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REVIEW ARTICLE

Review manuscript: Emotional regulation in Gaming Disorder: A systematic review

Francisco J. Estupiñá PhD | **Mónica Bernaldo-de-Quirós PhD** | **Marina Vallejo-Achón Msc** | **Ignacio Fernández-Arias PhD** | **Francisco Labrador PhD**

Faculty of Psichology, Universidad Complutense de Madrid, Madrid, Spain

Correspondence
Francisco J. Estupiñá, PhD, Facultad de Psicología, Campus de Somosaguas S/N, Pozuelo de Alarcón, CP28223, Madrid, Spain.
Email: fjepuig@ucm.es

Abstract

Background and Objectives: Problematic video game use is a source of concern. In addictions, difficulties with emotional regulation have become an important variable of interest. However, their study in relation to problematic video game use remains insufficient.

Methods: A systematic review was conducted following PRISMA 2020 guidelines; 322 studies were screened, resulting in a final sample of $k = 18$ studies. The methodological quality of these studies was rated as moderate according to the McMaster Critical Review Form for Quantitative studies (CRF-Q).

Results: There is evidence of relationship between different facets of emotional regulation and the presence of problematic video game use. Particularly, video games serve as escape strategy for suppressing emotional expression. There is no consensus regarding the nature of the relationship between emotional regulation, psychopathology, and problematic video game use, with various proposals suggesting moderation and mediation. There is also no consensus regarding the mediation of gender in the relationship between emotional dysregulation and problematic video game use. The level of certainty regarding the validity of the results was moderate.

Discussion and Conclusions: Emotional dysregulation plays a role in problematic video game use, especially through strategies as emotional suppression, and lack of abilities to understand and control emotions. It is important to consider emotional regulation as a potential target for research and intervention in clinical populations.

Scientific Significance: We review the largest sample of papers on problem gaming and emotion regulation to date. Our results highlight the importance of emotion regulation and, specially, emotional suppression, or negative escapism, on problematic video game use.

INTRODUCTION

Video games have become a thriving leisure activity, particularly among adolescents and young people. Its rapid growth is facilitated by the availability of a wide variety of increasingly appealing video games, greater accessibility to these video games through various devices, and widespread social acceptance.[1] Currently, video games are likely the primary leisure activity among adolescents.[2] Globally, there are approximately 3 billion people who play video games, spending around 8 h per week playing video games.[3] A significant percentage of these people who play video games are children and adolescents, with video gaming observed in approximately 90% of this population.[4]

While the majority of people who play video games demonstrate responsible use, an increasing number of studies indicate that a certain percentage of people exhibit problematic use of video games (PUVG).[5] This has raised significant social concern, as it has been observed that PUVG particularly affects adolescents.[6] In addition to the inherent dangers of PUVG, numerous studies have associated it with the presence of psychopathological, familial, and social problems. Taking this situation into consideration, Internet Gaming Disorder (IGD) was included as a diagnostic category for research purposes in Section III of the DSM-5.[7] Furthermore, the World Health Organization (WHO) included Gaming Disorder (GD) in the eleventh revision of the International Classification of Diseases (ICD-11).[8] Throughout this study, IGD will be used to refer to the population that meets diagnostic criteria for the disorder according to the ICD or DSM, while PUVG will refer to the population that exhibits problematic behaviors assessed through non-diagnostic means, which may include subclinical behaviors.

Determining the prevalence of PUVG poses a challenge due to variations in problem definition, assessment methods, and instruments,[5,9] resulting in a wide range of reported prevalence rates. As a reference, a systematic review and meta-analysis[10] found a global prevalence of IGD to be 3.05%, with the highest prevalence rates identified in adolescent populations and Asian countries, with a male-to-female ratio of 2.5:1. A specific review focusing on children and adolescents,[5] found a prevalence rate of 2.0%.

Like other addictions, research has focused on identifying factors related to, or predictive of, PUVG behavior. It has been consistently observed that IGD is more prevalent among males,[11] with adolescence being the period of highest vulnerability.[12] Other studies have examined predictors related to gaming habits, particularly the number of hours spent on video games as a risk factor, although consensus on this matter is lacking.[13] This line of research has also explored potential risk factors associated with the type of device (cell phone, gaming console, computer), connection (online vs. offline), location (home, transportation, and school), or type of video game used. Massively Multiplayer Role-Playing Games (MMORPGs) have frequently been highlighted as particularly problematic.[14] Additionally, other studies have focused on identifying the importance of underlying processes in gaming behavior, ranging from more general aspects to more specific ones such as cognitions related to video games[15] or the maladaptive socializing function of video games.[12] These investigations have contributed to identifying risk factors and establishing predictive models and intervention programs for IGD. However, to date, their scope is limited, prompting researchers to seek other explanatory factors with greater weight in relation to PUVG. In this endeavor, emotional regulation processes have shown particular relevance in explaining both normal and problematic video gaming behavior.

While emotion regulation is receiving a great deal of attention, a generally accepted definition is missing.[16] On the one hand, much of the existing research focuses on emotion regulation *abilities*, like emotion awareness or acceptance[17]; on the other hand, emotion regulation can be approached as a set of *strategies*, like rumination, or avoidance.[18] Both perspectives can be effectively integrated, and both interact with biological vulnerabilities and environmental and contextual characteristics.[16] Taken as a whole, emotion regulation abilities and strategies would comprise the processes of awareness of emotions; comprehension of emotions; cognition—emotion interaction; and modulation of emotional states, with this last process reflecting the more common understanding of emotional regulation.[19]

Individual differences in emotion regulation may underlie multiple psychopathological problems, including addictive disorders.[17] Differences in gender-associated emotional regulation strategies have also been identified. For example, Nolen-Hoeksema and Aldao[20] indicate that women generally use more emotional regulation strategies, especially rumination, which may explain higher rates of depression in women compared to men. Conversely, men tend to use more suppressive strategies, while women are more inclined to compensate for maladaptive regulation strategies with adaptive ones.

