>77</sup> Instead, two studies reported no significant association between the prevalence of GD and anxiety<sup>85</sup> or being self-isolated or quarantined.<sup>78</sup>

### Limitations

This current review summarizes research on the effect of playing video games during the COVID-19 on mental health

based on specific keywords used in the search string, the database included, and the review's time period. Besides, the included studies presented high heterogeneity for the methods used to assess mental health outcomes and the recruited sample regarding age, nationality, and gender. Furthermore, the use of self-reported questionnaires, especially in longitudinal studies, could have led to recall bias. Finally, the study designs adopted by research of this review (i.e., quantitative descriptive and mixed methods) do not allow for drawn detailed conclusions on the causality between game play during the COVID-19 and mental health outcomes.

### Conclusions

To summarize, the present systematic review shows a complex relationship between the effects of playing video games on stress, anxiety, depression, loneliness, and GD during the early stages of the COVID-19 pandemic. Video games, particularly online multiplayer and AR games, mitigated stress, anxiety, depression, and loneliness during stay-at-home restrictions among adolescents and young adults. However, in the case of at-risk individuals (i.e., especially male youth), playing video games had detrimental effects on stress, anxiety, depression, loneliness, and GD symptoms.

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*(Appendix follows →)*

Appendix Table A1. Quality Assessment Scores  
Using the Mixed Methods Appraisal Tool

Study	4. Quantitative descriptive					5. Mixed methods					Overall score
	4.1	4.2	4.3	4.4	4.5	5.1	5.2	5.3	5.4	5.5	
Barr and Copeland-Stewart <sup>18</sup>						Yes	No	Yes	Yes	No	3
Cheng et al. <sup>80</sup>	Yes	Yes	Yes	Yes	Yes						5
Claesdotter-Knutsson et al. <sup>94</sup>	Yes	No	Yes	Yes	Yes						4
Cuong et al. <sup>81</sup>	Yes	Yes	Yes	Yes	Yes						5
De Pasquale et al. <sup>76</sup>	Yes	No	Yes	Yes	Yes						4
Donati et al. <sup>82</sup>	Yes	Yes	Yes	No	Yes						4
Ekinci et al. <sup>89</sup>	Yes	No	Yes	Yes	Yes						4
Ellis et al. <sup>20</sup>						Yes	Yes	Yes	Yes	Yes	5
Giardina et al. <sup>54</sup>	Yes	Yes	Yes	No	Yes						4
Galán et al. <sup>84</sup>	Yes	Yes	Yes	No	Yes						4
Hall et al. <sup>78</sup>	Yes	Yes	Yes	Yes	Yes						5
Ismail et al. <sup>85</sup>	Yes	Yes	Yes	Yes	Yes						5
Kim and Lee <sup>91</sup>	Yes	Yes	Yes	No	Yes						4
Kim et al. <sup>90</sup>	Yes	Yes	Yes	No	Yes						4
Nebel and Ninaus <sup>53</sup>	Yes	Yes	Yes	Yes	Yes						5
Nguyen et al. <sup>17</sup>	Yes	Yes	Yes	No	Yes						4
Oka et al. <sup>77</sup>	Yes	Yes	Yes	Yes	Yes						5
Rogier et al. <sup>93</sup>	Yes	No	Yes	Yes	Yes						4
Sallie et al. <sup>79</sup>	Yes	Yes	Yes	Yes	Yes						5
She et al. <sup>86</sup>	Yes	No	Yes	Yes	Yes						4
Shrestha et al. <sup>87</sup>	Yes	No	Yes	Yes	Yes						4
Teng et al. <sup>92</sup>	No	No	Yes	No	Yes						2
Ting and Essau <sup>88</sup>	Yes	Yes	Yes	Yes	Yes						5
Zhu et al. <sup>83</sup>	Yes	Yes	No	Yes	Yes						4