Emotional regulation problems have also been identified in addictive disorders, which are related to this study. Heatherton and Baumeister[21] proposed long ago that addictive and compulsive behaviors could be mediated by avoidance-based emotional regulation strategies in their origin, and rumination in their maintenance. Different theoretical conceptions of addictions have scored the centrality of negative reinforcement[22] or experiential avoidance[23] as key issues to explain abuse. In the field of behavioral addictions, the construct of escapism has been proposed as candidate to play a central role in the development of addictions,[24] which may resemble a strategy for emotional regulation based on avoidance and suppression. Nonetheless, escapism is a more complex construct, with positive (self-expansion) and negative (self-suppression) facets.[25]

More recent studies confirm a connection between emotional regulation difficulties and addictive behaviors in both men and women, regardless of age.[26] This relationship becomes especially important in studies highlighting the positive results of therapeutic interventions targeting emotional regulation mechanisms in individuals with addictions.[27] In substance addictions, it is possible that the effect of a substance may explain, at least in part, the alteration in emotional regulation mechanisms. However, these mechanisms of emotional regulation may also be affected in behavioral addictions such as PUVG, in which anger and alexithymia play a central role.[28] The importance of these emotional regulation mechanisms has also

been highlighted in problematic use of new technologies. Quaglieri et al.[29] concluded that the "fear of missing out," or FOMO, interacts with emotional regulation problems in individuals with pathological behaviors related to the internet and social media. Thus, it seems logical to consider the existence of shared underlying mechanisms in these problems.

Given the significant relationship between alterations in emotional regulation and addictive problems, it is reasonable to think that these disturbances may have a relevant role in the development and maintenance of PUVG. This is particularly true considering that PUVG is systematically associated with problems in which this alteration is present, such as anxiety disorders, depression,[30] suicidal ideation, attempts and behaviors, as revealed by a recent systematic review.[31] Therefore, the connection between disruptions in emotional regulation and PUVG is reinforced. Additional support stems from research on "serious games," which employ video games as a means of training emotional regulation and have shown promising outcomes.[32] These collective findings underscore the involvement of regulatory processes that influence both typical gaming behavior and IGD.

The present study

Furthermore, it is important to specifically understand if there are specific alterations in emotional regulation and what processes moderate and mediate their relationship with PUVG. By advancing and deepening our comprehension of these processes, we can establish more intricate explanatory models and explore novel therapeutic and preventive alternatives that effectively target these mechanisms.

Therefore, the objective of this study is to explore recent literature to review findings on the relationship between emotional regulation and PUVGs.

METHOD

To achieve the objectives of the present study, a systematic review was carried out according to the PRISMA 2020 recommendations.[33] The research question was operationalized using the SPIDER tool,[34] as reflected in Table 1. SPIDER was chosen over PICO and its derivatives since the area of interest was not expected to include interventional studies.

The research question in natural language was summarized as: "which variations, alterations or dysfunctions in emotional regulation mechanisms do people who play video games often, in excess or in a pathological way, experiment?".

Eligibility criteria

Inclusion and exclusion criteria were defined and are summarized in Table 2.

TABLE 1 Research question produced through the SPIDER tool.

Sample	Gamers (pathological or not), video game players, patients diagnosed of Internet Gaming Disorder
Phenomenon of Interest	Emotional regulation
Design	Observational studies, including laboratory studies or studies based on standardized tests (not systematic reviews)
Evaluation	Emotional regulation strategies, emotional regulation process, emotional regulation results
Research	Quantitative studies

Information sources

Pubmed/Medline, Psycinfo and the Web of Science core collection were chosen as data bases for conducting the publication search. All databases were searched, and information was retrieved on March 6, 2022.

Search strategy

The search strategy was tailored to each of the databases used, and the final search strings for each database can be found in Table 3 for reference.

All search strings included the inclusion and exclusion criteria that could be implemented within the search tools used. The remaining inclusion and exclusion criteria were applied during the selection process.

Selection process

The first author (F. E.) performed all the searches and synthetized them in a single document which displayed basic bibliographical information for each candidate, including title and abstract. Exclusion criteria were also available for display and coding. The second, third and fifth authors read each title and abstract and marked each paper as included or excluded, coding the reasons for exclusion. Duplicates were ruled out. In case of disagreement among the reviewing authors, F. E. considered reasons for and against inclusion and made the final call for this stage. When the process with title and abstract was inconclusive, papers made it to the next stage.

In the second stage, selected papers' full texts were obtained and thoroughly examined by two authors. Each pair of authors independently applied the inclusion and exclusion criteria to the assigned papers. In the event of discrepancies, the authors discussed the papers and reached a consensus on whether to include or exclude them. Excluded papers were coded within defined categories.

The general flow of the process is outlined in Figure 1.

TABLE 2 Inclusion and exclusion criteria.

Inclusion criteria:	Exclusion criteria:
– Individual empirical studies – Sample of video game players: • adult, adolescent, or youth • occasional, at risk or pathological players – Observational studies with objective measures, based on laboratory tasks or psychometric testing – Published after 2013 – Published in English and Spanish – Published in peer—reviewed journals	– Studies that employ videogames to intervene on the emotional regulation process ("serious games") – Studies that employ videogames to assess emotional regulation strategies in nongamers – Studies that focus on neuroimaging techniques or with a neurological perspective – Systematic reviews – Interventional studies – Published before 2013 – Thesis, reports, and other nonpeer-reviewed documents

TABLE 3 Search strategies in each of the data bases.

Psycinfo	(noft(emotional regulation) AND noft (gaming OR video games OR gamers)) AND PEER (yes) AND pd (>20130101)
PubMed/Medline	emotional regulation"[Title/Abstract] OR "emotion regulation"[Title/Abstract]) AND ("video games"[Title/Abstract] OR "gaming"[Title/Abstract] OR "gamers"[Title/Abstract]) AND (2013/01/01:3000/12/12[Date—Publication] AND ("english"[Language] OR "spanish"[Language])) AND ((("emotional regulation"[Title/Abstract] AND "video games"[Title/Abstract]) OR "gaming"[Title/Abstract] OR "gamers"[Title/Abstract]) AND (2013/01/01:3000/12/12[Date—Publication] AND ("english"[Language] OR "spanish"[Language]))))) AND ((2013:3000/12/12[pdat]) AND (english[Filter] OR spanish[Filter]) Filters: English, Spanish, from 2013 – 3000/12/12
Web of Science	TS = emotional regulation AND (TS = gaming OR TS = video games OR TS = gamers) Timespan: 2013-01-01 to 2022-03-06 (Publication Date)

Data collection process and data items

A data collection process was defined in which a pair of authors—the same two authors that assessed inclusion and exclusion criteria—separately filled a data sheet including: study authors, country, and year; study design; sample size and characteristics (age mean and range, percentage of male participants; sample origin); measures; main quantitative results; and study conclusions. Each pair of authors then reviewed both data sheets and discussed whatever discrepancy until a consensus was reached.

Study risk of bias assessment

All selected studies were assessed with the McMaster Critical Review Form for Quantitative studies (CRF-Q)[35] which can be used across different quantitative designs. For each study, separate criteria were addressed individually, and, as synthesis, the percentage of positive criteria was calculated. While methodological quality is complex and cannot be summarized as a global index, offering a synthesis was deemed useful for readers since the failure to meet even a single basic criterion may completely undermine a study. Again, the same pair of authors assessed each paper independently, and later discussed all discrepancies until a consensus was reached.

Synthesis methods

After data collection and risk of bias assessment were complete, all authors read all studies and materials, and a discussion session, guided by the first author, took place to facilitate studies' exploration and data synthesis. Methodological differences (laboratory vs. psychometric studies; and within these, according to different emotional regulation assessment instruments) were used to present data in a coherent, tabulated way. Furthermore, for each of the study questions, studies that provided relevant data were considered, examining whether they supported one relationship over another and assessing the magnitude of these relationships.

Reporting bias assessment

Reporting bias was assessed indirectly, through the analysis of countries in which the sample was collected; studies first authors; and publication journals. Variability and homogeneity were considered as indices of possible reporting bias.

Certainty assessment

Certainty was assessed using GRADE criteria for quality of evidence in systematic reviews.[36] The whole set of studies was explored for

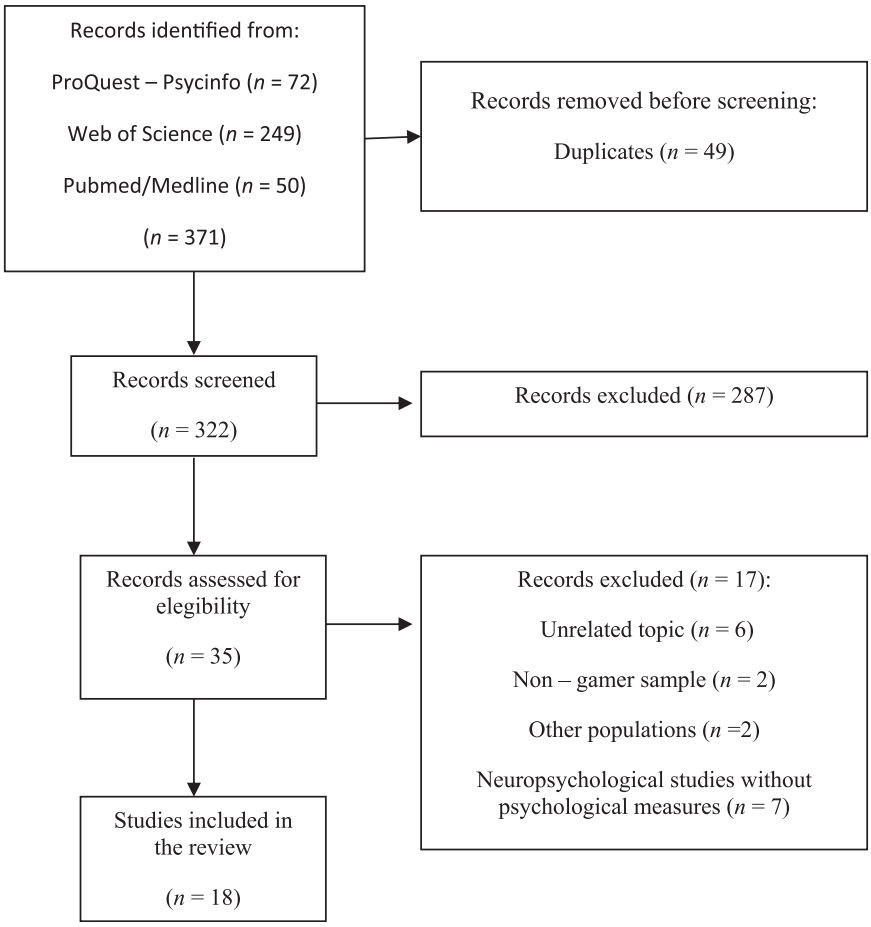

FIGURE 1 Systematic review flow diagram. No studies were dropped because of document availability issues.

limitations in study designs, inconsistency of results, indirectness of evidence; imprecision; and publication bias, as factors that could reduce the overall quality of evidence; and for large effects, dose–response gradients; and evidence of irrelevance for confounding variables.

RESULTS

Eighteen studies were included after the search process. The characteristics and conclusions of these studies are reported in Table 4.

The 18 studies included in the analysis were assessed using the CRF-Q scale. The scores on this scale ranged from 6 to 12 positive criteria out of a possible 16 points. The mean score was 8.9 (SD = 1.2), representing a range of 53.9%–92.2% of applicable criteria. The modal value was 61.5%. Globally, methodological quality was poor, with some systematic problems arising; the justification of the sample size was frequently absent, given the over reliance on probabilistic surveys. Reliable and valid measures were used, but psychometric data from specific populations was underreported. Clinical significance of the results was also lacking.

Some studies recruited heterogeneous groups, with subjects of up to 64 years of age. Outliers were present and rarely controlled. Male participants were overrepresented in most studies. Great differences in sample size were observed, with a range between 126 and 1536 participants.

The difficulties in emotion Regulation Scale (DERS) and the Emotion Regulation Questionnaire (ERQ) were the most frequent psychometric tools employed, with 9 and 4 studies each. Laboratory tests were used scarcely. Self-control and impulsivity were often employed as proxies for emotional regulation, with validity issues arising from this practice.

Detailed methodological ratings can be seen at Table 5.

Publication biases

Regarding the origin of the samples, 11 of the studies come from European countries, five from Asia and four from North America (although none from México). One study came from Turkey, the only midwestern country that produced studies on this review. No studies from African, Oceanic or Latin American countries were included. Taiwan was the country that contributed the most

TABLE 4 Results of the studies included in the review.

Reference	country	Participants	Dependent variables and instruments	Main results	Conclusions
Amendola[37]	Italy	*N* = 280 Age: 11-18 (*M* = 13.31; Sd = 2.33) 51.1% men Students	-ER (DERS)-IGD (CSAS. IAT)	- Significant association between ED and PUVG ($r = 0.372$; $p < .001$).-"Strategies" and "nonacceptance" of the DERS and being male explained 29% of the variance of the CSAS.- Significant differences in the DERS between age groups (11-12; 13-15; 16-18) ($F = 16.90$; $p < .001$).	- Lack of strategies of ER and nonacceptance of emotions significantly predicted PUVG.
Caro[38]	UK	*N* = 667 Age: 16-64 (*M* = 25.65; Sd = 7.59) 70.62% men Gamers	-ER (ERQ)-Gaming and life stressors (GDLS)-Motivations (MOGQ)-Coping Self Efficacy	- Time spent gaming was positively correlated with expressive suppression ($r = 0.123$; $p < .05$) and negatively correlated with cognitive reappraisal ($r = -0.071$; $p < .05$) and coping self-efficacy ($r = -0.122$; $p < .05$).-Significant bivariate associations between total GDLS and: cognitive reappraisal ($r = -0.117$. $p < .05$). expressive suppression ($r = 0.126$. $p < .05$) and coping self-efficacy ($r = -0.202$. $p < .01$).- GDLS was significantly predicted ($R^2 = 0.123$; $F = 17.97$; $p < .01$) by younger age ($\beta = -.161$). time spent gaming ($\beta = .220$) and coping self efficacy ($\beta = -.161$).	-Maladaptive ER (cognitive reappraisal and expressive suppression) and lower coping self-efficacy were associated with gaming during difficult life situations. Only lower coping self-efficacy was a significant predictor through the GDLS.
Chih-Hung[39]	Taiwan	*N* = 207 Age: 20-38 Gamers with IGD. Regular gamers and nongaming controls	-EI, Depression, anxiety andimpulsivity (clinical scales) IGD (DSM-5)-Psychiatric comorbidities (diagnostic interview)	-Lower values in total EI and in all its facets among players (t from −2.77 to −7.63; $p < .001$), particularly in self-control and wellbeing.- Individuals with IGD and comorbid generalized anxiety disorder (GAD); social anxiety disorder (SAD); or major depressive disorder (MDD) had lower trait EI in all subscales and experienced more severe depression and anxiety. - ADHD. GAD. SAD and MDD were more prevalent in gamers with IGD than among healthy controls.	Inadequate EI could make gamers have difficulty in coping with emotional problems and use online gaming to escape from these problems.
Dang[40]	China	*N* = 282Age: 18-27 (*M* = 20.47; Sd = 1.15) 60% women students longitudinal study	-EI (WLEIS)-IGD (DSM-5)-Coping Flexibility (CFS)-Psychopathological symptoms (DASS-21)	- WLEIS measured at baseline correlates with the PUVG tendency measured at baseline ($r = -0.14$; $p < .05$) and year later ($r = -0.23$; $p < .05$).- Path analysis: Trait EI had a significant indirect effect on PUVG tendency through depression (− 0.08 [95% CI = − 0.14; −0.03]) and coping flexibility and depression (−0.05 [95% CI = −0.08; −0.02]).	- Empirical support for indirect protective effects of trait EI and coping flexibility with respect to PUVG.-PUVG has an indirect correlation with depression.

TABLE 4 (Continued)

Reference	country	Participants	Dependent variables and instruments	Main results	Conclusions
Di Blasi[41]	Italy	*N* = 390 Age: over 18 (*M* = 28.28; Sd = 8.24) 74.1% men WoW players	-ER (DERS-18)-Internet Addiction (IAT-WoW)-Motivations (MPOGQ-WoW; includes "escapism" factor)	-DERS-18 correlates with escapism ($r = 0.43$. $p < .001$) and with IAT-WoW ($r = 0.39$. $p < .001$).-Direct relationship between escapism and PUVG ($r = 0.4$. $p < .001$). Relationship between ED and escapism ($r = 0.56$. $p < .001$).- Structural equation modeling: Indirect relationship between ED and PG ($r = 0.25$. $p < .001$), mediated by escapism.-The main contributions to escapism were avoidance ($r = 0.80$. $p < .001$) and escape ($r = 0.84$. $p < .001$).	- ED indirectly predicts PG severity.-Excessive gaming would be a maladaptive strategy to deal with negative emotions outside the gaming context by means of playing VGs.
Estévez[42]	Spain	*N* = 472 Age: 13-21 (*M* = 15.6; Sd = 1.33) 51.6% women Students	-ER(DERS)-Video game addiction (VGEQ)-Problematic Internet Use (IEQ)-Addictive Behaviors (Multicage CAD-4)-Gambling Disorder (SOGS-RA)-Attachment (IPPA)	-Correlations between ER and PUVG: total ED ($r = 0.27$. $p < .01$). nonacceptance ($r = 0.19$. $p < .01$). clarity ($r = 0.22$. $p < .01$). control ($r = 0.26$. $p < .01$).-Blockwise regression: two subscales of DERS: clarity ($B = 0.33$; - Relationship exists between facets of ED (lack of clarity, difficulties to control) and PUVG in a non-clinicalnonclinical sample. $\beta = .15$; $t = 2.12$. $p < .05$) and control ($B = .14$; $\beta = .14$; $t = 1.98$; $p < .05$) in a regression model ($R = 0.42$. $R^2 = 0.18$; R^2 adjusted = 0.17; $p < .01$) were significant predictors of VGA.	- Relationship exists between facets of ED (lack of clarity, difficulties to control) and PUVG in a nonclinical sample.
Estévez[43]	Spain	*N* = 1316 Age: 12-30 (*M* = 17.28; Sd = 2.70) 57.4% men 9.7% PVG	-ER (DERS) addictive behaviors (Multicage CAD-4)-Psychopathological symptoms (SCL-90-R)	-Significant correlations between PUVG and DERS lack of control ($r = 0.06$; $p < .05$). confusion ($r = 0.06$; $p < .05$) and total ED ($r = 0.07$; $p < .05$). -Mediational effect of ED between PUVG and psychopathology in the Sobel test: significant values for neglect and all facets of SCL-90-R (values around $Z = 2.20$) and significant values for confusion and facets of SCL-90-R of anxiety; somatization; Obsessive-compulsive; interpersonal sensitivity; paranoidism; psychoticism (values around $Z = 1.96$)	-Perfect mediation in anxiety, somatization, interpersonal sensitivity, and psychoticism.-Partial mediation effect in the remaining four.-No effect in depressive symptomatology.
Gaetan[44]	France	*N* = 159 Age: 10-18 (*M* = 14; Sd = 2)52% men	-ER (ERQ)-Emotional intensity (AIM)-Emotional Expressivity (EES)-Alexithymia (BVAQ)	-Regular VG players showed significant higher score on ED (ERQ), regardless of strategy ($t = 9.5$; $p < .05$), higher score on global intensity of emotions (AIM) ($F = 2.06$; $p < .01$; $\eta^2 = 0.01$), lower score in emotional expressiveness (EES) ($F = 6.03$. $p < .01$; $\eta^2 = 0.07$) and higher score in alexithymia ($F = 8.89$; $p < .01$; $\eta^2 = 0.1$)	-Regular gamers regulated their emotions more than casual gamers; felt their emotions more intensely, expressed their emotions less and their levels of alexithymia were higher.

(Continues)

TABLE 4 (Continued)

Reference	country	Participants	Dependent variables and instruments	Main results	Conclusions
Hollett[45]	Canada	*N* = 928 Age: 19-63 (*M* = 25.6; Sd = 6.5) 61.7% men 88% Caucasian players	-ER (DERS)-IGD (PVP)	-The sequential regression model that included the 6 DERS subscales explained 15% of the PUVG variance (*F* (6.871) = 26.259; delta R^2 = 0.149; *p* < .001), in addition to that explained by gender and age; difficulties with impulse control (*t*(870) = 4.056; *p* < .001) and the perception of limited access to ER strategies (*t* (869) = 2.766. *p* = .006).-Gender did not significantly moderate the relationship between PVP and DERS in any of its subscales.	-All dimensions of the DERS were associated with PUVG.-Difficulties with impulse control and perception of limited access to ER strategies were significant predictors.
Liau[46]	Singapore	*N* = 253272.8% men Elementary and secondary students from grades 3, 4, 7, and 8. Longitudinal study	-Personal strengths (including ER) (PSI-2)IGD (DSM-5)-Family factors (a parent-family connectedness scale)-Depressive symptoms (Asian Adolescent Depression Scale)	-Linear regression on IGD reveals emotional awareness (*B* = −0.2 (Se = 0.07); *p* < .01); and ER (*B* = −0.25 (Se = 0.06); *p* < .01) as predictors.-Logistic regression on IGD: emotional awareness (OR = 0.53 95% CI (0.38; 0.74); *p* < .01); ER (OR = 0.61 95% CI (0.45; 0.83). *p* < .01). -Structural equation modeling: changes in ER predict changes in IGD at time 3 (***ψss*** = − 0.20. *p* < .05)	-Increases over time in levels of ER were associated with decreased levels of problem gaming on the third measure.-Work on ER shows promise as a strategy for intervention in IGD
Liese[47]	USA	*N* = 689Age: 18-31 (*M* = 18.99; Sd = 1.29)34.8% men Students	-ER (DERS)-Potentially Addictive Behaviors (DSM-5)-Attachment (ECR)	- Mediation analyses: ED was significantly associated with the number of self-reported PUVG symptoms when controlling for anxious (*B* = 0.4 [Se = 0.01]; 95% CI (0.01; 0.07]) and avoidant attachment (*B* = 0.4 [Se = 0.02]; 95% CI [0.01; 0.07]).	-ED was related to PUVG. It also mediated the relationship between anxious attachment style and PUVG. This mediation did not occur between avoidant attachment style and PUVG.
Lin[48]	Taiwan	*N* = 207 Age: 20-38 (*M* = 25.59; Sd = 3.92) Gamers with IGD. regular gamers and nongaming controls	-ER: (ASQ)-IGD (DSM-5)-Depression (CESD)-Hostility (BDHIC-SF)	-Significantly lower score in the emotion adjustment score in the IGD group than in the control group and the regular gamer group (F_2 = 11.546; *p* < .001).-Logistic regression analysis: In the IGD group emotion adjustment was negatively correlated with depression and hostility; emotion concealment was negatively correlated with hostility (*r* = −0.469; *p* < .001); and emotion tolerance was negatively correlated with depression (*r* = −0.299; *p* = .013).	-Emotion adjustment is significantly negatively associated with IGD. Depression and hostility mediated the association.-Emotion concealment was also positively associated with IGD. Emotion adjustment moderated the association.
Marchica[30]	Canada	*N* = 1536Age: 18-27 *M* = 20.77; Sd = 2.73.45% men Gamers IGD. Depression; Dep + IGD. and controls	-ER (DERS)-Mindfulness (FFMQ-SF)-IGD (IGDS9-SF)-Depression (PHQ-9)-	-IGD-only group: issues with greater impulse control when upset (OR = 2.76; Wald v2 [1] = 18.87; *p* < .001); and difficulties with identifying emotions (OR = 1.87; Wald v2	-The clinical groups (IGD. depression. and Dep + IGD) reported greater ER difficulties, higher impulsivity and lower mindfulness.-Relative to the IGD +

TABLE 4 (Continued)

Reference	country	Participants	Dependent variables and instruments	Main results	Conclusions
			Impulsivity (Barratt Impulsiveness Scale)	[1] = 8.17; p = .004). Difficulties with goal-directed behavior when upset (OR = 0.71; Wald v2 [1] = 3.87; p = .049) were associated with a modest decrease in the likelihood of being in the IGD-only group.- Dep + IGD group: greater video gaming frequency (OR = 1.05; Wald v2 [1] = 12.41; p < .001). elevated impulsivity (OR = 3.65; Wald v2 [1] = 12.26; p < .001); difficulties with identifying emotions (OR = 2.63; Wald v2 [1] = 11.39; p = .001). and lower present awareness (OR = 0.44; Wald v2 [1] = 5.93; p = .015).	depression group, the other two clinical groups had fewer difficulties with cognitive impulsivity, whereas the depression group reported more difficulties with strategy use.
Muller[49]	France	N = 201Age: 12-25 (M = 19.02; Sd = 4.2) 63.18% male problematic gamers (PGs), nonproblematic gamers (NPGs) and nongamers (NGs)	-ER (PANAS, DERS, ERQ-CA, and IRQ)-IGD: GAS and game frequency-Avatar identification (PAIS)-Identity (DIDS. U-MICS. and EPSI)	- Emotional factors associated with PUVG were: negative affect (NA) (p = .032) from the PANAS; expressive suppression (p = .030) from the ERQ-CA; lack of emotional awareness (p = .006) and lack of emotional clarity (p = .003) from the DERS.- Logistic regression analyses of PUVG by gender. a) In females. lack of emotional clarity (OR = 1.23 IC 95% [1.01; 1.51]. p = .044), and interpersonal emotion regulation (OR = 0.88 IC 95% [0.81; 0.96]. p = .004) were associated with IGD; b) in males, negative emotions (OR = 1.10 IC 95% [1.01; 1.19]. p = .023), lack of emotional awareness (OR = 1.13 IC 95% [1.03; 1.25]. p = .012), lack of emotional clarity (OR = 1.17 IC 95% [1.04; 1.32]. p = .008). suppressive expression (OR = 1.08 IC 95% [0.96; 1.24]. p = .023). were associated with PUVG.	-PGs had higher scores in lack of emotional consciousness, lack of emotional clarity and expressive suppression, while also having lower scores in cognitive reappraisal and interpersonal emotion regulation than NPGs or NGs.-PGs factors associated with IGD differed by gender.
Sallie[50]	United Kingdom	N = 1344 Age: 18-90 (M = 28.93; Sd = 12.46) 74.7% males	-Impulsivity (SUPPS-P)-IGD (IGDS9-SF)-Anxiety and depression (HADS)-Personality: (TIPI)-COVID-19-related stress factors (scale ad hoc)	-Positive relation between PUVG severity and depression (r_s = 0.24; p < .0001), anxiety (r_s = .3; p < .0001), positive urgency (r_s = .22; p < .0001), and negative urgency (r_s = .4; p < .0001). controlling for age and gender.	Those who increased PUVG (63%) during quarantine were younger. left the quarantine household infrequently. reported poor-quality social interactions. and higher depression. anxiety. and Positive urgency impulsivity.- Negative emotionality and stress reduction are relevant to behavioral addictions disorders.

(Continues)

TABLE 4 (Continued)

Reference	country	Participants	Dependent variables and instruments	Main results	Conclusions
Stenseng[25]	Norway	*N* = 126Age: (*M* = 18.3; *Sd* = 3.15)Gamers	-ER (Escapism Scale and PANAS)-IGD (IGDT-10)-Trait Self-Control (Brief Self-Control Scale)	-Facets of escapism: Substantially overlapping between Self-suppression (SS) and IGDT-10 ($r = 0.53$; $p < .01$). Self-expansion (SE) was uncorrelated to PUVG ($r = 0.11$; $p = .25$).-Strong correlation ($r = 0.74$; $p < .001$) between SS and the Escape item of IGDT-10.-Escapism and trait self-control: SS was negatively correlated to trait self-control ($r = 0.40$. $p < .01$).	-In the gaming sample, self-expansion was related to positive psychological outcomes from gaming, whereas self-suppression was substantially overlapping with Internet Gaming Disorder (IGDT-10) and negative psychological outcomes.- The two dimensions of escapism suggest that there are two motivational paths leading to such engagement in these activities.
Ucur[51]	Turkey	*N* = 1067Age= 12-18 (*M* = 14.7; Sd = 1,8)47.7% male Problematic and nonproblematic gamers	-ER (DERS)-IGD (GAS)-Social support (MSPSS)	-The mean scores of DERS ($F = 14.59$; $p < .001$) and all DERS subscales were significantly higher in the PUVG group than in the control group (for all sub scales except awareness. $p < .001$; for awareness $p = .033$). -PUVG was significantly positively correlated with male gender ($r = 0.181$; $p < .001$) and DERS total score ($r = 0.234$; $p < .001$).-PUVG was significantly negatively correlated with MSPSS total score ($r = 0.129$; $p < .001$).-Regression: High DERS total score was associated with PUVG (*OR* = 1.03; 95% CI [1.02; 1.04]; $p < .001$).	-Male gender, high ED and low perceived social support were significantly associated with PIG.-Adolescents with PIG were unaware of emotional responses, lacked emotional clarity, did not accept their negative emotions, had difficulty in developing effective strategies to regulate their emotions, could not control their impulsive behaviors and could not continue goal-directed behavior when they experienced negative emotions.
Yen[52]	Taiwan	*N* = 174Age: 20-30 (*M* = 23.3; *Sd* = 2.34)Students with and without IGD	-ER (ERQ)-IGD (DSM-5)-Depression. Hostility and Anxiety (CES-D. PSWQ. BDHIC-SF)	-IGD group had significantly lower cognitive reappraisal strategies ($t = -2.64$; $p = .009$; OR = 0.91; 95% CI [0.85; 0.97]) and greater expressive suppression strategies ($t = 2.29$; $p = .02$; OR = 1.14; 95% CI [1.04; 1.25]).-Multiple linear regression analysis: ED significantly predicted depression, anxiety, or hostility of subjects in IGD group. The model explained 19% of the variance in depression ($R^2 = 0.19$. F (5.81) = 3.74). Cognitive reappraisal significant predicted depression ($B = -0.72$. $t = -3.66$. $p < .001$), as did expressive suppression (B = 1.02. $t = 3.24$. $p = .002$). Further, the model explained 18% of variance in anxiety ($R^2 = 0.18$. F (5.81) = 3.59). Cognitive reappraisal significant predicted anxiety ($B = -0.69$. $t = -3.20$. $p = .002$), as did expressive suppression ($B = 0.91$. $t = 2.66$. $p = .01$). The model also explained 12% of	-Subjects with IGD were less likely to practice cognitive reappraisal and were more likely to suppress their emotions.-Higher cognitive reappraisal and lower expressive suppression were associated with depression, anxiety and hostility among subjects with IGD.

TABLE 4 (Continued)

Reference	country	Participants	Dependent variables and instruments	Main results	Conclusions
				variance in hostility (R^2 = 0.12. F(5.81) = 2.2). Cognitive reappraisal significantly predicted hostility (B = – 0.75. t = –2.79. p = .007), as did expressive suppression (B = 1.09. t = 2.53. p = .01).	

Note: Statistics appear reported as they were in the original works. Missing degrees of freedom, and so forth. Could not be retrieved from the papers.

Abbreviations: ED, emotional dysregulation; EI, emotional inteligence; ER, emotional regulation; IGD, Internet Gaming Disorder (assessment based on DSM-5 criteria); PUVG, problematic use of video games (other forms of assessment).

to the sample, with three studies. Regarding the country of the samples, no systematic conflicts were observed in the results that could indicate cultural or geographic differences. However, it is important to note that the selected studies' sampling procedures did not adequately cover populations from South America, Africa, and Oceania. Asian studies employed inclusion criteria based on DSM-5 criteria, so, their participants constitute valid IGD samples, while the rest of the sample employed different psychometric tools with no diagnostic value and should be considered as PUVG samples.

Regarding the journals where the research was published, 11 journals accounted for one study each, four accounted for two studies each, and a single journal (Psychiatry Research) accounted for three included studies. Most journals gathered around the topics of addictions and addictive behaviors,[10] psychiatry and psychopathology,[6] and cyberpsychology and media psychology.[4] No journal was dominant or overrepresented, and there were no systematic conflicts in the results that could point to publication bias per journal or per topic.

A single author appeared twice in first position through the selected papers; both studies, nonetheless, employed different samples.

Certainty assessment

Some factors negatively affect the degree of certainty on the results of the review. First, almost all studies were cross—sectional, observational studies, based on surveys of self-selected participants, who completed self-reported instruments; second, the methodological quality was moderate and risk of bias was present; third, in most cases, the construct of emotional regulation was loosely defined, with significant discrepancies underlying the choice of instruments (e.g., emotional intelligence vs. self—suppression facet of emotional regulation); subsequently, five studies consisted of IGD samples, with the others comprising PUVG samples; finally, some specific results seemed inconsistent, namely the relationship between PUVG, psychopathology, and emotional regulation: Estévez et al.[42] pointed to a mediational role of emotional dysregulation between PUVG and psychopathology, while Lin et al.[48] pointed to a mediational role of psychopathology between emotional dysregulation and PUVG.

At the same time, no significant publication biases were apparent, except for the implementation of more stringent inclusion criteria employed in Asian studies. Among other factors relevant to the degree of certainty of the results, effect sizes of the relationship between emotional dysregulation and PUVG ranged from weak (r = 0.14) to moderate (r = 0.36) significant correlations; effect sizes of the relationship between escapism and PUVG ranged from moderate (r = .4) to large (r = 0.53) significant correlations; effect sizes of the relationship between PUVG and psychopathology were in the range of moderate (r = 0.24–0.3) significant correlations. Regarding the role of gender, results were inconsistent among studies, with a clear over representation of male participants.

TABLE 5 Methodological quality according to CRF-QS.[35]

Reference	CRF-QS items																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total
Amendola[37]	1	1	1	0	1	0	1	NR	NA	NA	NA	1	1	0	NA	1	66,7%
Caro[38]	1	1	1	0	1	0	1	1	NA	NA	NA	1	1	0	NA	1	75%
Chih-Hung[39]	1	1	1	1	0	0	NR	NR	NA	NA	NA	1	1	0	0	1	53.9%
Dang[40]	1	1	1	0	1	0	1	NR	NA	NA	NA	1	1	0	1	1	69.2%
Di Blasi[41]	1	1	1	0	1	0	0	NR	NA	NA	NA	1	1	0	1	1	61.5%
Estévez[42]	1	1	1	0	1	0	1	NR	NA	NA	NA	1	1	0	0	1	61.5%
Estévez[43]	1	1	1	0	1	0	1	1	NA	NA	NA	1	1	0	0	1	69.2%
Gaetan[44]	1	1	1	0	1	0	1	NR	NA	NA	NA	1	1	0	1	0	61.5%
Hollett[45]	1	1	1	1	1	0	1	1	NA	NA	NA	1	1	1	1	1	92.3%
Liau[46]	1	1	1	0	0	0	1	NR	NA	NA	NA	1	1	0	1	1	61.5%
Liese[47]	1	1	1	0	0	0	NR	NR	NA	NA	NA	1	1	1	1	1	61.5%
Lin[48]	1	1	1	1	1	0	1	NR	NA	NA	NA	1	1	1	NA	1	83.3%
Marchica[30]	1	1	1	1	1	0	1	NR	NA	NA	NA	1	1	1	NA	1	83.3%
Muller[49]	1	1	1	1	1	0	NR	NR	NA	NA	NA	1	1	1	NA	1	75%
Sallie[50]	1	1	1	0	1	0	1	NR	NA	NA	NA	1	1	NR	NA	1	66.7%
Stenseng[25]	1	1	1	1	1	0	1	1	NA	NA	NA	1	1	0	NA	1	83.3%
Ucur[51]	1	1	1	1	1	0	1	1	NA	NA	NA	0	1	0	NA	1	75%
Yen[52]	1	1	1	0	1	0	1	1	NA	NA	NA	1	1	1	NA	1	83.3%

Note: 0 = criterion not met; 1 = criterion met; 1 = clear purpose; 2 = relevant literature; 3 = appropriate design; 4 = biases; 5 = sample description; 6 = sample justification; 7 = reliable measures; 8 = valid measures; 9 = intervention description; 10 = absence of contamination; 11 = absence of co-intervention; 12 = reported statistical significance; 13 = appropriate analysis; 14 = clinical significance; 15 = reported dropouts; 16 = appropriate conclusions.

Abbreviations: CRF-Q, Critical Review Form for Quantitative studies; NA, not applicable; NR, not reported.

Considering these elements, confidence on the certainty of the results was assessed as moderate, with lower confidence on the role and effects of gender on PUVG.

DISCUSSION

In relation to the primary objectives of this systematic review, a substantial body of evidence indicates a correlation between the severity of PUVG and emotional dysregulation. Specifically, these findings suggest that a higher severity of the GD is associated with greater difficulties in regulating one's emotions.[30,37,41,42,45,47–49,51] This relationship has been examined from different perspectives and assessed using various instruments such as measures of emotional intelligence using scales like the WLEIS,[40] or measures of emotional regulation processes using scales like the DERS.[37] Consistent with the conceptualization of different but interactive emotional regulation abilities and strategies, two different facets of emotional regulation abilities stand out in supporting this relationship: lack of clarity and nonacceptance regarding the nature of one's emotions, and low self-efficacy and absence of strategies in managing one's emotions,[37,42,45,51] especially in people who play video games with high levels of depressive symptoms.[30] Two studies,[25,49] provide noteworthy examples supporting the notion that individuals with problematic video gaming tendencies often encounter difficulties in expressing, understanding, and regulating negative emotions. Another[44] also reported that people that make PUVG experience emotions more intensely and engage in more attempts to manage them but with higher levels of alexithymia. It appears, therefore, that individuals who exhibit greater problems with video games have a poorer understanding of their own emotions and have little confidence in their ability to manage aversive emotional states, which places high demands on their cognitive resources. Beyond the available evidence of a mere correlation, a longitudinal study[46] sheds further light on the relationship between emotional regulation and PUVG. The study, which involved children and adolescents from Singapore, found that improvements in emotional regulation preceded and predicted changes in the level of PUVG.

Gaming as emotional suppression

It seems clear that there is a functional relationship between PUVG and emotional regulation. More specifically, several of the collected studies provide evidence that gaming is used as an emotional regulation strategy based on emotional suppression, as opposed to other regulation strategies such as acceptance or reinterpretation.[25,38,39,41,52] This dichotomy between expression and suppression serves to differentiate regular, nonproblematic video game use from PUVG.[39,48] In an Italian sample,[41] authors use the term "emotional escapism," highlighting both positive and negative aspects. Similarly,[25] propose two facets of escapism: self-suppression and self-expansion, which are related to negative and positive psychological outcomes of gaming, respectively, with the former being more prevalent among people that make PUVG. Building on this functional perspective of problematic gaming,[38] found that lower self-efficacy in managing emotions predicted turning to video games in challenging life situations. In the same vein,[50] observed a greater increase in problematic gaming during the COVID-19 lockdown in males with higher impulsivity, lower social satisfaction, and poorer emotional state. On the other hand,[44] suggest, consistently with the self-expansion facet, that avatars and the relationship with the online environment could serve as a channel for emotional expression and facilitation.

Other psychopathology

Several studies have found evidence that the capacity for emotional regulation, emotional intelligence, or the tendency towards emotional suppression versus cognitive reinterpretation may mediate the relationship between problematic video game playing and other psychopathologies.[43,52] In contrast,[40,48] found that depression and hostility mediate the relationship between emotional dysregulation and problematic video game playing. It appears, therefore, that there is an interplay between emotional dysregulation, psychopathology (anxiety, depression, hostility), and pathological gaming, although it is premature to establish the nature of that relationship. This relationship can take various forms, and as[30] point out, "Gamers should be considered a heterogeneous group, and comorbid disorders are important when developing targeted treatments."

Gender

Although some studies indicate a stronger association between being male and exhibiting PUVG,[37,50,51] the interaction between gender, PUVG, and emotional dysregulation has not been systematically studied in the studies collected, with the exception of.[49] In their study, the authors found that males exhibited higher levels of negative emotions, lack of emotional awareness, and attempts at emotional suppression compared to females. Both genders demonstrated a lack of clarity about emotions, but, while women showed a tendency for in-depth exploration of emotions, particularly in interpersonal contexts, males tended to engage in superficial rumination. These results are consistent with prior literature on emotion regulation and gender,[53] and emotion regulation, gender and substance abuse,[54] which point to a greater degree of emotional avoidance among males, and a more frequent substance use as a mean of avoidance.

Implications for treatment

Several studies highlight the promising role of regulation strategies in the treatment of PUVG, particularly in patients with comorbid psychopathology.[30,40,43,46,52] Of particular interest is,[46] a longitudinal

study which suggests a potential causal role of emotional dysregulation in PUVG. Therefore, interventions focused on observing, understanding, and appropriately regulating emotions appear to be relevant for patients with video game abuse issues. Also, this further stresses the need to provide emotional regulation abilities and strategies to children and adolescents as a transdiagnostic preventive intervention, to prevent PUVG among an array of different conditions.[55]

Limitations of the studies

The methodological quality of many of the studies included in this review was low, with systematic issues arising from the use of self-selected samples and observational methodologies based on surveys, with a clear overrepresentation of males. Data suggest that women also frequently engage in video gaming[56] and that their styles of emotional regulation diverge from those of males[20] making it problematic to draw general conclusions from almost exclusively male samples. In other respects, such as age, some samples were highly heterogeneous, with no control or separate reporting, for example, of older age groups. There were also significant disparities in sample sizes, raising doubts about potential biases in such self-reports investigations. Nonetheless, sample sizes were often not justified a priori, and in some cases, issues of lack of statistical power were reported.

Lastly, five of the studies, all with Asian samples, used diagnostic criteria for IGD, while the remaining studies relied on less rigorous samples without well-established diagnoses (PUVG). This may be a result of the higher prevalence of the problem in Asian populations,[10] leading to a greater availability of clinically severe cases and increased concern for the most severe cases. Otherwise, the findings from IGD samples were consistent with those from PUVG samples.

Therefore, it appears necessary to refine the methodology by collecting samples with a priori adequate sample sizes that adhere to gender and age criteria. Additionally, it is desirable to develop objective measures that, at a minimum, allow for establishing the reliability of self-reports used in this type of studies.

Limitations of the review

This review is not without limitations. Despite the exhaustive search conducted, there may be studies that were not located due to language barriers, indexing issues, etc. Also, we have reviewed qualitative studies, which could make significant contributions to the topic. Due to the disparity in methodologies and measures, a clear comparison of the data is not feasible, making tasks such as synthesis or analysis of publication biases using statistical tools not possible. Nevertheless, the level of certainty in the main conclusions of the study, namely the existence of a relationship between the presence of PUVG and emotional regulation, and the role of video gaming as a form of emotional suppression in people who play video games and have problems (vs. emotional expression in players without problems), is high.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

ORCID

Francisco J. Estupiñá http://orcid.org/0000-0001-9941-0365
Mónica Bernaldo-de-Quirós http://orcid.org/0000-0002-2200-8375
Marina Vallejo-Achón http://orcid.org/0000-0002-8880-8455
Ignacio Fernández-Arias http://orcid.org/0000-0001-9132-0314
Francisco Labrador http://orcid.org/0000-0002-0175-4117

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